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Potential impacts of the use of data analytics to improve the student experience

Diego Rates

PhD in Education

Oilthigh Dhùn Èideann - The University of Edinburgh

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Name of student:	Diego Rates	UUN	S1688550
University email:			
Degree sought:	PhD in Education	No. of words in the main text of thesis:	96500
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Lay summary

In the last decade, there has been growing debates about both the incremental use of data in education and the improvement of the quality and student experience of higher education programmes. However, there is still little research on the intersection of these two areas: the use of data and analytics to support the improvement of the student experience and quality of higher education. If the intersection of these areas remains little studied, there are bigger risks that ineffective or unsafe analytic tools may be implemented in the future. To respond to the dearth of literature in this area, this study aimed to explore the potential impacts of analytics aimed at supporting academics and student representatives in the evaluation and enhancement of student learning experiences in Scottish higher education programmes. In order to identify the potential impacts of these tools, a clickable prototype was designed from conversations with academics and student representatives from various higher education institutions in Scotland. This prototype was then tested with potential users and refined based on the insights obtained. The final prototype was reviewed by academic leaders and student representatives in one-to-one interviews. Overall, five main potential benefits and nine potential key concerns were identified. An initial philosophical analysis of the potential impacts offered more possibilities to interpret their possible implications. Several areas for future investigation are suggested.

Abstract

Student experience and learning analytics have been growing areas of interest for higher education practice and debate. Yet, little research has focused on the intersection of these topics: the use of analytics to improve the student experience. In order to support further investigation in this area, this study adopted an exploratory design research approach to identify potential benefits and concerns related to the use of analytics to enhance student experience in higher education. To achieve this, a prototype was designed and evaluated based on tests and discussions with academics and student representatives from nine Scottish universities. These exploratory results suggest four main potential benefits and nine possible problems and issues. A theoretical and critical analysis offers additional interpretation of the possible implications of these potential impacts. Important areas for future research are suggested.

Acknowledgments

This work was possible thanks to the continued guidance and support of my supervisors. The advanced human capital scholarship of the research and development agency (ANID) of the Chilean state funded my work and allowed me to produce this dissertation. The patience and love of Alejandra –my partner- was also essential for me to be able to endure the intellectual and personal challenge of my ambitious PhD. My gratitude to them.

Dedication

To Alejandra (Jandita) for her love. To Hume and the brave Scottish thinkers for encouraging me with their example to challenge current ideas, without fear or favour. To Maturana and Varela for showing me that there is still a lot to think about and that coming from a humble country was no limit to addressing big questions and problems. To students and their engagement in making our world a better and fairer place.

I hereby declare that all contents of this thesis are unpublished and have been composed solely by myself, and by myself alone, except when otherwise noted.

Diego Rates

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Chapter 1. Introduction

1.1 Aim of the study

In the last decade there has been growing discussion about the development, opportunities and possible negative consequences of the use of data analytic systems (analytics) to support students' learning, a field widely referred to as learning analytics (LA) (e.g., Ferguson, 2012; Sin & Muthu, 2015; Papamitsiou & Economides, 2014; Avella et al., 2016; Vieira et al., 2018; Viberg et al., 2018; Aldowah et al., 2019; Hernandez-de-Menendez et al., 2022; Chen et al., 2022; Tsai et al., 2020; Jarke and Breike, 2019; Knox et al., 2019; Buckingham Shum et al., 2019; Parkes et al., 2020; Williamson et al., 2020). Likewise, over the last two decades there has been growing interests on and debates about increasing the focus of higher education quality policies on the improvement of the student experience (e.g., Harvey, 2005; 2009; Baird and Gordon, 2009; Sabri, 2011; Staddon and Stendish, 2012; Naido and Williams, 2015; Tan et al., 2016; Wintrup et al., 2017; Skea, 2017; Gourlay, 2017; Bloch et al., 2021; Budd, 2021). Nevertheless, there is still very limited research on the intersection of these two areas: the use of analytics to improve the student experience, or student experience analytics (SXA). If SXA systems remain unstudied, there are growing risks for the development of ill-informed tools that may fail to contribute to the improvement of higher education quality, or even create negative consequences for it.

In order to start addressing this critical gap in literature, this study sought to offer an initial exploration of the potential benefits and concerns related to the use of SXA in higher education. To achieve this, an exploratory (agile, human-centred) design research approach and methodology were adopted (Stebbins, 2001; Simons, 1969; Hassenzahl and Tractinsky, 2006; Beck et al., 2001) which involved the design and evaluation of a prototype analytics app – Hypatia- aimed at supporting academics and student representatives enhancement of the student experience of Scottish higher programmes. The research processes involved a sequence of methods. A (rapid) design ethnography (Holtzblatt and Jones, 1995; Duda et al., 2020) was conducted to generate an initial understanding of the context and needs of target users and inform the design of an initial prototype. Rapid prototyping (Gordon and Bieman, 1994; Campbell et al., 2012) was used to test and iterate the prototype app based on feedback from participants. Contextual interviews were used to discuss the final prototype version with academic leaders and student representatives. Thematically analysis (semantically, inductively and experientially; Braun and Clarke, 2006; Terry et al., 2017) of these final interviews was used to identify potential benefits and concerns related to the hypothetical adoption of this SXA app prototype. Finally, using a theorisation of the student experience (Rates, 2017) and number of references (e.g., Foucault, 1995), an initial theoretical and critical analysis of the potential impacts identified was conducted to offer additional interpretation and questions about the possible effects of using SXA in higher education.

1.2 Structure of this dissertation

Following this introductory chapter, chapter two (Literature Review) presents a broad outline of literature surrounding the use of data and analytics to improve the student experience in higher education. The sections of this chapter synthesise main ideas and debates about the data revolution (2.1.1), LA (2.1.2), higher education and quality policy (2.2.1), student experience

(2.2.2). student-staff partnerships (2.2.3) and the context of the Scottish higher education sector (2.2.4).

Chapter three (Theoretical and critical frameworks) describes the references used to provide an initial analysis of the potential impacts of SXA identified in chapter five. A theoretical framework based on ideas from bioconstructivism (Maturan and Varela, 1987), design theory (Simon, 2019), collective sense-making (Kurtz and Snowden, 2003), sense of place (Cross, 2001) and extended cognition (Charbonneau, 2010) is used to define student experience, its research, and the use of analytics for this purpose and later analyse the findings from chapter five. A critical framework based on Foucault's ideas of normalisation (1995) and biopower (2004, 2007) is used to question narratives about the use of data to improve the student experience presented in chapter five.

Chapter four (Method) discusses the adopted research approach (4.1), process (4.2) and methodology (discovery, prototyping and evaluation phases) in detail. Section 4.2.1 describes the design ethnography implemented. Section 4.2.2 outlines the rapid prototyping methodology used. Section 4.2.3 reports the contextual interviews conducted and section 4.2.4

Chapter five (Results and Discussion) presents the identified potential benefits and concerns related to the use of SXA from the inductive analysis of contextual interviews (5.1). Section 5.2 offers an initial theoretical and critical analyses of the potential impacts identified in the previous section.

Chapter six (Conclusions) concludes this dissertation by examining the relevance of the exploratory findings obtained for the current academic discussions and suggesting avenues for future research.

Chapter 2. Literature Review

To situate this exploratory study within contemporary literature, this chapter presents an overview of essential discussions related to the use of data analytics and of the concept of student experience in higher education contexts. It is important to reiterate that due to the very limited literature about the specific potential impacts of the use of analytics to support the enhancement of the student experience, this study has adopted an exploratory approach. Due to insufficient previous research, the review of literature in exploratory studies differs to other types of inquiry (e.g., descriptive, explanatory, predictive, applied, critical research) in which related existing literature is used to directly inform highly specific research questions and methods that would advance what has already been similarly done. Exploratory research by definition investigates little studied topics and questions, and thus, does not enjoy such a wealth of relevant previous references from where to build upon. Stebbins (2001), one of the most cited authors on exploratory inquiry, suggest these studies to focus literature review sections to demonstrate limited studies in the specific research area. This justifies investigation on this topic and the exploratory approach chosen. Additionally, Stebbins (ibid) suggest not to offer extensive discussion of the literature surrounding or linked to this gap. Stebbins argues this takes the attention away from the focus of research. Similarly, Stebbins recommends avoiding 'received frameworks' from this surrounding literature, as these could bring external prescriptions that can pose obstacles and restrictions for the exploratory inductive analysis, as well as treating participants as "automated figures" (Van Maanen, 1988, p. 131) "who are manipulated

according to the theoretical discourse selected by the researcher(s)" (Rates and Gašević, 2022, p.177). Following this line of thought, in this chapter I present a comprehensive but brief and not exhaustive synthesis of some key debates about the use of data analytics and the enhancement of student experience in higher education, and of the limited discussion on the intersection of these topics (represented in Figure 1). In this way, it is expected to provide a minimum background for this study, justify its realisation, and define its relevance for contemporary literature and society. Yet, as indicated above, the literature discussed is provided as a reference of contemporary debates and is not taken at face-value or endorsed, nor used to frame or restrict the findings of the exploratory inductive analysis presented in this study. On the contrary, also following Stebbins' suggestions (2001), this study makes further links to the literature in the results and discussion section which are driven by the inductive findings obtained, instead of the other way around.

After this clarification, this chapter has the following structure. Firstly, I discuss the so-called data revolution and LA as an instance in the domain of education. This section introduces important debates about the opportunities and threats that the use of advanced data machines generates for education and society. An extended review of general discussions about the data revolution I offered in Appendix A (for reference purposes only). This section ends by noting that little research has focused on the intersection between data analytics and student experience, which is becoming a central concept in higher education. Then, the chapter continues by delving deeper into the discussions related to student experience and its evaluation and enhancement in higher education. An extended review of literature about the history of higher education and quality policies is offered in Appendix B for reference purposes. Finally, this chapter provides an overview of student-staff partnerships, which is the context for evaluating and improving the student experience that this dissertation focuses on. Likewise, I introduce details of the Scottish higher education sector, the scenario in which this study is situated. In the end, I conclude by stating the research objective and questions driving this dissertation.

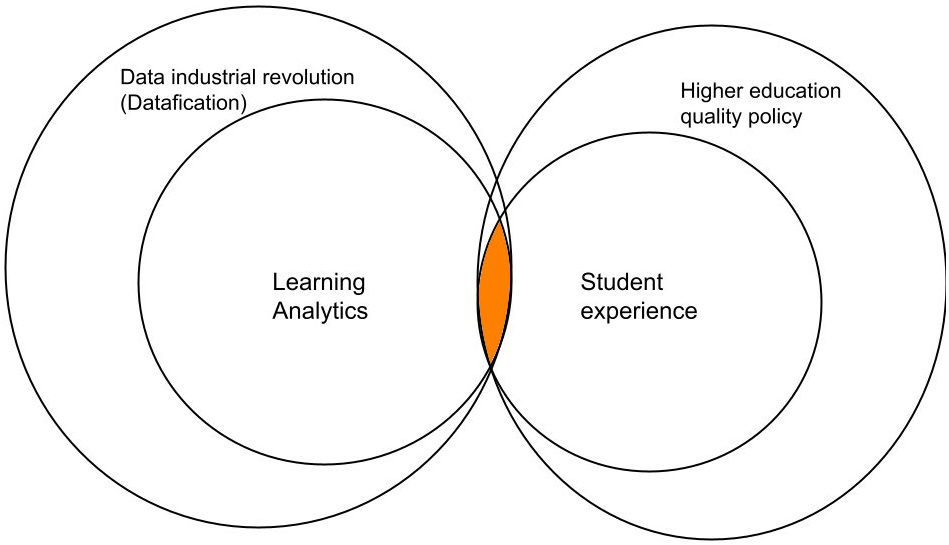


Figure 1. Literature surrounding analytics tools aimed at supporting the improvement of the student experience.

2.1 Data revolution and learning analytics

To start reviewing the literature directly surrounding the topic of this study –the potential impacts of the use of SXA apps in higher education- I think it was best to start by introducing wider discussions about the massification of data-based systems (data machines) and LA. Considering these recent discussions provides a minimum global background that situates LA and SXA as part of a wider technological, industrial and social transformation and the associated debates in literature. These links to broader discussions about the relevance of the so-called data revolution and LA will serve as references for reflecting the findings presented in chapter 5. However, due to the extensions of these debates, in this section it is only presented as brief synthesis of these discussions. As mentioned, a succinct but more extended reading of the wider literature about the data revolution is presented in Appendix A.

2.1.1 Data revolution, datafication and data society

Over the last decade, the growing massification of data machines –advanced systems based on the collection, processing and communication of digital data aimed at monitoring, predicting and controlling physical or digital systems- has been driving increasing impacts to multiple areas of human activity. This massification of data machines has been widely discussed as a new industrial revolution --the so-called data revolution- and has been predicted by the chair of the World Economic Forum to lead to deep economic and social consequences: “[these new technologies] will fundamentally alter the way we live, work, and relate to one another” (2016, p1). At intergovernmental level, the report ‘A world that counts’ of the United Nations (2014) frames data as *the life-blood of decision-making and the raw material for accountability* and called for a data-revolution on national and international development agendas to “produce high-quality information that is more detailed, timely and relevant for many purposes and users” (p.6). The report suggested that governmental embrace for this data revolution can lead to increase in citizen participation, accountability and better policies, thus, “better outcomes for people and the planet.” (Ibid, p6). In the light of the potential economic, social and governance impacts of the data revolution discussed, it is possible to argue that these changes may lead to profound social transformations that produce a new form of postindustrial, postdigital society: the data society.

While optimistic narratives have dominated the economic and policy discussions, the concept and benevolent implications of the data revolution has been widely questioned, particularly in academic research. The report ‘A world that counts” (UN, 2014) acknowledges that the data revolution creates new risks and challenges. The report mentions risks for individuals and minorities related to privacy, discrimination, data sovereignty and data access inequalities and therefore calls governments to balance the potential benefits with the rights of individuals. The report indicates that civil society and academics also have key roles to play for this goal. The rising narratives about data have also been challenged. An importance reference is Kitchin’s critique (2014) that data is abstract, fallible, situated in complex social and economic contexts that data is trying to remodel, and rhetorical: “how data are conceived and used varies between those who capture, analyse and draw conclusions from them” (p.4, from Rosenger, 2013; Floridi, 2010). Kitchin (2014) suggests that such notions are mostly ignored by advocates and official discourses related to data. Another important reference for this study is van Dijk (2013) and her critique of the concept of datafication. The term of datafication is said to have been introduced to describe how data-machines help “taking all aspects of life and turning them into data” (Cukier and Mayer-Schönberger, 2013, p.35). van Dijk (2013) critiqued optimistic

perspectives about datafication for being based on uncritical stances about datafying human life and giving data-power to corporations and governments (both pointed as colluding in using online digital data for surveillance by van Dijk). van Dijk called this optimist but naïve position the ideology of *dataism*.

Since van Dijk's early critique, the concept of datafication has been the focus of hundreds of academic articles (Flensburg and Longborg, 2021). In one of the most prominent critiques of the (big) data revolution and datafication, Zuboff (2019) suggests that the new data power was being used to build a surveillance capitalism: a new form of rogue capitalism in which states and corporations use digital data to monitor and control the behaviours of citizens, obtain unprecedented concentrations of knowledge and influence, and overthrow people's sovereignty. Finally, Mejias and Couldry (2019) also argue that, in the light of uber present and pervasive data and analytics infrastructures (e.g., wearables, psychometrics and workplace monitoring), the ideas of agency, autonomy, and the *self*, have been put into question. Furthermore, these authors argue that datafication follows colonialist rationalities of appropriating human life to extract economic and political benefits. This summary of debates on the so-called data revolution and datafication offers a number of key ideas to consider about the wider context in which both learning and student experience analytics are situated.

Firstly, while there are varied interpretations (e.g., Schwab; 2016, UN, 2014, Zuboff, 2019, Kitchin, 2014), it is widely recognised that advancements and massifications of data-based machines are expanding at a vertiginous pace and leading to important changes in multiple areas of human activity. The specific expansion of these technologies to improve learning and the quality of higher education is the focus of this study. Secondly, independent of the perspective, these transformations are extensively acknowledged as triggering profound implications for these human activities and society more in general. Potential benefits for individuals, businesses and the state are debated, but extremely serious risks and threats are also highlighted in the domains (UN, 2014) of privacy, human rights, protection of minorities, creating new inequalities or for democracy (van Dijk, 2014; Zuboff, 2019), among others. The narratives discussed converge in stating that profound changes being already witnessed and are further expected for the future, on the scale of previous technological revolutions (e.g., agricultural, steam-power, electricity, digital). Thirdly, as already noted, discussions seem to suggest that there are two main narratives in research: optimistics explorers of the 'positive' opportunities of the data revolution that primarily focus on technical issues and benefits, and, on other side, skeptical critics who are centred on challenging the narratives of the optimistics in the light of datafication's suggested undesirable impacts for human and social life. In synthesis, narratives of the data revolution or datafication, while contested, converge in indicating that we seem to be currently living an historical time where the "landscape is changing before our eyes" by the expansion of data-machines (MacFeely, 2020, p.1090). And perhaps, beyond the external panorama in front of our eyes, the datafication of human activity may also redefine aspects of our internal world such as individual's autonomy (Mejias and Couldry, 2019) and identity. In consequence, the data revolution or datafication is considered one of the wider, high-level contexts in which the study of the potential impacts of the use of analytics to support the improvement of the student experience in higher education will be reflected.

2.1.2 Learning analytics and the datafication of higher education

2.1.2.1 Expansion of Learning Analytics (LA) research

In the previous section it was discussed about the global phenomenon denominated data revolution and its expansion to multiple areas of human activity. In the case of education, interest in the use of data and analytic tools has experienced fast and persistent growth in the last decade. In this regard, the main research has been the field referred to as Learning Analytics (LA), which is frequently defined as focusing on systems that collect, analyse and report data to improve learning (Conole et al., 2011) and "the environments in which it occurs" (Siemens & Baker, 2012). Overall, within less than a decade, LA was catalogued as one main surging technology for higher education (Johnson et al., 2016) and became one of the top ten publication topics in educational technology (Gašević et al., 2014). An old but frequently discussed illustrative example of LA is Course Signals, a system created by Purdue University in the United Sates (Arnold & Pistilli, 2012). This system retrieved and analysed data about students' academic performance, background and interactions in the university's online platform to calculate the predicted risk of academic failure for students in a course. Based on the predicted risks, students were shown a traffic light which signaled their calculated risk level in the online platform interface, in addition to different actions depending on the students' risks, such as personalised emails sent by staff, referrals to specific support, or meeting course staff. Another illustrative example is the study in the Open University (a large, online distant education institution the UK) by Rientes and Toetenel (2016), which used multiple regression models with data from different sources to assess the effects of learning design patterns in student's retention, satisfaction, and use of VLEs. Using data from mapped design patterns of 151 academic modules from different disciplines, VLE's usage, student satisfaction, student retention, and institutional analytics data, related to more than 110 thousand students and around 6.7 million hours (about 764 and a half years) of student online interaction, this study found strong influence of module learning design on student retention and satisfaction, and moderate influence on time spent by students using the VLE. More specifically, findings suggested that transmissive learning designs had negative effects on student retention, while communication embedded in learning design (i.e., students participating in content-related discussions with a tutor or peer) had positive impacts for student retention.

A general aim for LA has been related to ''harness [the] unprecedented amounts of data collected by the extensive use of technology in education'' (Gašević et al., 2017, p. 63) in order to "provide insights helpful for enhancing teaching practice, learning decisions, and educational management" (Tsai et al., 2020, p.2; from Siemens & Baker, 2012). Then, it is possible to suggest that LA refers to the investigation of the use of data machines to enhance the activities and decisions related to students' learning, or, using *en vogue* terminology, to the *datafication* of learning. Ten years ago, Ferguson (2012) suggested that a few material factors enabled and drove initial research in LA. Firstly, Ferguson pointed to the expansion of the use of computers and massification of specialised software used by teaching staff and students in higher education to access and share information about courses and programmes of study known as virtual learning environment (VLE, also called learning management system, LMS). Ferguson noted (from Britain and Liber, 2004) that the percentage of higher education institutions that used VLEs went from 7% to 85% between 1994 and 2003. And beyond VLEs, the increased use of digital systems in other areas of student learning –such as libraries, software- and online-based learning- also triggered new mass-production of digital records –data- related to student learning activity. Secondly, Ferguson suggests the massification of 'big data' and the advanced data machines, on the other hand, offered new ways to analyse these then novel large data sets about students' learning activity and interaction. Additionally, Ferguson suggested the interests

of governments and institutions in optimising student learning in higher education as another important non-material driver of research and implementation of LA.

From several reviews (Ferguson, 2012; Sin & Muthu, 2015; Papamitsiou & Economides, 2014; Avella et al., 2016; Vieira et al., 2018; Viberg et al., 2018; Aldowah et al., 2019; Hernandez-de-Menendez et al., 2022; Chen et al., 2022a) is possible to appreciate that, in bit more than a decade, LA has expanded into a very broad array of areas and themes. Some examples mentioned in these reviews include: modelling student behaviour (activity and interaction); prediction of student performance (e.g., grades, passing rates); risk of student drop-out; informing pedagogic decisions; use and enhancement of virtual learning environments; informing course or module learning and assessment design; policy frameworks; dashboards for teaching staff and students; generate insights about social activity; understand the use and improve software-based education and MOOCs; support automated cognitive tutors; intelligent feedback; recommendation or learning resources and courses; estimating learning gain; support self-direct learning, and; research and data ethics, amongst others. To achieve this, a diverse range of analysis techniques has been used on quantitative and qualitative data: classification, clustering, regression, text mining, data visualisation, process mining and machine learning, to name a few examples. In their review, Aldowah et al., (2019) suggested that the bulk of LA research has aimed to understanding and supporting i) collaborative learning and learning-related social interactions, ii) self-regulated learning, iii) evaluating learning resources (e.g., content), iv) monitoring/evaluating student learning, v) detect and address risks of student drop-out, and, vi) gain insights to inform decision-making of educators and students.

A recent bibliometric analysis identified 3900 journal articles on LA between 2010 and 2019 (Chen et al., 2022b). Considering that in 2010 and 2011 this study identified less than 50 publications, these results show a vertiginous expansion to the more than 800 articles published in 2019. LA research has been conducted in Europe, Asia, North and South America, Africa and Oceania (Tsai et., 2020), with the United States, Spain, the United Kingdom, Australia, Canada and Germany being among the countries with the most studies (Waheed et al., 2018; Chen et al., 2022b). A recent study which gathered data from 45 European higher education institutions found that improving students' learning outcomes, teaching quality, student satisfaction, student retention, and explore potential benefits, were the most frequent institutional motivation for implementing LA (Tsai et al., 2020). In terms of evidence of positive impacts in higher education, this seems to be discussed as an area where further research is still required. Ferguson and Clow (2017) reported that only a very small number of studies included evidence about positive effects on learning outcomes and learning support and teaching practices. Viberg et al., (2018), using a much larger sample of studies, obtained similar findings: 35 percent of the 252 papers reviewed presented evidence of positive effects of LA in learning support and teaching, while only 9 percent included evidence about increasing learning outcomes. Of the latter, Viberg et al., found reports of evidence of LA impacts of increased knowledge acquisition (e.g., Tempelaar et al., 2013; Whitelock et al., 2015; Guarcello et al., 2017; Mangaroska et al., 2018), skill development (e.g., Tabuenca et al., 2015; Ochoa et al., 2018; Worsley, 2018) and cognitive gains (e.g., Gašević et al., 2014; Chiu and Fujita, 2015; Sonnenberg and Bannert, 2015). In relation to positive impacts for learning support and teaching, some promising examples have been found in identifying students at risk (e.g., Herodotou et al., 2020), personalising feedback at scale (e.g., Lim et al.., 2021) and improving learning design (e.g., Yau and Ifenthaler, 2021). Dawson et al., (2019) also analyses the early impact of LA research. By looking at papers from the main conference and journal in the field from 2011 to 2018, they

concluded that investigation of LA had contributed with “insights into, and an understanding of, the learning process” (p.452).

2.1.2.2 LA: challenges and critiques

Despite the vast research conducted and relevance gained, it is also necessary to recognise that the implementation of LA in practice is still sporadic and predominately in small scale (Viberg et al., 2018; Dawson et al., 2019; Gašević et al., 2022; Tsai et al., 2020). Viberg et al., (2018) found that only 6% of the reviewed studies described LA systems that had been implemented in practice. Dawson et al., (2019) also concluded that research has mostly focused on small exploratory studies and a shift towards evaluative investigation that target “systemic impact” (p.453). Such developments raise attention to the obstacles that LA systems may face in order to be successfully adopted in educational practice. Tsai et al. (2020) discusses four areas of challenges in this regard: stakeholder engagement and buy-in, weak pedagogical grounding, resource demand, and ethics and privacy. On the other hand, in the introduction of a special issue, Buckingham Shum et al., (2019) argued that LA must integrate human-centred design approaches and methods (e.g., Jokela et al., 2003; Giacomin, 2014; Gulliksen et al., 2003) in order to ensure that the created solutions provide successful response to the complex needs and context of students and educators, and in this way, that these can be effectively adopted in educational practice.

The ultimate benefit of analytics for education is also an area of important evolving debate. Firstly, broader critique of educational technology research (a field denominated ‘technology-enhanced learning) can be extended to LA. Bayne (2015) argued that research in educational technologies has followed the trend of the individualistic ‘learnification’ of education (Biesta, 2005; 2006; 2013), in which teaching, and the social and collective elements of education are disregarded (more about this in the next chapter). Additionally, Bayne (2015) critiques the transhumanist narratives in which technology is claimed as enhancing human-based education. As noted in Rates and Gašević (2022), frequent issues raised in critique of LA are linked to critical data studies (CDS) and related to the potential of data to foster profit-driven and consumerist approaches in HE (Selwyn, 2019; Prinsloo, 2019), as well as to discriminate and oppress students and teaching staff (Selwyn, 2020). In a similar fashion, Parkes et al. (2020) note that most of existing LA research has failed to involve students and highlight the dangers for these tools to be subjected to neoliberal approaches that conceive education as a technological practice (from Freire, 2007). Parkes et al. (2020) suggested inverting these tendencies by designing more human and democratic LA.

In an editorial for a special issue on the wide topic, Jarke and Breike (2019) argue that, in a so-called knowledge or data society, the datafication of education has strategic social implications: “The education sector is one of the most noticeable domains affected by datafication, because it transforms not only the ways in which teaching and learning are organised but also the ways in which future generations (will) construct reality with and through data” (p.1). Although the datafication of education and learning and teaching processes seeks to drive benefits for practice, Jarke and Breike note, it has also prompted sensitive concerns related to “surveillance and control, privacy issues, power relations, and (new) inequalities” (p.1; from Anagnostopoulos et al., 2013; Eynon 2013; Selwyn 2015; Livingstone and Sefton-Green 2016; Lupton and Williamson, 2017). Education institutions are discussed as being fused with data-machines and becoming ‘data platforms’ (Williamson, 2015). The changes in the use of data in education, Jarke and Breike suggest, are modifying the discourses, policy, external monitoring,

management practices and “decision-making and opinion-forming processes of educational stakeholders" (2019, p.1). In other words, the implementation of data machines in education influences its social and political processes. Yet, Jarke and Breire editorial also reminded, the roles of stakeholders and the ways in which data-machines were being implemented in education seemed to be little discussed (Eynon 2013; Williamson 2015). The special issue introduced by Jarke and Breire includes articles reporting on the datafication of childhood education (Bradbury, 2019), schools (Manolev et al., 2019; Ratner et al., 2019), and universities (Jones and McCoy, 2019), as well as about the roles of educational technology providers (Macgilchrist, 2019) and relationships with governance and policymaking (Williamson & Piattoeva, 2019).

Arguing that “educational research has been slower to grasp the far-reaching [social and political] effects of such ‘datafication” (p.31), Knox et al., (2020) examine how some data science methods --training machine learning, nudging students- reformulate learning as *machine behaviorism* and discuss related speculative near futures of ‘learning’ *across* humans and [data] machines. Knox et al., argued that training machine learning algorithms and artificial intelligence with data-traces from students frames the student as data producer, a tole that goes beyond the learner as mere consumer. Likewise, the authors suggest that sensors, the Internet of Things, and smart wearable devices were also redefining the possibilities and intermediating learning physical and digital educational environments and the body of learners. Knox et al., (ibid) highlight that research on machine learning (which is valid for analytics more in general) formulates learning as the recognition of patterns, a behaviorism model which has been widely abandoned in education sectors in favour of cognitive and constructive understandings of learning. Following this theoretical tension surrounding the datafication of education, Knox et al., (ibid) discuss the growing permeation of machine learning systems aimed to identify emotions of students, with the underlying behaviourist “logic of such devices [being] that they can read mood from the student’s voice, body, brainwaves or face and deliver feedback which is supposed to prompt the student” in order to persuade them, change their internal states and “reinforcing positive or preferable emotional conduct” (p.41). In other words, Knox et al., argue, “learning itself is reconceptualised” as a “psychologically quantifiable affective” phenomena which is “both detectable as autonomic bodily signals and amenable to being changed” to what is defined as “‘correct’, ‘preferable’, or ‘desirable’” for particular ideologies and normative principles (p.41). Thus, Knox et al., (ibid) conclude that this *machine behaviourism* “appears to usher in new powerful regimes of centralised control” to educational practice (p.42).

In the editorial of another special issue, this time focused on the datafication of higher education, Williamson et al., (2020) reflect on a number of important discussions in the field. Firstly, they note that ‘governance by numbers’ is a long-established (and critiqued) trend in higher education with examples being research metrics, university rankings and league tables. The advancements of new data machines, however, open powerful paths to expand and deepen these governance approaches and practices to unprecedent levels. Secondly, they mention that collection of student-generated data is fostering the sector’s focus on “measuring and comparing” student engagement, satisfaction, experience and learning gain as “as proxy measures” of (educational) performance and quality. Thirdly, Williamson et al., (ibid) also remind us of an emergent educational data technology market where student data can be monetised and used to train machine learning products, and thus, can become a source of profit and of unfair commercial advantages or monopolies. Another important point raised is that the datafication of higher education is pursuing a more pervasive “capacity to categorize and define

what ‘counts’ as quality education, a good student or an effective teacher” (p.356), what Prinsloo (2020; in the seme special issue) describes as a new form of ‘data colonialism’. New mechanisms for institutions, business and governments from the global North continue to abuse epistemic supremacies to seek profit and control from the global South. Williamson et al., (ibid) also discuss that datafication also brings questions about the embedded perspectives on pedagogy and learning that are applied into higher education practice, such as explored earlier by Knox et al., (2020). Risks of impoverished notions of learning that only account for what can be datafied are highlighted in this issue in the example of analytics dashboards circumspect – and create limitations to- how students are seen by educators (Brown, 2020). Datafication of education can be argued as reformulating teachers and students and their subjectivities, becoming data doubles (Raley 2013) or subjects build from data traces processed by algorithms (Harrison, 2020). On this sensitive topic, Sefton-Green and Pangrazio (2021) have recently argued that the growing datafication of education challenges the existence of the critically reflexive educative subject, a fundamental principle of modern (liberal or critical) higher education. With connection to this matter, Williamon et al., (2020) also recognise that, within the context of the datafication of higher education, data literacies of teaching staff and students also emerge as a critical issue. The authors argue that data literacies are needed for both using data systems and enabling academics and students to critically appraise (Raffaghelli and Stewart, 2020) (and control) the validity of the produced data, the associated inferences made at the light of this evidence, and the possible ethical implications of its use.

Another topic raised by Williamson et al., (2020) is about the use of data analytics and the risk of deepening pre-existing social inequalities in higher education. As introduced in the previous section, the risks of algorithms reproducing social inequalities and creating systematic disadvantages to marginalised groups have been widely discussed. In light of this issue, Hayes and Cheng (2020) argue the need for non-discrimination and ‘epistemic equality’ to be integrated as an indicator of quality in higher education. Williamson et al., (2020) also highlights the threats raised by increasing digital monitoring of student engagement. The authors draw attention to the fact that this trend poses “[f]undamental questions [in relation to] the ownership of data, its ethical uses, permanence, the risks of reproducing discrimination, and implications for privacy and liberty of students and academics” (p.361). The piece of Kwet and Prinsloo (2020) offers an analysis of the “smart campus” and the normalisation of “surveillance architectures” in the university. Finally, the editorial of Williamson et al., (2020) open up further discussion on the disconnection between social and data sciences and scientists. The dialogue in Selwyn and Gašević (2020), the authors argue, evidences a long and difficult task ahead to reconcile different disciplines, methods and philosophies. Nevertheless, Williamson et al., (2020) also argue that, if sensitivities of the ’controversies of datafication’ are considered, new efforts in social/data science (as the authors name it) offer the possibility of relevant experimentation. In all, in this editorial, the authors conclude that the datafication of higher education brings a “myriad [of] problems” for academic discussion and practice. Yet, beyond mere resistance, the authors also suggest that data might also offer opportunities to strengthen the case of the university as a public, democratic and sustainable institution which are worth engaging in “to reimagine and reshape the role of the university in the 2020s” (p.362).

2.1.2.3 LA synthesis: important expectations and debates but lack of focus on student experience

Overall, the reviewed literature suggests that, while still in a relative embryonic stage, research in LA has rapidly expanded and raised important expectations and debates about the future for higher education. Nevertheless, at the moment there is still scarce literature about the potential impacts of analytics tools aimed to support the evaluation and improvement of the student experience –a concept that has become central in discussions about higher education quality and its enhancement.

2.2 Higher education, quality and student experience

What is higher education? What are the main topics related to higher education quality? What is meant by student experience? After introducing main debates about the so-called data revolution and its development in education in relation to LA, this section aims to introduce some important discussions about higher education, quality policies, student experience, student-staff partnerships and the specific context of Scottish universities. With the focus of this exploratory study being the potential impacts of the use of analytics to improve the student experience in higher education, it is relevant to briefly review these themes in order to provide a minimum background to interpret the relevance of the findings offered by this study. Unfortunately, these themes are all quite complex and extensively discussed and it is not possible for this dissertation to cover them in great detail. These are also topics that surround the focus of this exploratory study –an exhaustive review of their literature would also then be distracting. Having noted these issues, next are introduced some important discussions about higher education quality concepts, policies and mechanisms. For further reference only, Appendix B offers a more extended review of these topics, plus a review of literature related to the history and current trends in higher education. This section then continues examining debates about student experience, student-staff partnerships and the quality context for Scottish universities.

2.2.1 Higher education quality

Brief history of higher education

Higher education in Europe was founded by organised students in the Bologna, Italy, in 1088 CE. Italian and then Scottish universities kept student participation in decision-making, but most universities followed the later master-led model that the church established in the University of Paris (Day & Dickinson, 2018). This is an important point for this dissertation. It was not academics who created (Western) universities: students created universities that led to the creation of academic careers. Modern student representation was created in the University of Edinburgh in the late 19^{h} century. It then expanded to other Scottish universities, and within a few decades, to other countries. More interesting details about the development of student representation and its implications are shared in Appendix B.

With the advancement of scientific, industrial and technological development, after the second world war a new social and economic paradigm started to influence policy (in both sides of the cold war): the idea of the post-industrial society or deindustrialisation. Clark (1940; see also figure in appendix D) suggested that, thanks to advances in technology and mass production, societies would tend to decrease the number of people employed in secondary activities (manufacturing) to increment the amount of people working in tertiary (services) and quaternary (research and innovation) activities. Such a scenario creates the need to provide advanced post-secondary education to the majority of the population, conditions which would bring

immense pressures to transform higher education from serving an intellectual elite to mass provision. This transformation is at the heart of many debates in higher education. From 1972 to 2019, the number of students in post-secondary education (most in what we call higher education or universities and colleges) went from 35 to 231 million. In the same period, however, state funding only increased (in average) from 0.6 to 0,7 percent of national gross product (yet funding from 1972 is based in only a handful of countries). These hard numbers tell the tale of universities in the second half of the last century, but particularly in the first decades of this century: crowded universities with decreased (proportional) public funding. This expansion has also surfaced the inevitable questions about the quality of higher education.

Quality: concept, mechanisms, impacts, critique

Since the 1980s and 1990s, universities and governments started importing industrial models of quality assurance to higher education (Harvey and Stensaker, 2008). Five different conceptualisations of quality have been mostly used over these decades (Welzant et al., 2015; Harvey and Green, 1993; Harvey, 2006): quality as excellence, quality as perfection, quality as fit for purpose, quality as value for money, and quality as transformative. Details about these are briefly discussed in appendix F, but it is key to mention that the improvement of the student experience has become a central aspect for all these conceptualisations of quality (Harvey, 2005). Regarding the application of these conceptualisations, a number of mechanisms have been used to implement related quality policies. There are internal and external quality assurance and improvement mechanisms, depending on the stakeholders who define and implement them. Dill (2007) indicates that external quality mechanisms include national qualification frameworks, quality assessment or audits, and the publication of information about programmes. The latter is expected to inform the choices of students, which then operate as a marketised system. This is relevant for consideration of the roles of data in quality evaluation and improvement.

With quality policies and mechanisms aiming to guarantee demonstrable enhancement to higher education, it is logical to examine their effects. Pham (2018) suggests that benefits related to the implementation of higher education quality policies and systems include fostering cultural change, improvements supported by external recommendations, engagement of diverse stakeholders in discussions about quality, and limited improvements to the student experience as reported by a small number of studies. Ewell (2010) discusses 20 years of quality policy and suggested other cultural and systemic benefits. However, Eswell (ibid) also noted that after two decades, it was still not possible to determine benefits for the quality of student learning. This lack of sufficient evidence to indicate reliable positive effects can be argued as a critical failure of higher education quality policies. This failure is even more significant when recognising the suggested negative effects of these policies and mechanisms. Pham (2018) argues that the literature suggests two main problematic impacts: increased bureaucracy and resource and time demand of quality mechanisms and generating distrust and resistance by academics. Quality mechanisms, particularly external ones, have been deemed to be time consuming and burdensome. This is particularly relevant as it implies reallocating internal resources which could be directed towards supporting students and teaching staff (Harvey, 2005; Cheng, 2009; Godwin, 2011). On the other hand, Pham (2018) notes academics' broadly held distrust and resistance to quality mechanism is well known. For instance, academic audits have been regarded as clashing with academic values in England (Harvey and Newton, 2004) and increasing dissatisfaction, alienation and negative views about the efficacy and efficiency of

quality mechanism by Australian academics (Everett and Entrekin, 1994; McInnis et al., 1995). In the light of this literature, it is possible to argue that quality policies in higher education have not been able to demonstrate the generation of substantive improvements to the students' learning (their intended purpose) and have evidenced important undesired consequences. It is perhaps then no surprise that these higher education quality policies have been strongly critiqued.

Harvey (2005) argued that, in the case of the UK, the expansion of external quality mechanism was driven by neoliberal ideology of the government in the 1980s aimed at fostering economic growth and link funding with performance indicators to boost productivity (efficiency). Harvey (ibid) also notes these efforts were resented by their "evident desire to control the sector to an unprecedented degree" (p.269). Houston (2008) argued that fundamental assumptions of industrial manufacturing quality systems –such as quality defined by customer satisfaction and reduction of variation and its need to be measured- were taken for granted. Houston (ibid) argues that these uncritically accepted ideas, particularly competition of institutions focused on key performance metrics, places higher education as business and market. Additionally, Houston (ibid) suggested quality systems were construed in impoverished notions of systems, which focused on individual mechanisms instead of a holistic view that accounts for emergent phenomena. Houston and Paewai (2013) argued that quality systems were implemented by governments to control higher education through coercion (related to funding, reputation, status). Jarvis (2014) suggested that the subsidiary, regulatory and evaluative state driven by the 'new public management' culture disrupted the traditional internal peer-review process that universities had used to maintain and foster academic quality. Jarvis (ibid) argued that ideas of efficiency, performance and value were used as rhetorical motifs to foster control and instrumentalisation of higher education towards the production of employable graduates, and thus, contributing to the economy and the state. In this way, Jarvis (ibid) argues that quality policies remained primarily a matter of ideology and politics.

Similarly, Tomlinson and Kelly (2016) argued that market-oriented discourses of higher education were focused on employability as common denominator between student and employer's interests. Bloch et al., (2021) notes that the student experience has become an outcome in itself, pointing to a change of improvement efforts focused on learning to student's perceived effect of these changes. Furthermore, Bloch et al., (ibid) note that few studies have tried to measure the impact of quality practices, making it difficult to distinguish which mechanisms are more effective. Lastly, de Mello et al., (2022) review of literature suggested that quality process enabled educational innovation, however, output-oriented mechanisms were more likely to inhibit innovation because of their "tendency towards standardization" (p.10). These authors (ibid) also suggested top-down quality mechanisms may be less effective due to stakeholder engagement being the main driver of quality improvement.

In synthesis, higher education has expanded at a great pace in the last half a century and integrated quality systems in the last three decades. Quality policies are suggested of being developed by economic and political interests of governments and being particularly influenced by neoliberal ideologies. These policies have not appeared to be able to demonstrate substantive improvement of the quality of learning but seem to have triggered important costs and generated stress and distrust in academics. Tensions about increased focuses on student experience and employability as measurable outcomes are also discussed, particularly when considering that output-oriented mechanism may be more likely to inhibit rather than boost

educational innovation, and that stakeholder involvement might be the most important driver for enhancing quality. In all, these discussions offer an important background to consider the debates about the student experience in higher education and the roles that the use of data and student-staff partnerships can have to improve it.

2.2.2 Student experience in higher education

2.2.2.1 Student experience: concept in literature

In the review of Ryan (2015) the author concluded that, after decades of implementation of quality systems across the world, there are no international agreements on what higher education quality is, or how to improve it. Yet, Ryan also suggested an international trend of growing interest, research and policy focused on student involvement in quality enhancement activities. In line with previously discussed growth of service, student-centred, and consumerists approaches to education in the last decades, the will and voice of students about their educational experience have emerged as a central reference point, in both literature and policy. The term student experience has already been mentioned earlier, particularly about limited improvements to it that quality systems have been able to demonstrate in three decades (Pham, 2018; Harvey, 2005) and attempts to measure it as a performance outcome in higher education sectors via satisfaction, engagement, experience surveys and questionnaires (Bloch et al., 2021; Dill, 2005). English speaking and European countries have tilted their quality to policy towards the enhancement of the student experience. Cahill et al., (2010) argued that "'quality enhancement' in higher education frequently [refers] to a deliberate process of change that leads to continuous improvement in the effectiveness of the *learning experience* of students *and* the *student's experience of higher education*" (p.284, my emphasis). So, as described by Cahill et al., student experience can be understood as considering both the experience of learning, and of being part of a higher education institution and community. A recent systematic review (Rates, 2017) suggests an exponential growth in student experience research in the UK: from less than five journal articles per year in 2006 to over 50 publications in 2017. However, most of these studies took the concept for granted without providing a general conceptualisation. Following the colloquial use in research and practice, student experience seems to be used to refer to student's learning or educational experiences and their accounts of it. In other words, the terms seem applied to denote the perspective of students about their education and learning. Accordingly, student experience has been linked to concepts such as student voice and feedback. Some recent attempts propose theoretical lenses to understand and describe these concepts. There has also been significant critique and the usual suspect –neoliberalism- has been brought forward, once again. To gain an overview of current discussions, some of these patches are stitched together.

Harvey (2005) argued that a new type of quality framework --the enhancement-led institutional review (ELIR)- was convened in 2003 in Scotland by collaboration of the national quality agency (QAA Scotland), Scottish Higher Education Funding Council (SHEFC); the universities' association (Universities Scotland); higher education institutions and student bodies. This new quality model, Harvey suggested, departed from previous emphasis on monitoring institution's processes more broadly: ELIR "focuses on the activities undertaken by each institution to continually improve the learning experience of students" (p.270). As Cahill et al., (2010) notes, Harvey (2005) went as far as to suggesting that an important part of academics' discontent and distrust with higher education quality processes, and their perception of quality systems as mechanism of the state to control higher education, was related to this previous emphasis in

compliance and competition instead of ownership and improvement. More recently, as already mentioned, Bloch et al., (2021) pointed out that student learning experience has been increasingly considered (and measured) as an *educational outcome*, of the like of the more traditionally assessed student's learning gains or performances. In other words, while the focus on demonstrating learning and learning improvements persists, growing attention and monitoring has been given to evaluate the teaching and learning activities from the perspective of students. In this sense, the interest in the student experience appears not understood as an end-in-itself, or an alternative to learning as a central educational purpose or desired outcome, but as a complement that aims at evaluating the learning processes in order to drive continuous insights into, and improvements for, teaching and learning. Harvey (2009) defined 'total student experience' holistically as "all aspects of the engagement of students with higher education" (p.25). Baird and Gordon (2009) identified multiple meanings of student experience by higher education institutions and literature. All the lived experiences of all students in one institution, all experiences of an individual student including beyond classroom, the experience of individual students with specific aspects of university life, 'consumer' experiences, or learning experiences. The authors then defined student experience in higher education as primarily an experience of personal transformation (or development), linked to promises about future employability, contributions to society and social standing, materialised through guiding of teaching staff and access to learning environments and resources.

Tan et al., (2016) note that authors also emphasise the student experience as "within and beyond the classroom" (Douglas et al., 2008, p. 19), considering teaching and learning aspects but also 'ancillary higher education services' (e.g., library, facilities, WiFi, etc.). Tan et al., (2016) also point out that some authors have argued of a need of looking at the student experience from the perspective of the broader learning context, different students and other relevant stakeholders, and affective (and not just cognitive) domains (Arambewela and Maringe, 2012; Baird and Gordon, 2009). A key element then, at least for this study, is that the understanding of the student experience is related to teaching staff learning how the student(s) perceive and understand the activities and interactions which are part of their education. As I will argue later, the perception and feelings that the student has when in their lectures, their individual and group coursework, using infrastructure and learning environments, and so on, is something that teaching staff –or anyone else except the student themselves – can learn without the student own analysis and description. Even if observation is used by teaching staff (a very old method) or we add emotion analysis via face-recognition artificial intelligence to gain some good pointers, the ultimate source of authority over how students experience their education are students themselves. Therefore, the concept of student feedback and student voice are essential in the discussion of student experience. Shah and Pabel (2020) refer to the student voice –from an academic's point of view- as "listening to the reflections, experiences and aspirations of students about a whole range of matters important to them" (p.195).

In sum, as a group of researchers also concluded recently (Matus et al., 2021), the concept of student experience is defined and used in widely different ways in literature and practice. Perhaps this is unsurprising due to the linguistic and theoretical combinations which the terms *experience* and *student* could result in. In any case, due to the growing utilisation and 'measurement' of the concept of student experience in higher education quality evaluation and enhancement, the eclectic or ad-hoc use of the term is not trivial. There is government driven use of student satisfaction surveys to drive competition between universities aimed to enhance the student experience. There are also internal and research explorations of student's learning

and non-academic experiences. In the systematic review of Matus et al., (ibid, p.8) the authors identify three main focuses in research about the student experience: analyses or evaluation of teaching and learning activities; analyses of engagement and sense of belonging, and; personal wellbeing and feelings of students. It is possible to argue that the increased importance of the student experience in the policy, research and practice linked to higher education enhancement makes the undertheorisation of the concept an uncomfortable and critical problem for present academic debate. In order to start bridging this gap, the third chapter later proposes a brief theoretical model of student experience (ontology) and student experience research (epistemology) based on cybernetics and design theory, among other conceptual underpinnings. This model, and the conceptual elements discussed by other authors, will be used to analyse findings from this exploratory design study in the fifth chapter. Yet, before advancing this proposed model, I find it important to conclude the review of the literature on student experience by synthesising discussions about the future but also critique of the concept and its use in higher education.

In light of the discussions about the briefly reviewed growth in interest about and conceptualisation of the student experience in higher education, at this point it is possible to abstract a number of central ideas for this dissertation. The concept of student experience is discussed as emerging within internal and external interests in enhancing higher education teaching and learning in the last couple of decades. In the last decade, student experience has become a central concept for higher education quality enhancement policy. However, despite its increasing prominence, widespread use and 'measurement' as proxy of quality, there is little theorisation of what the student experience is and how to learn about it. Some recent sources argue that the student experience is understood in different and also changing ways. Accordingly, it has been argued that issues of data collection, bias, teaching approaches and practices, and the protection of the well-being of students and academics should be considered in future discussion about the higher education students' experiences. Following this rationale (i.e., narrative), it is possible to highlight a number of questions of interest for this dissertation. Could data analytics be used to analyse and improve the student experience? Could artificial intelligence help us better understand the experiences of students? Could the data revolution help better 'measure' the student experience and create value for higher education and society? Could the use of data machines lead to enhanced student experience and quality in higher education programmes? What could be the impacts for higher education and society related to the datafication of the student experience? Is the wellbeing of academics, students, academe and higher education at risk? Acknowledging the expansion of data machines such as data analytics applications, it is only a matter of time that further integration of these systems will be witnessed in the whole of higher education and in relation to the analysis and enhancement of the student experience. In the area of educational practice and quality, the use of student surveys and questionnaires is already shifting towards more integrated and sophisticated data applications. Thus, the datafication of the quality and student experience in higher education can be flagged as active and already underway. In this context, these questions highlighted above do not wonder about highly speculative futures, instead, they are pointing to present developments, opportunities and threats. With this scenario and pressing questions, next I offer a brief overview of the critiques of the student experience in order to add an additional layer of (critical) analysis to this dissertation.

2.2.2.2 Student experience: beneficial narratives for higher education and society?

The discourses of student experience previously discussed associated the term to interests, both by researchers and governments, for the improvement of higher education. By doing so, the student experience is somehow portrayed as an intrinsically positive concept. Nevertheless, it should be acknowledged that, like in the general case of enhancement systems and conceptualisations, the idea of student experience as a central element in higher education quality has been increasingly contested. The critiques available claim conceptual, methodological and political problems related to focusing higher education and its improvement on the experience of students. Twenty years ago, when student satisfaction surveys had recently started to be implemented by universities *en masse*, Wiers-Jenssen et al. (2002) already notes that consumerist approaches to student satisfaction in higher education could be problematic: "[Consumerist approaches to student satisfaction] could have negative long-term effects on highly appreciated process functions of higher education, such as the formation of general intellectual abilities and perspectives, and the enhancement of the individual student's personal character."(p.186). Wiers-Jenssen et al., also questioned the abilities of students to assess the quality of their experiences and teaching and learning processes. This is an important point going forward for this dissertation. Additionally, they argued that satisfaction surveys did not account for the previous academic background of students, even when this variable has been statistically associated with academic performance. Furthermore, Wiers-Jenssen et al., also bring attention to studies reporting that for learning activities to be productive they should not be "too pleasant or unrestrained" (p. 184; from Good and Brophy, 1986).

In 2011, in an attention-grabbing article titled 'What's wrong with the student experience?', Sabri argues that the *discourse* of student experience in higher education policy "homogenises, commodifies and diminishes an understanding of both 'student' and 'experience'." (p.657). Referring to an independent review in England suggesting that student experience should be considered as a 'public information needs' (i.e., public goods) that is critical for 'student choice' and to formalise the understanding of higher education students as consumers, Sabri claims that student experience has been discussed as "an absolute representation of reality that exerts a moral authority […] to almost any aspect of higher education" (p.658). Sabri also argues that student experience policy discourses frame the student as a *tabula rasa*, a blank canvas where experiences are imprinted by their education. Sabri critiques such an approach for: promoting the 'illusion' that student learning is not conditioned by social and cultural background, and, ignoring both the place of relationships with teaching staff and other stakeholders and the variation of experiences due to the different context in each higher education institution. Sabri concluded this influential article with a number of controversial points. Firstly, following ideas from Clegg (2011) related to cultural capital, that policy narratives about student experience have been combined with increased curricular emphasis in market relevance and employability and hence knowledge which is highly context-dependent, which may weaken the scale of student's intellectual development, particularly for students in growing applied or industry related programmes, which predominantly recruit students from more vulnerable backgrounds. Secondly, taking ideas from Dewey, Sabri highlights that the discourses in student experience policy frame students as consumers and higher education institutions as 'providers', ignoring the roles of knowledge, academic staff, other stakeholders and the recognition that education is a social practice. In the own sharp words of Sabri:

"'The student experience' discourse, and in particular its centrality to the simplistic notion of student choice, is consistent with an ideological belief in the virtues of marketisation and the

sacralisation of the consumer[.] Invocations of 'the student experience' are wrapped in a sense of righteousness, which often accuses other actors of failing students in some way. At the same time, this sacred form reduces what students do to an economic transaction, in effect it is a hollowing out of education from experience." (2011, p.665).

Ten years ago, Hagel et al., (2012) critically examined the use of national student engagement survey (AUSSE) in Australian universities. After analysing the structure of the survey, the authors of this study concluded that this national instrument was mostly restricted to a "functional ideology" focused on student behaviour. The authors then observed limitations of this national student survey included the limited extent to which they provide information about student behaviour and perceptions; insufficient adaption to the Australian context, and; omission of student's autonomy and reflection. Furthermore, Hagel et al., also noted that the analysis of data, except for a couple of exceptions, showed the failure of the US national student engagement survey (NSSE) to produce robust predictions: "the empirical evidence *does not provide strong support* for the predictive validity of the NSSE scales." (ibid, p.483, my emphasis). In the light of these findings, the authors conclude that it was critical that the Australian government and university management did not misuse data from this survey. Subsequently, the authors suggested that internal use of survey data would be best, yet, when doing so, it should be considered that data could be masking areas where enhancement are needed and that cross-disciplinary comparisons may not be adequate.

In 2013, Sabri analysed the UK National Student Survey (NSS). In this piece, Sabri argued that this data collection and consumption instrument became a 'fact-totem' (De Santos, 2009) after gathering intense social attention, leading to sense-making, and being linked to identity narratives in a higher education institution. Sabri (2013) notes that, in line with discussions in Sauder and Espeland (2009) about league tables, important dates linked to NSS data collection and publication "elicited feelings of dread and anxiety" in staff (p.4). For academics of this institution, Sabri argues, the NSS is important part of the working life, and seemly more so for staff who are responsible for a particular course or module: they can feel *personally* accountable (my emphasis). One participant quote describes the depth of NSS effects for academic's identity and professional status: "People take it personally […] an emotional badge of worth from the student and a potential stick to be beaten with by the institution" (p.5). Another participant of the Sabri (2013) study summed it up by saying "It haunt us". It is important to examine this point. Based on Sabri assertions, the collection, analysis and publication of data about the student experience, at least in this institution at that time, but likely in other places too, had significant impact in the professional and personal life of academics. Of course, such a proposition raised serious sensitive questions about the implementation of advanced analytics to collect, analyse and communicate student experience data. Also relevant for this dissertation, Sabri noted that one participant pointed out that the NSS was "abstract" while internal evaluation can be "detailed, timely and relevant" (p.5). For the case of students, Sabri argued that some were suspicious about how the NSS data would be used by stakeholders different from the relevant teaching staff and higher up in the echelons. Sabri also noted that some students said they were chased by email, letter and phone in order to respond to the survey. Also of interest to this dissertation, Sabri noted that some students reported frustration about the framing of NSS questions and "having to express differentiated experiences as aggregated" (p.7). Finally, overall, Sabri concludes that institutional and national records and rankings "add levels of emotion and meaning to how academics experience the NSS" (p.8) but there also seemed to be resignation to accept that the NSS could not be phased out, a resignation associated to

sensations of “powerlessness” (ibid). In other words, the NSS-mediated datafication of the student experience as a proxy for academic professional performance has critical effects on teaching staff, yet it is argued that many of them see this as an inevitable imposition by government.

An article by Staddon and Standish (2012) put the student experience into more formal philosophical terrain, yet, primarily to reiterate the philosophical weaknesses and problems around its poorly theorised discourse in policy, practice, and some research. In line with ideas previously discussed, Staddon and Standish (ibid) link the policy discourse related to student experience with consumer-oriented understandings of education: “One outcome of a [consumer orientation] is a new emphasis on the quality of the student experience. Indeed, the phrase ‘student experience’ is now reiterated, as if *de rigueur*, in university policy statements and in the burgeoning literature on student satisfaction...” (p.631). The authors then point out that the logic of such orientation is that "universities that keep a good student experience will remain competitive and that a good student experience is one that combines good quality with value for money” (p.631-632). The problem of this approach, and its related focus on the student experience, Staddon and Standish argue, is its delusional narrative of virtue that ends up distorting higher education practice into a toxic performative exercise: “What masquerades as a virtuous fit involving content, teaching and learning, and assessment, in fact becomes vicious: assessment reduces to the measurement of learning outcomes, to which teaching and learning are unwaveringly directed, while content is selected to be amenable to this end.” (p.636). Staddon and Standish then open the question of an even more problematic scenario driven by the datafication of student satisfaction in higher education: “the substance of learning has been subjugated to the generation of the feedback universities are required to provide” (ibid, p.647). While these are not generalisable claims, Staddon and Standish unfold deeply problematic relationships between discourses of student experience and traditions and principles of academic scholarship. These authors also argue that trends towards engaging students in quality evaluation and improvement (e.g., as pedagogical consultants, co-designers, scholars of teaching and learning) appeared to be caused by a lack of trust in academics knowing how to teach their disciplines., and, moreover, “[i]n fact, [engaging students] *encourages* lack of confidence” (p.639). After this confidence hit, the system them ask teaching staff to be accountable of generating and demonstrating improvements.

In this article, Staddon and Standish also critique the student voice, another central concept for this dissertation. The authors argue that the student voice is a key idea for quality policy and student experience: “is in the driving-seat for quality in higher education and, by default, the driver for the conception of experience” (p.642). In other words, the supposed need (for academics) to consider the voice of students is at the centre of student experience discourses and narratives of students as consumers. However, this voice is only heard by the system when it is expressing student’s satisfaction about the consumerable quality of higher education. Through this mechanism, it can be argued, the student and their voice are reduced to a satisfaction sensor aimed at making higher education more competitive and controllable. As many others have similarly highlighted, considering general service satisfaction as a proxy indicator of experience “leaves certain possibilities [of higher education] with no place to go” (p.643). From this analysis, Staddon and Standish conclude that dangers related to student experience discourses are raised. In this context, it is important for higher education teaching staff, in all its forms, to resist diversions from what is most important at this educational level, that is, the authors argue, to teach students how to develop and critique judgements that have

evolved in their disciplines. Staddon and Standish suggest for this to happen it is required to go beyond restricted consumer understandings of the student experience and challenge students, allow degrees of freedom, drive student immersion in their disciplines and their enquiry and criticism traditions, expose limits of knowledge, and understand assessment and criteria, among other issues. In my view, it is difficult to argue that a lack of such elements does not determine a detriment to the quality of higher education.

Naidoo and Williams (2015) expand the critical links associated with the consumerist focus of student experience policy. Like others, they related the student experience with the marketisation of higher education and the growth of student fees (in some countries) that reconstructs higher education from a public good to a private service. Public benefits have been reinterpreted as the sum of individual benefit and its external ramifications (from Marginson, 2011). In particular, Naido and Williams focused on the policy introduction of 'charters', which, as already mentioned, define 'mutual expectations' between students and the institution. Such policy-driven arrangement, the authors argued, is "indicative of the fact that HE is now considered to be a private contractual investment between individuals and institutions: (p.216). From 2017 onwards, multiple authors have offered further critiques to both customer oriented higher education and its conceptualisations of the experiences of students. Looking at the UK context, Tomlinson (2017) conducted interviews and focus groups with students (N=68) from seven different institutions. Tomlinson argues that students recognised increasing student consumer orientations and that growing student fees increased both their expectations and notions of authority to scrutinise their programmes, changes "warranted by the more transactional relationship that they had with their institutions" (p.456). However, Tomlinson also identified that consumer-oriented perspectives failed to describe the totality of interests and views of many students about their higher education experiences. Moreover, attitudes towards those consumer-oriented approaches varied within the student body: some students seemed inclined to identify with such narratives, while others were more ambivalent, or directly resistant to adopting such identities. About this resistance, Tomlinson reflected, those students felt that a consumer identity "would both diminish their role as learners and their efforts towards achieving their degree" (p.462). Tomlinson concluded that, for participants in this study, a consumer identity did not fully reflect how students think of themselves and their higher education learning experience. I note this will be an important point going forward for both the theory proposed and the analysis of the findings.

Skea (2017) delves into the limitations of qualifying higher education in function of satisfaction of a student as consumer. Specifically, Skea highlights that, beyond seeking to settle students' expectations, higher education has also a critical capability, and I would argue, a clear duty, of unsettling students and their world view. Thus, current perspectives to student satisfaction and its measurement "limit Higher Education to the short-term meeting of student expectations" (p.374). On the other hand, Beerkens and Udam (2017) offer critical insights about new higher education governance models focused on stakeholder engagement. From a study with employers, teaching staff, students, rectors, government officials and from a number of Estonian universities, Beerkens and Udam found that, as new governance and new public service assume, engagement of different stakeholders was indeed capable of enriching quality assurance's aims and social responsiveness. Yet, the authors argued, some interests can be contradictory between them and trying to create policy and tools mixes can create problems and 'toxic' combinations. For instance, Beerkens and Udam suggested, a good balancing of quality control and enhancement mechanisms can be difficult to achieve, and transparency instruments

might create conflicts if the information published is not comprehensive or reliable, if it is misleading, or, if stakeholders do not have the assumed capabilities for its analysis. This last point, of course, being of great interest for this dissertation. In the editorial of the special issue "Teaching excellence in higher education: critical perspectives", Gourlay and Stevenson (2017) concluded that all its publications discuss non-trivial tensions between marketised higher education with a consumer ethos and its erosion of core academic values, such as an understanding of higher education as a public good, promoting social justice and collaborative work, and to critique hegemonic social and political assumptions.

In another paper that year, Gourlay (2017) offers a posthumanism critique of discourses of student engagement in higher education. Student engagement, as previously introduced, is concept used to describe student learning activity and interaction, which is argued as essential to for an 'effective' student experience and student-centred (active learning) narratives. Gourlay gives the example of the 'flipped classroom', where the lecture is replaced by the selection of content and student peer-to-peer interaction following coursework instructions. Gourlay argues that these discourses tend to categorise more passive students (ibid) or teaching and learning practices and may overestimate that both following instructions and 'high' student interlocution are a generic gold quality standard for higher education teaching. Such discourse, Gourlay argued, was for example applied in the UK academic professional development accreditation criteria, possibly creating career-related pressures for early-career academics to adopt such practices. Other forms of teaching and learning that do not tick the boxes of what is *defined* as 'observable engagement', reiterates Gourlay, can be "pathologised […] or rendered invisible" (p.28). Drawing from Biesta's critique of student-centred learning and reclamation of importance of teachers and student-teacher relationships in higher education (which will be further discussed later), Gourlay then argues for posthuman, analyses of student engagement which expand beyond the individual student, or teacher-student relationships. Gourlay (2017) proposes to consider student engagement as a dynamic and evolving sociomaterial network of human and non-human actors (e.g., students, teachers, notebooks, pens, classrooms, books, computers, libraries, etc.) which mediate the assemblage of the day-to-day of teaching practice and student learning. Gourlay indicates that such posthuman perspectives might allow to overcome limitations of abstract and reductionists understandings and practices about student engagement, and hence, of student experience: "[a sociomaterial approach might offer] richer and more nuanced range of ways in which we might conceptualise student engagement [and avoid] a collapse into an over-simplistic educational model" (p.33). For this dissertation, this critique raises important questions: what observable interactions are defined to represent students' learning? How are these defined? And, what could be the effects of the use of sophisticated data machines to evaluate, improve, or surveil the engagement of students with their social and material higher education context?

These previous questions were partially explored by Wintrup (2017). Wintrup in this case took a 'connectivist' perspective (e.g., learning being achieved and increased by the networks which students connect to) with a Foucauldian turn to analyse the use of analytics to assess student engagement. The author reflects that use of analytics to monitor data trails from student digital activity and interactions (i.e., engagement) could make students and educators fear to be categorised (and then judged) as 'at risk' or 'ineffective', respectively. These fears of punishment, Wintrup argues, could then make both students and educators to internalise surveillance mechanisms in order to change their behaviour (e.g., learning and teaching decisions and habits) towards compliance with what is prescribed as desirable observable

student behaviour. Wintrup notes this coercive self-regulation can lead to neglect of other forms of student activity and networks which, while not monitored, are beneficial or essential for student learning. Accordingly, Wintrup concluded that if there is awareness to these issues and relevant policies and law can be put in place, it might be possible to avoid these unproductive and problematic forms of educational surveillance and open opportunities for desirable applications of analytics. Raaper (2018) offers an illustrative example of this coerced self-regulation related to how students' understanding of the formal assessment of their learning can influence their behaviours. From interviews in an English university, Raaper found that learning assessment activities triggered feelings of fear, stress, panic, freaking out, or being in a nightmare –what gave the "impression of students as fearful and needing to perform in a 'right' way" (p.11). For instance, a quote from one of Raaper's participants discusses how a student learned to think that writing more than a hundred words for a marked essay without a citation was *doing something wrong*. Ultimately, Raaper argues that learning assessment practices framed under employability and consumer-oriented perspectives worked as a disciplinary power resulting in "strategically minded" student subjectivities (ibid) enforced by diffusion of self-regulation and responsibility. The case reflected by Raaper that monitoring student learning is not neutral raises similar concerns in relation to the use of data analytics to evaluate the student experience and how this could become a disciplinary technology and impact the understandings, behaviours and wellbeing of students and academic staff.

To round-up this overview of the critiques related to the existing discourses around the conceptualisation and measurement of the student experience, next I review ideas of interest discussed in publications from the last few years. Mendes and Hammett (2020) offer a critique of the conflicting tensions between policy-driven student identities of *student as consumers* and *students as partners in educational improvement*: the paradox of strategic-active student citizen. In the words of the authors:

"there is a tension between on the one hand the positioning of students as strategic, instrumental members […] who are expected to make decisions to prioritise their own degree outcomes [and, at the same time,] expectations of student participation assume students will be active citizens of the university [participating in] activities which will have deferred benefits for future student cohorts and for the longer-term benefit of the institution" (p.12).

Budd (2021) reflected about 'studenthood' (to be a student) looking at the student experience critique from a post-critical ethos inspired in the 'Manifesto for a Post-Critical Pedagogy' by Hodgson et al. (2017). Budd divides the body of knowledge around three main areas of attention and seeks ways in which post-critical views enable to think of where 'love' (i.e., value) for the student experience may be found. Firstly, Budd argues that plenty of literature has focused on the inequalities of students' experiences due to structural differences associated to socioeconomic, cultural, racial and gendered factors. Yet, from a post-critical stance, literature seems to overemphasise structural differences and from a negative, half-empty glass perspective. Budd suggests that positive aspects of the experience of marginalised higher education students also need attention and research should go beyond the describing and complaining about dysfunction of higher education. Secondly, Budd notes that multiple publications have centred on the links between student experience and the neoliberal marketisation of higher education. But, Budd argues, there is scarce empirical evidence to back up many of the analyses and critiques, or the ways in which universities translate national policy. Finally, Budd reflects, another important area of inquiry has focused on the topography of

the student experience, which tries to understand how the physical and digital places and spaces of higher education influence student interactions, experiences and opportunities. While these perspectives, Budd indicates, offer possibilities for new understandings of the student experience and complex student-university and student-student relationships, research has mostly focused on the topographical experience of marginalised students and investigation about majority student groups experience their position. Overall, Budd concludes that studies have offered little 'good news', but there are clear signals of academics push for both positive student agency and to resist academic degrees being "flattened into readily observable metrics" (p.126). In light of this, Budd recommends attention to the personal and social transformation that can be fostered in the experiences of higher education students.

McCune (2021), on the other hand, discusses important tensions experienced by academics between research and teaching work in research-intensive universities. Specifically, MCcune recognises that, although universities have increased efforts to strengthen academics' valuation of and efforts towards teaching, institutional pressures to prioritise research poses difficulties and tensions. McCune then explored how academics –in research-intensive universities- could reconcile researcher and teaching identities, concluding that policy improvements must go beyond teaching areas, such as looking to avoid conflicts between research and teaching metrics, which can penalise academics academics' careers progression. While authors may have not being explicit about it, this is a relevant point to consider in relation to described academic resistance to time required for teaching and student experience enhancement, and, to the findings from this dissertation. Darwin (2021) recently explored the changing landscape of student evaluation, noting that while alternatives to student surveys have emerged in the last years (such as partnerships, action research, peer assessment, teaching awards), the prominence of policy-driven student ratings have blocked attention to these potentially more effective methods. Darwin concludes that, overall, the recognition of student perspectives as a valuable resource is still understudied: "How student perspectives can be more effectively understood and valued in shaping higher education pedagogies remains relatively underdeveloped" (p.229). Subsequently, Darwin suggests that "it is essential also *to consider some of the alternative constructions of capturing the student perspectives*, especially where attempts are being made to use it *as a catalyst* for more sophisticated forms of pedagogical dialogue, debate and transformation" (ibid, my emphasis). Finally, Wang and Williamson (2022) reviewed previous studies to try to confirm if course evaluation instruments (CEI) produced valid measures of teaching quality, or if lenient student grading could affect courses' score. The authors found that research showed correlation between grading and (CEI) scores and the empirical studies that analysed the nature of this association appeared to confirm the lenient grading hypothesis. Wang and Williamson conclude that higher education institutions reflect on the reliance of course evaluation instruments.

2.2.2.3 Student experience: *synthesis*

The reviewed literature suggests that the student experience has become a central and ubiquitous concept in higher education practice and discourse. The concept seems to be used to discuss student's own understanding of their learning activities and interactions, thus, reflecting a critical view of learning processes. However, the concept also seems under-theorised and to be used in ad hoc, informal ways. Also, significant critique has contested its use in higher education. Critique has pointed out that student experience follows a student-centered and consumerist approach to higher education. Authors argue that challenging

student's experience and contesting their world view are important requirements of intellectual growth and critical reflection associated with higher education. The external and internal pressure of student experience questionnaires and surveys is then strongly critiqued for their coercive influence to change the behaviours of teaching staff and students, as well as their lack of recognition that the experiences of students will vary depending on their backgrounds. In all, there is a growing interest in understanding and enhancing the learning experiences of higher education students, and at the same time, increasing fears that such interest, and the methods used, can be ultimately counterproductive. Accordingly, in this complex context, in this study I try to evaluate what are the potential impacts –benefits, concerns and challenges- of using analytics to inform the evaluation and enhance the student experience in higher education.

2.2.3 Student-staff partnerships for quality enhancement

It has been already introduced that a recent review of the literature suggests a trend of increased international interest in student involvement in the higher education quality enhancement process (see appendix A). However, there are different ways in which student participation can take place. An additional international trend in the last decade has been the growing interest in student participation as partners in the evaluation and enhancement of higher education quality (Bovill & Bulley, 2011; Cook-Sather, 2014), which is referred to as student-staff partnerships (SSP) or student as partner (SaP). A recurrent definition for SPP describes it as "a collaborative, reciprocal process through which all participants have the opportunity to contribute equally, although not necessarily in the same ways, to curricular or pedagogical conceptualisation, decision making, implementation, investigation, or analysis" (Cook-Sather et al., 2014, p.6–7). In synthesis, it can be said that SSP involves egalitarian participation of the student body in shaping and improving their (higher) education. This adoption of egalitarian student participation can be distinguished from other forms of student involvement, as illustrated by Figure 2.

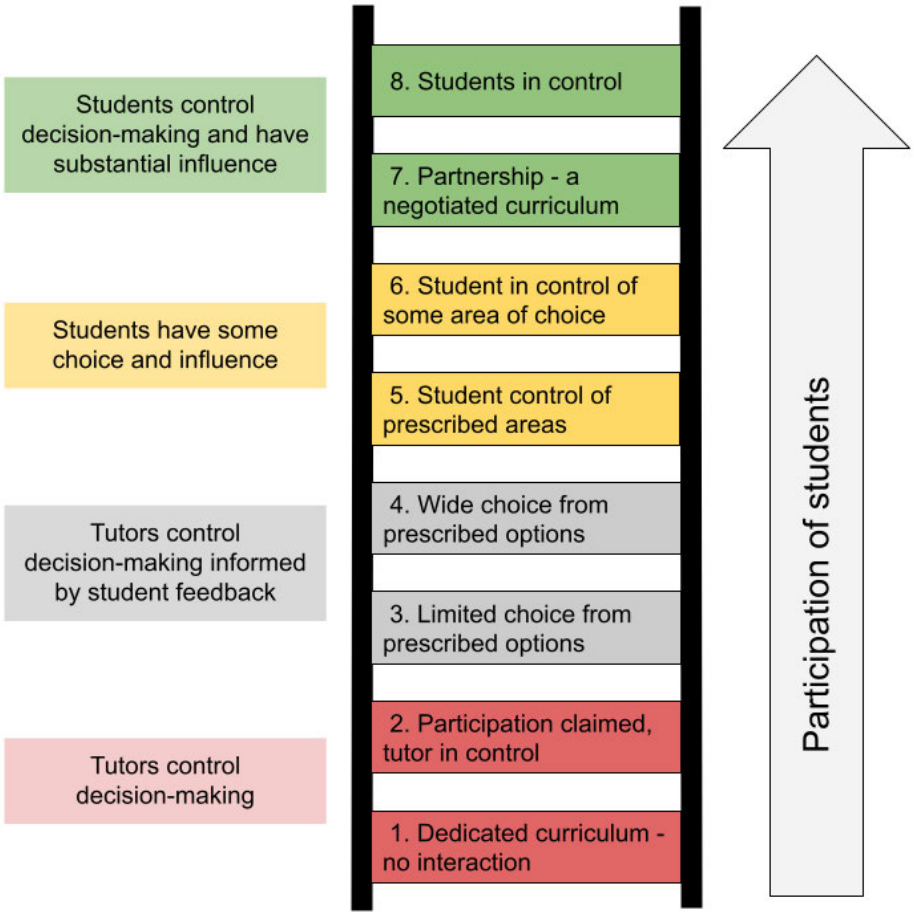


Figure 2. Student participation ladder (from Bovill and Buley, 2011).

As modelled in figure 2, students can participate either as passive receptors of the curriculum, informants for teaching staff decision-making, by choosing a limited range of options, or by taking part in negotiation and decision-making –and become egalitarian partners. Therefore, partnerships go beyond student identity of and participation as consumer and have been argued as a valuable form of resistance of the marketisation of higher education "where universities are competitive, managerial corporations; academics are employed training providers; students are *passive, paying, individualised consumers*; and learning is a *packaged product*" (Peters and Mathias, 2018, p. 54, my emphasis).

Student-staff partnerships are relatively novel and just in early maturity (Healey & Healey, 2019) and consequently, it is yet difficult to evaluate their contribution. A recent review of the literature (Matthews et al., 2019) analysed 63 empirical publications between 2011 and 2015 identified a number of reported benefits and challenges of student staff partnerships. Results of Matthew et al. suggest that the main positive outcome is on of student-staff relationships is that, as partnership "helped them build trust in their partners and allowed them to become more understanding of, and empathetic toward, roles and perspectives other than their own" (p.250). Secondly, findings in the Matthews et al., is review point to educational benefits in students' "learning, academic performance and metacognitive learning" (ibid), and also appeared to increase students' "motivation for learning, ownership of learning and for engaging students

from underrepresented groups" (ibid). The review identified benefits for staff's "learning about teaching, new pedagogies, insights about students learning and how learning happens" (ibid) and to increase staff "motivation for teaching, engaging in partnerships with students and in practices that engage students in learning" (ibid). The authors also indicate that the main negative outcome for students is feeling "their expertise was under or overestimated" (ibid), and for staff were issues "relating to confidence, such as worrying whether the initiative would be successful, or experiencing a sense of vulnerability or discomfort" (p.251). In sum, although these results cannot be confidently generalised, this review suggests that partnerships appear to show benefits for students cognitive and metacognitive learning and motivation, for teaching staff pedagogical knowledge, and importantly, for student-staff relationships –which we discussed as a key area abandoned by current quality and student experience policy. However, on the other hand, partnerships also seem to create new expectations and tensions about these transformed relationships.

For this dissertation, the question of central interest is related to the possible impacts of the use of data and analytics within student-staff partnerships for student experience evaluation and enhancement. In this regard, an important conceptual precedent is the role that (access to) information plays in enabling effective participation in decision-making and partnerships. As discussed in a small preliminary study (Rates and Gašević, 2022), Klemencic (2011, 2012) has noted that adequate access to information is one of the conditions required for effective participation, and that higher levels of access to information are needed for higher levels of participation, such as a partner in decision-making instances. Subsequently, it can be argued that egalitarian access to key information, such as relevant data, is one of the requisites for student (and staff) informed participation as partners in the improvement of the student experience. Following these arguments, it can be hypothesised that staff and students use of data analytics may have non-trivial effects on the partnerships for student experience enhancement. Yet, as indicated earlier, there are multiple partnership mechanisms. In this dissertation the focus has been placed on the collaboration of academic staff and student representatives of higher education programmes from Scottish universities.

2.2.4 *Smashing!*: Student experience in Scottish universities

As previously mentioned, this study aims to explore the potential impacts of the use of analytics to support student-staff partnerships to enhance the student experience of Scottish higher education programmes. Universities in Scotland follow UK-wide and Scottish quality enhancement regimes. For the context of this dissertation, the UK-wide policy if interest is the UK Quality Code, published by the QAA. The Scottish policy of interest is the SHEF. The Quality Code establishes that the ultimate goal for universities quality system is safeguarding and enhancing of the student experience, making this concept central for the discussion and work in educational quality –see definition of 'quality assurance' from QAA, 20182, p.29. For this study I considered as reference the 2015 version of the UK Quality Code (which has been recently updated, see QAA, 2018b). The code, among others, included three parts with multiple chapters and 19 expectations for higher education institutions. These expectations were a requirement for all programmes, independent of study modalities and country of delivery (i.e., also involving transnational programmes). However, universities are provided full autonomy by the code to organise their own systems and processes to achieve these expectations. The part B of the code is focused on the quality of learning and student experience, or in the official terms, it was: "concerned with the quality of the learning opportunities that are in place to

support students in higher education and enable them to get the most out of their higher education experience" (QAA, 2015; p.12). The expectations of Chapters B1, B3, and B4 stated that universities need to demonstrate effective and systematic processes to design and continuously improve higher education programme's curricula, teaching, and personal and professional development activities. All of these processes are expected by the code to include participation of academic and professional staff and students.

Chapter B5 sets general expectations of partnerships with students, that, as just said, is required at curricular, teaching and extracurricular dimensions (again, please note, for all UK-based programmes, irrespective of modality of study or country of delivery). Specifically, the chapter established the expectation that higher education institutions shall take formal action to ensure that students, both as individuals and collectively, participate in partners in the improvement of the student experience: "[P]roviders take deliberate steps to engage all students, individually and collectively, as partners in the assurance and enhancement of their educational experience" (QAA, 2012, p6). Within this context, for all UK Universities, Student-Staff partnerships are considered a necessary piece of the quality assessment and enhancement of the student experience (ibid). Student-Staff Partnerships are defined in the policy (ibid, p.5) "in a broad sense to indicate joint working between students and staff" for the (ibid, p. 6) "assurance and enhancement of [the student] experience". This Student-Staff Partnership should be formalised by each University and its student body –Student Association, Union or similar- where they should (ibid, p.7) "define and promote the range of opportunities for any student to engage in educational enhancement and quality assurance.". These opportunities are expected to cover the active participation of students in areas like (ibid, p.4) "application and admission, induction and transition into higher education, programme and curriculum design, delivery and organisation, curriculum content, teaching delivery, learning opportunities, learning resources, student support and guidance, [and] assessments", amongst others. This general expectation is further illustrated by pointing that the opinion of students is considered for enhancements related to the experiences of present and future students, and that adequate alternatives are offered so students are enabled, and encouraged, to share their perspectives: "the views of students […] inform and improve the student educational experience both for current and future cohorts [and that] opportunities are provided to students in a manner and at a level which is appropriate to them, and in an environment [where they] encouraged to take up the opportunities on offer." (ibid, p.5). While embedded in the intricacies of autonomous mechanisms, and the naïve, or perhaps deceptive optimism of policy claims, the text of the UK Quality Code is explicit, and, in that sense, unambiguous in demanding the implementation of forms of student-staff partnerships aimed at enhancing the educational experience in higher education programmes and institutions.

Also, of crucial importance for this study, the Quality Code also established a general requisite of inclusive higher education provision, by demanding that institutions, regardless of social background or disabilities, "to ensure that all students have equal access to educational opportunities" through "removing arbitrary and unnecessary barriers to learning" (QAA, 2011; p,1). Overall, the Quality Code requires UK universities to implement autonomous but systematic curricular and teaching (and for general services too) design and improvement processes focused on creating the best possible student experience. The code indicated that these design processes must eliminate arbitrary barriers that may hinder equal student access to the educational provision. The policy also establishes that institutions must include students as partners (plus other stakeholders) in these design and improvement processes. Students

shall be able to participate as individuals or collectively (at different levels e.g., programme, academic department, institution-wide). Within this broad framework and the autonomy of institutions, some minimum characteristics of these processes are set up by the code. British universities are expected to create and maintain environments where academic staff and students can engage in discussions to bring "demonstrable enhancement of the student experience" (ibid, p.10), and have "arrangements [...] for the effective representation of the collective student voice at all levels". Additionally, to (ibid. p.11), "ensure [...] that student representatives ('reps') and academic staff have access to training and support [...] to [effectively] fulfil their roles" in the assessment and enhancement of the student experience (ibid, p.12). These roles are at last expected to involve discussions between academic staff and students informed by available evidence: "[student-staff engagement] in evidence-based discussions based on the mutual sharing of information" (ibid, p.14), and, "monitor and review the effectiveness of student engagement in quality at least annually". In other words, the minimum required by programmes and institutions to be granted higher education degree-awarding powers is to have, at the least, one meeting a year in which staff and student reps co-evaluate and find potential improvements for programme and course teaching and curriculum. Of paramount relevance for this study, this co-evaluation and identification and agreement on enhancement actions is expected to be based on mutually available data.

Now, the key instances where this student-staff engagement occurs, especially for Scottish Universities, are what is known in most institutions as Student-Staff Liaison Committees (SSLCs), and least frequently but with a higher level of decision-making, in programme reviews. SSLCs are held normally once or twice a semester and gathers student reps with programme director(s) and academic staff to discuss and agree on plans for course and programme enhancement. This instance of conversations between student reps and programme staff, is the direct opportunities for universities to engage with students, get course and programme feedback from students, get the chance to discuss and debate this feedback with Student Reps, and agree on plans and actions that will improve the student experience of Higher education programmes. Within its degree of autonomy, the Higher Education sector in Scotland has set and is pushing its own strategic agenda for the enhancement of the quality in its universities, as we have said, with the aim to become the best place to study in the world -although this independent approach is not free of tensions with UK national strategies, see Scottish Funding Council (2015). This national strategy is stated in the Quality Enhancement Framework (QEF) which can be defined (sparqs, 2017) as "a set of national arrangements agreed between the Scottish Funding Council (SFC), the Quality Assurance Agency Scotland (QAA Scotland), National Union of Students Scotland (NUS)] and Universities Scotland", and it is composed of five areas of work (QAA Scotland, n.d.): Institution-led reviews, Enhancement-led Institutional Reviews, Public Information, Student Engagement, and, a programme of Enhancement Themes.

These areas cover two main activities for Scottish Universities: the publication of information about problems, solutions and results of institutions in the enhancement of the student experience, and, the development of strong participation and contributions of effective student-staff partnerships for quality. For this study we focus on two central areas of the current strategy, efforts and consequently expectations of the Scottish Higher Education sector: the use of evidence to enhance the student experience, and enabling effective student-staff partnerships for quality. The Enhancement Themes programme generates an area of focus for the enhancement work of all Scottish Universities during a 3-year period. The current period

2018-2021 is titled ‘Evidence for enhancement’ and calls all Scottish Universities to focus their enhancement work on research and implementations related to the use of evidence. The work is developed across and between universities and sector organisations related to higher education quality in Scotland. At a high-level, the current theme is composed of four areas of work (QAA Scotland, 2018): Defining and capturing evidence, Student engagement and demographics, Optimising existing evidence, and, Exploring Learning Analytics. The key idea for this study based on this current context, is the contingency that the Scottish sector is now aligned around the use of data for the enhancement of the student experience. Strategically inclined to identify where and how the use of data can ease and maximise the enhancement of the student experience. The second central part of the Scottish strategy related this study are Student-Staff Partnerships. We focus here in the area of ‘Student engagement’, defined (QAA Scotland, n.d.) as “an important element of the Quality Enhancement Framework (QEF)” and which is operationalised by the work of Student Partnerships in Quality Scotland (‘sparqs’). ‘sparqs’ is an agency funded by the Scottish Funding Council, and its driven by the mission of (sparqs, 2019, p.5) “[f]oster a culture of partnership between students and staff which enables the Scottish education sector to respond to challenges and realise its ambitions to provide the best possible experience for each and every student”. To achieve this, sparqs has provided support to students and institutions, mainly with training programmes for these stakeholders, to enable them to have an effective collaboration to enhance the student experience.

In synthesis, the recent expectations and efforts of the Scottish higher education have been centred in enabling universities to use evidence-informed student-staff partnerships as the main drivers to enhance the student experience programmes. Thus, it can be argued, access to evidence to support the effective collaboration between academic staff and student reps in the assessment and enhancement of their programmes is a critical area for the existing policies and strategies related to Scottish universities.

2.3 Literature synthesis, gap and research objectives

Synthesising the main ideas from this review of the literature, it is possible to say that the student experience, and the evidence needed for its improvement, has become an increasingly key focus for higher education quality assessment and improvement in Scotland, the UK, and many other countries. The concept of student experience is used in quality policies as a driver of competition for student satisfaction ratings. The consumer-centred conceptualisations and rating of student experience are poorly theorised and widely critiqued. Student-staff partnerships are discussed as offering alternative perspectives and mechanisms for the student experience evaluation and enhancement. However, little attention in research has been given to the use of data analytics to support the improvement of the student experience, and less so for the case of data analytics used to support student-staff partnerships for this purpose. Considering the strategic public interest of higher education, its quality and enhancement, plus the expansion and impacts of the implementation data machines and the potential benefits but also undesired impacts of the datafication of the student experience, the limited research in this area can be considered both a significant opportunity and risk. Consequently, the limited literature in the topic can be said to justify exploratory investigation in this area.

In order to start addressing this gap in the literature, this dissertation used an exploratory design research approach to provide initial answers about the possible impacts of the use of data analytics to support student-staff partnerships for the improvement of the student experience in

Scottish universities. To achieve this, this study aimed to respond to the following research question:

What are the benefits and problems related to the use of data analytics to inform the collaboration of academic staff and student reps to evaluate and enhance the student experience of Scottish higher education programmes?

By offering an exploratory answer to this question it is hoped to produce initial insights into what implications the implementation of data machines could create for the improvement of the student experience in student-staff partnerships in Scottish universities, and higher education in general.

Chapter 3. Theoretical and critical frameworks

As already introduced earlier, while this is exploratory research project presents the results of an inductive and not a formally theory-driven analysis, these exploratory and inductive findings produced (section 5.1) are then reviewed from theoretical and critical perspectives (section 5.2). These briefs and initial theoretical and critical analyses presented in chapter five were intended to offer additional interpretation of findings and their relevance to the literature. In particular, following recommendations for exploratory research (Stebbins, 2001), the focus of these theoretical and critical analyses was to offer new possible questions for more specific and advanced research. Nevertheless, Stebbins (ibid) also suggests not to bring 'received frameworks' that can be distracting, prescribing and overshadowing for the inductive and not formally theory-driven exploratory analysis presented in section 5.1. Accordingly, it is not required (and perhaps even counterproductive) to read this chapter before section 5.2. If the reader wants an orthodox exploratory research experience, I suggest doing that, that is, skipping this chapter and returning after completing section 5.1.

The theoretical framework selected corresponds to the expansion of a model developed in my MSc dissertation (Rates, 2017; which was linked with this PhD project). Using a combination of ideas from bioconstructivism, design theory, collective sense-making, the concept of sense of place and extended cognition, this model offers a theorisation of the concepts of student experience, student experience research, and student experience analytics. This theoretical framework was created and expanded in response to the lack of thoroughly theorised conceptualisation of the student experience, and provided the opportunity to theoretically analyse the exploratory findings about the potential impacts of the use of SXA apps in higher education. The theoretical underpinnings of this model (e.g.., bioconstructivism, design theory) were personally selected due to my previous familiarity and interest with them, and in particular, due to my appreciation for their affordance of describing and linking crucial educational concepts such as knowledge, learning, experience, emotions, learning environment, the role of data-instruments and design assumptions and decisions: all of which seemed to be closely related to the student experience and use of analytics to inform collaborative decision-making such as in student-staff partnerships. More specifically, the concept of user experience is a little discussed but obviously an important precedent to the idea of student experience and its use in quality policy and mechanisms in higher education. Hence, integrating the concept of user experience from design theory to the understanding of the student experience was deemed an important step for the relevant theoretical discussion. On the other hand, the critical framework

selected corresponds to certain key concepts and ideas, particularly from Foucault. In particular, the ideas of normalisation –the internalisation of disciplinary mechanism- and bio-power –the pursuit of power by modern states through the control and expansion of human populations- were selected to question the narratives related to the exploratory findings produced and the theoretical analysis proposed, and consequently, to offer additional interrogation and connections in relation to contemporary thinking. The references selected were again based on my personal familiarity with and preference for the Foucauldian critique of knowledge and power in modern society and my belief that these particular ideas were useful to examine my own discourses about knowledge, data, analytic tools, student experience, quality policy and higher education, to name a few critical concepts intersecting the object of this study.

Overall, while both the theoretical and critical analysis influenced by the model and references discussed in this chapter are aimed at expanding the possibilities of interpretation and not to be conclusive and only initial and not exhaustive –following my acknowledgement that exploratory data is strongly unsuitable for reliable theoretical and critical examination-, they provide further reflection about the potential impacts of the use of SXA tools in higher education quality improvement and the relevance of these hypothetical impacts for the current literature. More discussion about the implementation of these analyses is presented in chapter four.

3.1 Theoretical framework

What is the student experience? What are students and teaching staff? Are they humans? What are humans? What is an experience? What is education? In the section about higher education student experience (previous chapter), the diverse and mostly unsystematic ways in which the concept of student experience is understood and applied in practice, policy and academic debate was introduced (e.g., Staddon and Stendish, 2012; Matus et al., 2021). Basically, there is a lack of robust theorisation of the student's experience despite its central importance for the teaching responsibilities of academics. On the one hand, as academics tend to work around academic theory related to different disciplines, I believe that the fact that that student learning experience seems to be undertheorised is a serious problem for contemporary academia. On the other hand, there seem to be two other main problems linked to the lack of theorisation of the student experience. One of these issues is that the student experience is measured externally and internally (Bloch et al., 2021). I believe most academics will convey that when there is a system that measures a variable that is not thoroughly theorised, this is very problematic. Moreover, it is possible to argue that if there are growing expectations for measuring an untheorised variable as an outcome of a system (e.g., such as the student experience in higher education as noted by Bloch et al.(ibid), the situation is *extremely* problematic. Finally, it can also be suggested that a limited theorisation of the student experience also creates the lack of a subject/object which can be a matter of full-fledged academic critique. Without theoretical constructions, the critique and deconstruction of the student experience can only be based on limited conceptual or contingent domains. Subsequently, the undertheorisation of the student experience can be argued as a very serious and uncomfortable current problem for higher education practice and discourse. Therefore, proposing systematic theorisation of the student's experience can be suggested as highly desirable academic research. Such effort is attempted in this section.

In order to address this lack of undertheorisation of the student experience, this section discusses a theoretical framework about the student experience and its research. Basic ideas of this model were developed in my MSc dissertation (programme funded by my scholarship in

preparation of this doctoral study). I start next by defining the main concepts and theories underpinning the presented model (bioconstructivism, design theory, collective sense-making, extended cognition and sense of place). Then, I use these building blocks to define what the student experience is (ontology), how we can learn about it (epistemology), and the associated interpretation of SXA.

As introduced earlier, the proposed theorisation of the student experience is used in this dissertation in two main ways. The first thing to note is that, as an exploratory study, the central endeavour for this study is to produce inductive analysis of the potential impacts of analytics to evaluate and enhance the student experience. In other types of non-exploratory research (i.e., purely descriptive, explanatory, design, critical inquiry) theories are used to develop deductive analysis. In other words, theory is used to support deductive analysis and avoid the limitations of induction. This study, in first instance, offers inductive analysis based on patterns drawn from interview data (i.e., to identify potential positive and negative impacts of SXA in higher education). So, the presented theory is not used, in the first instance, to produce these main exploratory findings. Yet, after presenting this inductive (non-theory driven –at least explicitly and formally) in chapter five, in a second reading, the inductively identified positive and negative impacts related to the hypothetical use of SXA are analysed from the lens of the proposed model. The second use of this theory, done in combination with the theoretical analysis of the benefits and problems identified, is as a subject of critique based on the critical framework discussed also in this chapter. Having clarified how the proposed theoretical model is used in this dissertation –and how it is not-, next I discuss the conceptual underpinnings utilised to build it.

3.1.1 Conceptual underpinnings of the theoretical model of the student experience

3.1.1.1 Maturana and Varela's bio-constructivism

What is life? What is knowledge? How do humans learn about their environment? How do humans teach each other? The most important philosophical reference for this study is the so-called bio-constructivism –also discussed as second order cybernetics- proposed by Humberto Maturana and Francisco Varela. The relevance of this theory for this dissertation is twofold. This theory is followed as a high-level philosophical position which proposes an interpretation of what knowledge and research are, and hence, what this dissertation and its claims ultimately are. So, the ontological and epistemological positions underlying this dissertation are represented by this theory (this is further discussed in the method's chapter). Additionally, the ontological and epistemological propositions of this theory also allow me to frame students, academics, knowledge, learning, experiences, and experiences, among other central ideas for this dissertation.

Maturana and Varela were two neuroscientists that were conducting research at Harvard in the late 1960s about the nervous system and perception (Maturana, 2002). From their experiments with pigeons and frogs, Maturana and Varela arrived at significant findings about the nervous system –and thus, animal cognition- being a closed system. A closed system is one where its operations and outputs are end-to-end determined by its internal structure. Accordingly, the state, operation and outputs of a closed system are not primarily determined by external triggers (i.e., the structure of and information from the external environment). In other words, animal cognition, and thus knowledge, are both determined by the internal structure of the nervous system. While external information and structure can be processed by the nervous system,

these inputs are processed solely based on the operational characteristics and possibilities of its internal structure. Accordingly, animal life can only perceive and understand their environment (and themselves) based on the complex structure of their nervous system. Of course, as scientists, Maturana and Varela believed that human beings are animals (mammals and hominins, for that purpose). Maturana and Varela did not only arrive at these experimental results: they focused their careers into developing the philosophical expansion of this central finding (ibid). This resulted in what is known as biological constructivism and second order cybernetics. Since its early diffusion in the late 1960s and early 1970s, the thought of Maturana and Varela has been widely influential across science, philosophy, education, design, counselling, and spirituality, to name some fields (for a short summary, see Vallejos, 2021). I can strongly recommend their famous and widely available book 'The tree of knowledge' (1987) as a comprehensive introduction to the unique and rich philosophical propositions offered by these authors. The shorter piece 'Biology of cognition' (Maturana, 1970) may also be a good introductory reference. In any case, the main idea underlying their philosophy and this dissertation as a research exercise has been already introduced –the cognitive system of living beings being a closed system- and the basic tenants are presented next. Additional sources are also offered for further reference.

Autopoiesis and ontogenesis: the student, the teacher, and the researcher as living beings

The first and most of importance premise for this dissertation –in general as a research exercise, and specifically in terms of the theoretical approach to the specific subject of study- is that myself --as the author of this dissertation- and higher education students, academics, and every human being, is a living being. This may initially sound obvious, self-evident or trivial. Such assertion –humans are living or mortal beings- can be argued as widely accepted by many religions, philosophies, and science. For bio constructivism, as the name suggests, the idea that humans are living beings is not trivial; instead, it is the foundational proposition which serves as the basic building block to understand what knowledge, learning, language, research and education are (as defined by this theory). As Maturana and Varela elaborate (e.g., 1970; 1975; 1987), living beings are widely recognised –scientifically speaking- as an organisation of molecular components that replicate themselves. To do this, living beings (be it bacteria, algae or humans) have an exergonic metabolism, that is, their molecular processes are produced with energy captured from the environment (e.g., sunlight, carbs, lipids) and aim to generate a homeostasis with the ambience in order to maintain and replicate its own organisation. In other terms, living beings self-reproduce the organisation that constitutes them, and when they stop doing so, this organisation loses its ability to sustain itself in time (what we call death and defines what life is). The explanation for this is related to the entropy of the physical systems and their tendency to diminish the levels of organisation. I will avoid discussing entropy in detail and only refer to say that it is one of the very few undisputed physical principles and indicates that physical systems only naturally evolve towards decreased levels of order (or increased chaos). Accordingly, the complex molecular organisations that constitute a living being or cell, like any physical system, will naturally tend to lose the specific ordered structures that allow it to consume external energy and self-replicate in time. As Maturana (1970) describes it, living beings are circular organisations:

"This circular organization constitutes a homeostatic system whose function is to produce and maintain this very same circular organization by determining that the components that specify it be those whose synthesis or maintenance it secures." (p.3).

Maturana and Varela went a step further. They proposed that this structural autonomy via self-replication of living beings is what defines living beings, hence, providing a novel definition of life and biological organisms (instead of the more traditional definition based on organisms 'birth, development, reproduction, death'). The authors coined the term autopoiesis (from ancient Greek self –auto- creation –poiesis-) to describe this fundamental characteristic of life. Then, living systems, as defined by Maturana and Varela (1970), are autopoietic (self-creating) systems. Subsequently, the organisation of the circular, self-replicating or autopoietic organism alone is therefore what maintains living beings' organisation and keep its structure in time. This is relevant because it can be used to define living (autopoietic) beings as closed systems in which i) the state of their structure is determined by its own structure, and ii) all the possible states of its structure can only lead to reproducing the organisation (Maturana, 1975). If this ceases to happen, the living (mortal) being will lose its ability to self-replicate its organisation, cease to exist and stop being autopoietic. Additionally, as will soon be detailed, Maturana and Varela also suggest this basic principle implies, by definition, that all the biological processes and functions, including cognition, seek to perpetuate the autopoietic (living) organisation and their homeostasis with their contingent environment.

By defining living beings as autopoietic systems, that is, organisations which their own structure determines self-replicating their organisation in time, then it is possible to describe autopoietic systems as adapting their structure to a changing medium to maintain a homeostatic equilibrium with their environment. In the words of Maturana (ibid): "a plastic autopoietic unit under conditions of perturbation generated by a changing medium, necessarily results either in the establishment in the autopoietic unity of a structure that can generate specific changes of state of the medium, or in its disintegration" (p.156). For example, a single bacterium which starts losing water in their cellular plasma due to increased temperature and evaporation through their external membrane can maintain its organisation by changing their structure, such as reducing gaps in their membranes to reduce evaporation. A human suddenly facing a cold night outside might light a fire to stay warm. In this case, the direct desire experienced by the person might be linked to avoiding the stress and uncomfortable feeling of a cold body. However, Maturana and Varela would argue, there is an underlying biological, self-preservation, autopoietic dynamic driving the response of this person (this response understood as internal changes in cognition, sensations, movement that trigger the lighting of the fire): *autopoiesis*. The authors (1975; 1987) defined this as *structural coupling* between a living being and the medium: when changes in the structure of interactions of a living being are coupled to changes in the environment. The single bacteria modified its membrane, and the person experienced complex but subtle internal and molecular changes of state in its biological structure when feeling cold and lighting the fire. The history of structural change within the organisation of a living, autopoietic system triggered by its structural coupling with the external environment is defined by Maturana and Varela as ontogenesis, or history of being (from the ancient Greek history of –genesis- and being –onto-). All these concepts are represented in Figure 3.

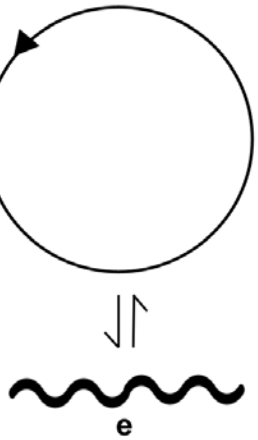


Figure 3. Autopoietic system, environment and ontogenesis.

Represented as a dynamic circular loop, the autopoietic system interacts trough exchanges of information and energy (arrows) with the environment (e). In its exergonic metabolism and continuous self-production, the autopoietic system maintains its organisation by modifying its structure to respond to environmental changes and sustain homeostasis. Regarding this study and the theoretical model of the student experience proposed, by acknowledging that humans are living and thus autopoietic beings, it is possible to describe students (and teaching staff, myself as researcher and readers) as autopoietic beings. Students (and academics) are self-replicating beings that interact with their environment in ways that they can continue to exist as structurally stable units. If this ceases to happen, students, teachers, researchers and readers will stop *being*. Considering this basic description of humans, students and educators (and myself as a researcher) as living beings, the next focus is on how living (autopoietic) beings can produce knowledge.

Knowledge as a biological process

As already introduced, Maturana and Varela were doing research on the nervous system and perception in animals. Their main ‘experimental discovery’ was that the nervous system of animals operated as a closed system. In experiments with pigeons and frogs (Maturana, 2002; Maturana and Varela, 1987), Maturana noticed that the functioning of the nervous system was primarily determined by its own structure and, thus, that the perception of these animals was then independent of the external environment, In the words of Maturana, the findings from these experiments “meant abandoning the notion that there was an external independent world to be known by the observer” (Maturana, 2002, p.5). Or, as Maturana also suggests, “namely the fundamental question was no longer "what is the essence of that which I observe?" but rather "how do I do what I do as an observer in observing?" All that follows comes from that basic epistemological and ontological change in my thinking.” (p.6). It is relevant to note that from these findings related to animal nervous systems that Maturana, and then in collaboration with Varela, initiated serious analysis of living beings, cognition and arrived at the idea of autopoiesis. The nervous system is constituted by a complex network of neuron cells or neurons. The flow and communication of electrical impulses through neurons and the nervous system depends on their structure. From sensing neurons to process centres (e.g., spinal cord, brain) and effector neurons (e.g., neurons linked to legs, hands or vocal cords) the functional

state of neurons and the nervous systems is determined by their internal state (reference state). Therefore, Maturana and Varela argue, the nervous system can be described as a closed system, or in other words, an autopoietic system within an autopoietic system. Subsequently, animals perceive, and mediate their interactions with their environment based on an internal autopoietic system –the nervous system. In the words of Maturana:

“for an animal to discriminate objects visually the receptors in its eyes must absorb light quanta and be activated: yet, the objects that the animal sees are determined not by the quantity of light absorbed, but by the relations holding between the receptor-induced states of activity within the retina, in a manner determined by the connectivity of its various types of cells. Therefore, the nervous system through the relative weights of the patterns or interactions of its various components, both innate and acquired through experience, which relations will modify it at any given interaction” (Maturana, 1995, p.21; from Maturana and Frenk, 1963; Lettvin et al., 1965).

Accordingly, animals with a nervous system can be represented by figure 4 in which the autopoietic system is constituted by an internal dynamic structure (the nervous system) which operates as a closed system and mediates what perceives of its contingent the medium, as well as the possibilities of its interactions with it.

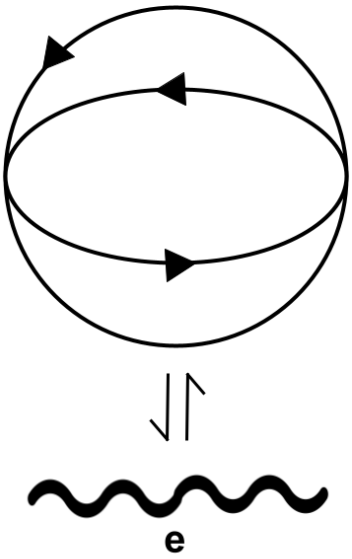


Figure 4. Second order autopoietic system

Knowledge is understood by Maturana and Varela as the enactment of the interaction of the observer with their medium as determined by their neural system. Hence, this theory defines knowledge as doing (action, operating) by an observer in coherence with their cognitive structure. Thus, knowledge is determined by the structure of the nervous system (innate or learned) that determines interaction and by what an observer determines as operationally coherent based on the structure of its nervous system. Accordingly, knowledge from a biological perspective can be argued as generated by a living being’s -operationally coherent- interaction with their environment. Therefore, Maturana and Varela propose, “from this standpoint, every interaction of an organism, every behaviour observed, can be assessed by an observer as a

cognitive act[.] In a nutshell: to live is to know." (Maturana and Varela, 1987, p.174). By extension, every interaction of an organism is part of its cognitive domain, with this understood as the sum of all the possible interactions that the structure of the cognitive domain of the organism enables. In this way, knowledge can be described as a biological phenomenon related to the possibilities of the interactions enacted by the internal and closed structure of living beings.

For this study and the presented theorisation of the student experience, if we define students and teaching staff as autopoietic beings which interact with their medium (including other observers) in order to maintain their physical and neural structure in (metabolically exergonic) homeostasis with their environment, the knowledge of students and staff can be described by what they do as enacted by, and in coherence with the possibilities of interaction generated by their cognitive structure. In other words, the knowledge of educators and students is related to their own cognitive structure and the possibilities of recurrent interaction with their environment which these cognitive structures can enact.

Learning as a biological process

Understanding knowledge as relative to the nervous system and the possible interactions of a living system which constitute their coherent structural coupling with their environment, Maturana and Varela learning suggested as changes in the nervous system which determine new possibilities for its interactions and structural coupling. These changes are selected through interaction with the medium, yet they are specified and therefore determined by the possible states that the structure of the nervous system allows (because it is an operationally closed system). Maturana proposes that, for living and autopoietic systems, "[l]earning as a process consists in the transformation through experience of the behaviour of an organism in a manner that is directly or indirectly subservient to the maintenance of its basic circularity" (p.35). Thus, both knowledge and learning –as the possibilities of interaction enabled by the internal structure of the nervous system and the changes to this structure and the possibilities of structural coupling, respectively- are then determined by the structure of the nervous system and the history of interactions with the medium. Hence, of crucial importance for the theory of Maturana and Varela, particularly for educational discussion, knowledge and learning are related to and determined by each organism. In other words, two animals (of the same or different specie) might receive the same information from their environment (i.e., the same physical perturbation) but this information will be perceived in a unique way by each depending on its own specific nervous structure and history of interactions. Likewise, the changes that will occur to their nervous and thus cognitive system (learning) for each organism will be determined by its unique structure and interactions. Following this perspective, Maturana even argues that it is not possible for transcendental knowledge to exist: "any knowledge of a transcendental absolute reality is intrinsically impossible; if a supposed transcendental reality were to become accessible to description, then it would not be transcendental, because a description always implies interactions and, hence, reveals only a subject-dependent reality." (Maturana, 1987, p.60). Such rationale sustains the famous premise from Maturana: 'everything said is said by an observer'. A premise which is adopted as an ontological and epistemological frame for this dissertation to self-define itself and to recognise the validity and limitations of the validity of its reality claims.

In relation to this study and the theorisation of the student experience, students' (and academics) own learning can be then described as the changes in the possibilities and hence ways they recursively interact with their environment. Student learning can also be defined as

determined by their own neural system, cognitive structure, knowledge and history of interaction with their environment. Therefore, what students and academics (and researchers) learn is unique to the internal coherence of each individual (autopoietic being)

Co-ontogenic drift: histories of consensual interaction and structural and cognitive change

Maturana and Varela propose that, when two second order autopoietic systems have recurrent interaction with each other, due to both their cognitive systems being operationally closed systems, they can be described as operating in structural coupling like they do with their environments. In the words of the authors: “from the standpoint of the internal dynamics of one organism, the other represents a source of perturbations indistinguishable from those that come from a “non-biotic” environment.” (1987, p.180). The recurrence of their interactions implies that their internal cognitive and overall structures interlock in an exchange of information which triggers recursive adaptation. This recurrent adaptation is a source of dynamic internal and coherent changes in the cognitive structure of each autopoietic system. From the previous concepts, this mutually transformative interaction can be defined as learning and, over time, to a history of mutually transformative interaction or *co-ontogenic drift*. Then, the evolution of these systems throughout their co-ontogenic drift can be described as a structurally coupled unity of structurally closed systems: a third order cybernetic system.

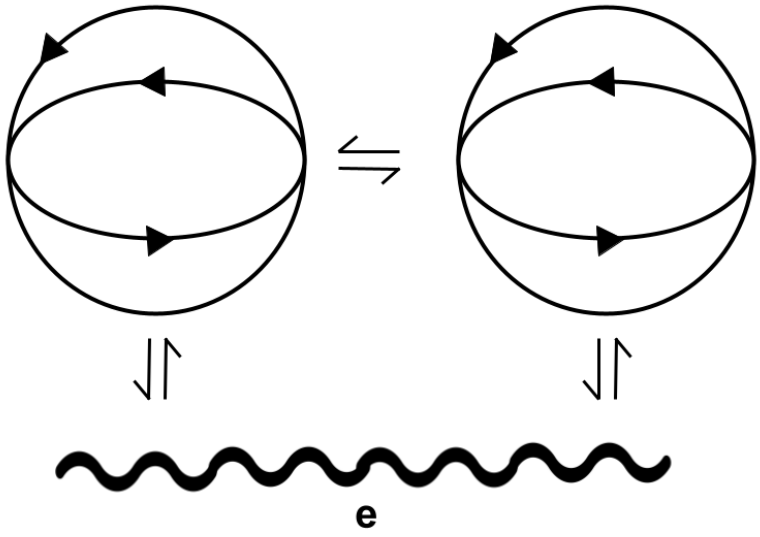


Figure 5. Co-ontogenic drift: histories of structural coupling and transformation

Figure 5 illustrates two second order autopoietic systems experiencing structural coupling and co-ontogenic drift. While these systems are each closed, their recurrent structural coupling produces a third order system. To avoid complicated terminology, these are described also as second order cybernetic system. For animals, interaction with other beings is many times a biologically critical necessity, such as for reproduction, caring for young descendants, or for them to learn how to feed, social hunting, etc. For humans and contemporary societies, these interdependencies are even more widespread (when was the last time you produced or

gathered your food?). This concept and scheme are critical for this dissertation, as Maturana and Varela discuss education as a co-ontogenic drift between (primarily) the student and educator. Secondly, framing human interaction (such as education or academic peer-review) in this way also allows us to provide a biological definition of social phenomena and language (i.e., societies and language as a biological process). A social phenomenon is related to the observation of co-ontogenic interaction between autopoietic (living) beings (Maturana and Varela, 1987). This means that social phenomena must be constituted by recurrent reciprocal interactions that are coherent to the cognitive domain of each autopoietic system. Communication is understood then as interactions that constitute the coordination of reciprocal interactions that are coherent to the cognitive domain of the participating autopoietic systems: "[w]e call *communication* as the coordinated behaviors mutually triggered among members of a social unity" (ibid, p.193). From these understandings, and based on neural systems being closed systems, when individuals (e.g,. students, teaching staff and researchers) recursively interact with people their neural and cognitive systems evolve in adaptation to coordinate these recursive interactions in ways that are coherent with their own neural and cognitive structures and domains. Over time, this recursive adaptation produces changes in the neural and cognitive structures and observers' possibilities of interaction with other observers and the environment. This idea establishes the basis for biological interpretations of human interactions and relationships such as education. However, further conceptualisations about language, emotions and mutual acceptance are also essential for defining education from the perspective of biological constructivism the proposed theorisation of the student experience presented in this dissertation.

Language as a biological process

Maturana and Varela suggest that communicative behaviours learned by a history of social interaction represent linguistic behaviour. The linguistic domain of an organism is the sum of all its possible linguistic behaviours, or in other terms, the linguistic domain is all the possibilities of (learned) social (coordinated) interaction of an organism. Then, for Maturana and Varela (1987) language emerges as the specific and recursive linguistic interactions that describe and coordinate the linguistic interactions that coordinate social interactions (co-ontogenic drift). Considering a linguistic distinction as an observer's description of distinguishable unities or systems in the environment that it operates, using words of the authors: language arises when the (autopoietic) observer "makes linguistic distinctions of linguistic distinctions" (ibid, p.211) as part of its coordination of social, structurally coupled action. Languaging is used by the authors to describe language as an action of consenting and coordinating linguistic distinctions that coordinate social interaction of autopoietic systems. With the emergence of language and languaging (i.e., linguistic distinctions of linguistic distinctions), then, the possibilities for linguistic and social interaction are changed. Hence, language transforms individuals' operation and their history of structural coupling with other organisms. Another way to put it: "language is a manner of living together in a flow of coordination of coordination of consensual behaviors or doings that arises in a history of living in the collaboration of doing things together" (Maturana, 1988; as cited in Maturana, 2002). Moreover, Maturana and Varela argue that observation, the observer, and the environment actually emerge from language:

"observing arises with language as co-ontogeny in descriptions of descriptions. With language arises also the observer as a languaging entity; by operating in language with other observers, this entity generates the self and its circumstances as linguistic distinctions of its participation in

a linguistic domain. In this way, meaning arises as relationship of linguistic distinctions. And meaning becomes part of our domain of conservation of adaptation […] Indeed, we are observers and exist in a semantic domain created by our operating in language where ontogenic adaption is conserved" (1987, p.211).

Language can then be described as interdependent phenomena and closed system (within each individual): in the internal structural interactions of a living being, as well as in the structurally coupled and coherent interaction between two or more autopoietic systems. Overall, the theory of Maturana and Varela points out that we human beings, as living beings, find ourselves observing invariantly isolated from the external world (by language and the nervous systems that operate as closed systems). While Wittgenstein suggested in his early work that "whereof one cannot speak, one shall remain silent", Maturana and Varela avoid metaphysical duties by simply stating that "[t]hat about which humans cannot talk [they] cannot speak" (Maturana, 1978, p.58). For some, this embodiment of cognition and language may convey a lonely and relative human existence. However, Maturana highlights that such perspective illuminates and promotes the value of socialisation and collaboration:

"Every human being, as an autopoietic system, stands alone. Yet let us not lament that we must exist in a subject-dependent reality. Life is more interesting like this, because the only transcendence of our individual loneliness that we can experience arises through the consensual reality that we create with others, that is, through love." (1978, p.64). From this standpoint, the language used in the communication between teaching staff and students could be described as the linguistic distinctions used to coordinate the linguistic distinctions which define the possibilities of interaction and, ultimately, the coherent interactions between them. Now, to complete the review theory and concepts from bio-constructivism that underpin the theoretical model of the student experience, next I describe the concept of mutual-acceptance, love and co-existence, education and democracy.

Emotions, love, mutual acceptance, co-existence, education and democracy

Until now, the theory of Maturana and Varela has been able to construe biologically based interpretations of concepts such as life, cognition and knowledge, learning, communication, social interaction and language, all based on the definition of living beings as closed systems. These authors add further complexity and possibilities for their theories by offering a similar discussion about emotions and love. Maturana suggests that emotions can be understood as states of the nervous system which trigger the domain of possible relational operation: "[e]motions emerge as bodily dispositions that specify domains of action" (Maturana, 1997, p.33; original from 1990, own translation). Maturana offers an illustrative example (1990). When a person enters a dark room and turns the lights on, the person sees a cockroach and screams. The cockroach, that was crawling down the floor looking for food, stars running away. The emotion of the cockroach changes with the encounter, and so the domain of actions that the cockroach can take in this new state: "The cockroach changes its field of action. If you offer it some food it cannot eat, nor can it copulate; there are certain things [(that it could normally do)] that it cannot do [(under an emotional state of fear)]" (p.33, own translation). Hence, for Maturana, emotions determine the possibilities for linguistic behaviour, linguistic distinctions, language, reasoning and social interaction: "[e]motions, as biological phenomenon, belong to the internal dynamic of the generation of space in the relational behaviors that an organism (animal) can experience at any given time […] Emotions are not changeable by reason. Only emotion changes emotion." (Maturana and Davila, 2006, p.37). Subsequently, for humans (e.g.,

students and educators), Maturana suggests, emotions are central source of motivation to our existence and doing: “when we distinguish emotions, we distinguish different domains of relational behaviors that at every moment constitute the relational fundament on which we human beings do all that we do as language beings.” (2002, p.28).

Under such an understanding of emotions, it begs the question of what roles emotions play in relation to our social interactions. Maturana puts it in this way: “For a recurrent history of interactions [(co-ontogenic drift)] to occur there must be an emotion that constitutes the behaviour that results in recurrent interactions. If that emotional state is not present, there is no history of recurrent interactions and there is only casual encounters and separation” (Maturana, 1997, p.32). Maturana argues there are two main emotions in this regard: negation (of the other) and love (acceptance of the other). Maturana and Varela argue that love –biologically speaking- is the emotional state (relational behaviour) in which the observer accepts another observer as a legitimate observer in co-existence (Maturana and Varela 1987; Maturana, 1997; Maturana and Verden Zoller, 2008). Love, then, is the emotion that enables humans to develop recurrent interactions with one another. Importantly from an educational standpoint, love and social interaction is based on mutual acceptance and ceasing manipulative desires:

“[love] does not distort the relations in terms of what is expected or desired to happen. Love lets it be and is, therefore, “visionary,” not blind, and entails seeing [...] the other in its full legitimacy […] and hence, acting accordingly. The presence of purposes, aims, or expectations in a relationship denies love, as these become the center of attention and care. Such purposes, expectations, and aims generate blindness with respect to the participants in the relationship, whoever or whatever these may be. That is, by attending to what one expects the other to do, the other disappears and the relationship does not take place in love but occurs in use and manipulation.” (Maturana and Verden Zoller, 2008, p.223-224).

In all, as animals but particularly human beings exist in language and social interaction, Maturana argues that love is a fundamental aspect of human and animal biology:

“love constitutes a space of recurrent interactions in which a domain of co-existence where the coordination of the coordination of the consensual domain that constitutes language and is the basis for what is human can be developed, and it is because of this that love is the most fundamental emotions in the hominid lineage that we belong” (Maturana, 1997, p.32, own translation from Spanish).

To conclude with these theoretical underpinnings, love as mutual acceptance is also discussed by Maturana as a central and defining element in education and democracy. Education is simply understood as a co-ontogenic drift (see Figure 5) or mutually accepted co-transformation between two or more individuals. In other words, education is a history of recurrent coherent interactions which occur in languaging and social interaction in which each individual is transformed into a desirable new self. In the words of Maturana, “educating is constituted in the process in which the child or adult coexist with the other and in this coexistence it is spontaneously transformed [(as a result of their structural coupling)] in a manner in which is way of living becomes progressively coherent with the other in the space of coexistence” (Maturana, 1997, p.13). For Maturana, education involves learning to do new things but also goes beyond that: it is also a process based in mutual acceptance, love, consent and where individuals learn to coexist: “Learning is transforming how we live together. Those being educated become adults of one kind or another according to how they have experienced this transformation. They do not

learn only mathematics or history, but rather they basically learn to live with their teacher of math and history, and learn to think, react, and see with them." (p.32). In other words, "Education as a phenomenon in transformed personal relations is a relational venue in which the student does not learn a subject, but rather learns a way of living with others. The student learns a way of being a human being." (ibid). In this way, as noted, education is a consensual co-transformation. Consent is paramount for Maturana, as non-consensual structural couplings (recurrent interaction between individuals) are not recognised as social interactions per se. For instance, for Maturana the military is not a social organisation, as it is based on distrust and control. Education, on the other hand, must be defined differently as mutually desirable and acceptable recurrent interactions:

"Upon reflection, we see that we are immersed in a way of doing things in this patriarchal-matriarchal culture stemming from distrust and control. Control that submits ... submission that demands obedience ... obedience that generates fear and insecurity. From this emotional backdrop comes the lack of respect for oneself and for others. Parents, teachers, the State ... we try, from this environment of mistrust, to do what we do and obtain what we wish through control. Control is the relational dynamic from which oneself and others arise denied capacities and talents, narrowing viewpoints, intelligence, and creativity, generating dependence, from which autonomy and self-respect are not possible." (Maturana and Davila, 2006, p.34).

Thus, for a desirable education, educators need to exercise critical reflection about their roles, power, autonomy, and the ones of students: "[t]his is possible only if teachers have reflexive autonomy, and respect for themselves and their students." (ibid, p.32)

Finally, these ideas link to the final analysis of democracy and governance. For Maturana, it is useful to refer to objectivity without parenthesis (reality claimed as independent of the observer) and between parenthesis (reality claims recognised as observer-dependent). Maturana suggests that political and religious propositions are commonly made as objectivity without parenthesis, or in other words, as "revealing a reality independent of the observer" (Maturana, 1997, p.36). Maturana argued that such is the cause of eternal dispute and lack of resolution (it should be noted, he wrote this in times of his country leaving a 17-year dictatorship related to capitalism-socialism cold war conflict). The "task of democracy", Maturana then argued, "is to get away from such oppositions by creating a domain of coexistence in which the pretension of having privileged access to an absolute truth vanishes" (p.36). Maturana continues to highlight, and contests democracy is often portrayed as the "free battle for power": "[this is a mistake if what we want is a coexistence in which poverty [(inequality)], abuse and oppression do not emerge as legitimate ways of living". For Maturana, "democracy is the art of everyday politics that demands acting in the knowledge that one is not the owner of truth[,] and that the other observer is as legitimate as oneself" (Maturana, 1997, p.36, own translation).

This notion of democracy is important for this dissertation in two ways. Primarily, it establishes that education must aim to constitute ways of living based on mutual-acceptance and coexistence, in which reality is acknowledged as subject-dependent. In other words, this establishes my political positioning for this dissertation in relation to education and the type of society it should promote. Secondly, this is also of crucial importance whereas it offers political and educational interpretations for the understanding of partnerships between academic staff and student reps which this dissertation is focused on. From these ideas of democracy and education I attempt to convey student-staff partnerships as a form of educational governance based on mutual acceptance and recognition in which neither has privileged access to

knowledge about the educational reality they participate in, appraise and co-construct. In synthesis, from the lens of bio-constructivism, education can be understood as a relationship between students and teaching staff which is based emotions of mutual acceptance in which both coordinate interactions that change their ways of understanding their understanding of their environment and themselves, and therefore, of living with others. Having covered these multiple but essential concepts, now I move to discuss the ideas of design theory used to construct a theoretical understanding of the student experience.

3.1.1.2 Design theory

Design (and education) as applied science

After using a description of education as a consensual co-transformation, this understanding will now be expanded by adopting the linguistic distinctions afforded by design theory. As a consensual recurrent interaction, education can be, at least in theory, distinguished as an intentional activity. This notion is the base to utilise design theory. Broadly speaking, (formal) education in general –and higher education in particular- are widely discussed –in international conventions, national policy and research- as a public service or good, which if not funded, is regulated by the State. There is an overlap and a degree of conflictive interpretation between human rights and international trade conventions, where the first define education as a human right that the state must guarantee in the former, while the latter defines education as an activity in which private individuals and organisations must be free to offer and select educational provision (Tomasevski, 2006; Tilak, 2008; 2009). More details about current discussions about higher education are provided in appendix A. Of relevance for this section, as said, formal educational is extensively understood as an intentional activity, in which the students receive a public service and interact with a public good offered by educators from institutions that are regulated, funded or administered by the State.

In general, services are frequently defined as intentional activities involving “interaction that solves a problem, or provides a benefit, for the service user” (Rates, 2018; from the review by Edvardsson, 2005). By understanding formal education as a public service, and thus, education as intentional activities and interactions, it is possible to argue that education is better understood as so-called applied or design science. In his seminal work for design theory, the Economics Nobel prize winner Herbet Simon (2019; original from 1969) describes design or applied sciences (e.g., architecture, medicine, law, engineering, agriculture, computer science) as different from basic sciences (e.g., physics, chemistry, biology, sociology, anthropology, archeology). While so-called basic science is focused on better understanding the reality which is ‘independent’ of the observer, in design sciences the observer aims to do the opposite: the observer, as part of the environment, seeks to create an artificial system to manipulate and transform reality as much as possible in intentional and non-spontaneous ways. Thus, Simon argued, applied or design sciences pursues knowledge for the creation and testing of artifacts and the artificial world, while basic sciences look for knowledge about phenomena ‘independent’ of the observer, that is, about the natural (naturally emerging) world. Accordingly, Simon argued, it is fundamental for design research to study the required (intended) events (requirements) and the actions that are best to specify the occurrence of these intended events (specifications). In this way, Simon established a widely used notion that design is the creation of artifacts, and that design or applied research is the study of the artificial world. In relation to

the design observer, Simon suggested that a designer is "[e]veryone who devises courses of action aimed at changing existing situations into preferred ones" (ibid, p.111). Figure 6 represents the observer in basic and design research. When considering (formal) education as a public service and thus a recurrent and intentional interaction, educators can be understood as designers. Borrowing from the definition of Simon, *educators devise courses of action (e.g., educational activities) aimed at transforming the student into the desired qualified graduate*.

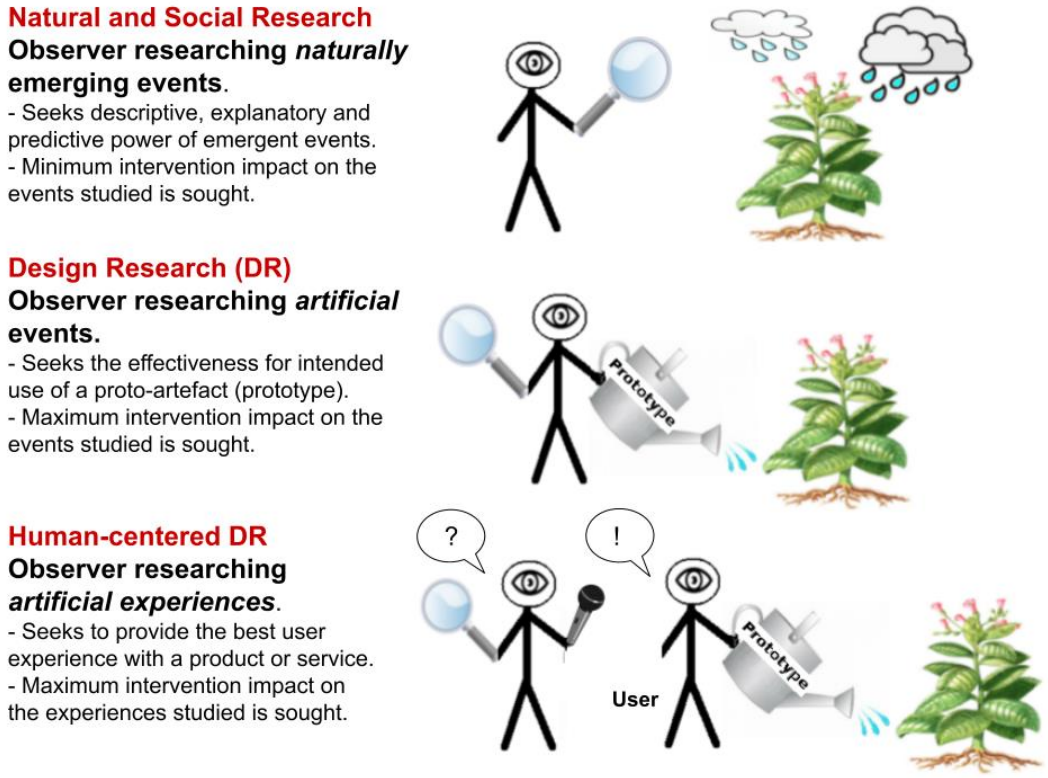


Figure 6. Observer in basic and design research

In his Aim and Structure of Applied Science, the mathematician and philosopher Niiniluoto (1993) argues that, in a challenge to the hegemonic philosophical discussion, applied science can be not only pragmatically but also systematically distinguished from basic science. To do this, he (p.3) develops two systematic distinctions: the "utilities" of their research, and the logical structure of their knowledge claims. Niiniluoto (ibid) argues that (p.3) while the "utilities" of basic research are *descriptive, explanatory and predictive power*, the "utility" of applied research (p.5) is *effectiveness for intended use*, this last, including (ibid) "economic efficiency, ergonomical, ecological, aesthetic, ethical, and social aspects". In relation to the structure of knowledge claims, he argues that in basic science knowledge claims are of the form (p.7): "X causes A in situation B". Sentences of this form are normally described as "hypothesis". Instead of "caused" the "hypothesis" could be composed in relation to a "probability", or in relation to an "influence", for a terminology closer to qualitative scholarship. Whilst Niiniluoto (ibid) argues, knowledge claims in design sciences are of the form (p.12): "If you want A, and you believe that you are in a situation B, then you ought to do X". The author refers to sentence of this form as "technical norms", which here we match with the industry term of *design hypotheses* or *assumptions.*

If now we consider design in terms of linguistic distinctions, design research can be understood as focusing on learning about the linguistic distinctions which coordinate linguistic distinctions which describe and coordinate intentional transformation of our world. Accordingly, it is possible to suggest that design hypotheses (the kind of hypotheses that can be answered by design research –such as this dissertation) are related to linguistic distinctions that describe the intentions of observers (what is the intended use of the artifact) and effectiveness of the designed artefact (to what extent the artefact helps to produce the intended effects). The ideas of Louridas (1999) from Levi-Strauss ideas of design as bricolage offer additional possibilities to describe. Louridas takes the ideas of Levi-Strauss and proposed the understanding of design as bricolage, in virtue of design being the selection and structure of desired events:

“science brackets out events and secondary qualities to arrive at the essentials and primary qualities. It uses structures, in the form of its underlying theories and hypotheses, to arrive at its results, which take the form of events. Bricolage works the opposite way: it creates structures, in the form of its artefacts, by means of contingent events. To arrive at a definition, *bricolage is the creation of structure out of events*.” (p.520).

From design as bricolage, Louridas (ibid) argues, then “science is concerned with discovering facts about the world, while design is concerned with changing the world.” (p.531). Hence, design can be associated as linguistic distinctions coordinating linguistic distinctions that coordinate how the observer recurrently designates intentional changes to its material reality and practice: “whereas science applies its logic to the abstract, i.e., to concepts, design applies its logic to concrete objects carrying meanings, i.e., to signs.” (ibid, p.532). In conclusion, while basic research can be associated with the internal and external interactions realised by an observer to better understand its environment, co-ontogenic drift and self, on the other hand design research can be linked to the internal and external processes of an observer which formally seeks to intentionally perturb its environment, co-ontogenic drift and self. The external processes of design can then be observed as the outflux of information of an observer in a recurrent history of interaction (a (co-)ontogenic drift). The internal process cannot be observed but can be argued related to the internal coordination of the coordination of (linguistic distinction which describe linguistic distinctions about) the intentional interaction of an observer with its medium and co-observers.

The previous ideas of applied or design research are relevant for this dissertation in four important ways: for its educational positioning and research approach, for the theorisation of the student experience proposed, for the research methodology, and for framing the SXA prototype designed. Firstly, this research project adopted a design research approach, and thus, it attempts to answer design research questions and used design research methods. More specifically, these related to design hypotheses and design research procedures about understanding the potential impacts of using an analytics app to evaluate and improve the student experience of Scottish higher education programmes. More about the research approaches of this study is discussed in the methods chapter. In second place, in the theoretical model being built in this chapter, education and the student experience will be later construed as artefacts of design, and therefore, suitable for description as design research processes and, henceforth, as coordination of linguistic distinctions that coordinate linguistic distinctions that coordinate recurrent interactions related to learning of structurally coupled in co-ontogenic drift. Thirdly, similarly, to being relevant for the research approach of this study, these basics characterisations of design are also relevant to understand the design research methodology

selected in this study. As per tradition, this is further discussed in the methods chapter. Finally, these ideas of design research are also relevant to frame the analytics app prototype as a design artefact, and more importantly, as a tool aimed to support the design research partnership between academic staff and student reps aimed to evaluate and enhance the artificial experiences and education of students in Scottish higher education programmes. In other words, the prototype of this study is a design artefact aimed to support design research by two types of observers. Noting these different and recursive implications of design theory for this study, next I discuss contemporary design ideas that can be used to further expand the understanding of design as the domain of human and student experience.

Human-centred design: design of experiences

Simon (2019) initially defined design and designers as the creation and creators of artificial systems (defined by system requirements and specifications). Influenced by ergonomic research, in the 1980s and 1990s a new perspective started to emerge: human- and experience-centred design. At the turn of the millennia, an illustrative marking stone was the publication of the ISO Standard 13497 (1999) titled 'Human-centred design processes for interactive systems'. This set of standards established that ISO certified organisations which produced products and services that involved human interaction had to include design research processes in which design hypotheses were informed and tested from the perspective of the target users of such service or product. In simple words, these standards affirmed the widely accepted view at the time that for products and services to be safe and effective their design needs to be validated with intended users before offering them to the public. Specifically, the agency Ash Consulting (2001) suggested that this ISO standard established that:

i) design of products or services which involve human interaction requires have a deep, evidence-informed understanding of the context and needs of the intended users, and,

ii) the effectiveness (plus safety) of product and service aimed for human use must be validated through testing and iterating of prototypes with potential users in realistic simulation. In other terms, human-centred (also known as user-centred) design recognises that the user has the ultimate legitimate authority to define what the product or service should do, and the extent to which the use of a product or service meets its intended use.

Accordingly, it is possible to indicate that, for contemporary human-centred design approaches and practice, it is primarily the users who are the main observer in the design process. Therefore, the account of possible and real users about their own contexts, needs and experience using a product or service (prototype or actual) is essential for human-centred design. Subsequently, contemporary design practice is centrally focused on designing experiences of the users of a product and service, rather than objects, activities or interactions (which are external and thus observable characteristics considered in earlier definitions as the artefacts of design). Similar to the general definitions in this influential former ISO standard, Hassenzahl and Tractinsky (2006) argued that the design of experiences for the user of a product or service –discipline known in practice as User eXperience design (UX)- considers the subjective accounts of users in regard to their context, needs and experiences of use of these products or services:

"an [artefact] that fulfils more than just instrumental needs in a way that acknowledges its use as a subjective, situated, complex and dynamic encounter. UX is a consequence of a user's internal state (predispositions, expectations, needs, motivation, mood, etc.), the characteristics

of the designed system (e.g. complexity, purpose, usability, functionality, etc.) and the context (or the environment) within which the interaction occurs (e.g. organisational/social setting, meaningfulness of the activity, voluntariness of use, etc.)" (p.95).

While there is varied literature about human-, user-centred and experience design, most of this approach and its related methods have been largely developed in practice rather than academic debate. There are, however, multiple sources which discuss these perspectives of design. For the scope of this study, I only provide some illustrative examples of its common practices. Some well-known processes include the collection and analysis of qualitative and quantitative data to create a fictional user (so-called user personas, profiles) that helps design researchers (observers) to describe and visualise a type of likely user and think about the design process oriented to solve a problem for. Nielsen (2004) argues that personas are created to "understand the people who the design is for, as something other than statistics, and it is a way to develop empathy for the users" (p.122) Additionally, design researchers, based on the analysis of evidence gained from this type of users, create 'user stories' which represent the contextualised account of a potential user which states what they intend to happen, why, and what for. The basic structure of a user story (c.f., Niiniluoto's (1993) technical norms) is of the form '*As a* (type of user), *I want to* (what the user wants to do with the product or service) *in order to* (why the user wants to do it)'. Testing prototypes with users in realistic scenarios –known as usability or user testing- is another frequent practice in which design observers observe the user using a prototype and listen to their feedback. In all, through similar methods, user experience designers are able to design objects with a main focus on the domain of the experience of users. In other words, these methods help designers to to identify some of the situated perspectives and desires of users and to avoid some of their own biases (think for examples of an urban individual designing a tractor for farmers, or a non-retired designer designing pension payment services services).

Education as designing artificial learning experiences

After discussing the essential characteristics of human-centred and (user) experience design, a number of links to bio-constructivism and education can be noted. These contemporary approaches change the focus of design. From an earlier attention to describing the descriptions that coordinate the creation and testing of an external (material or digital) artificial system (i.e., such as an object, activities or interactions that are physically observable), human-centred design moves the emphasis to the linguistic distinctions that users use to describe both their experiences and intentions in a situated context, and, their experience of using the designed system in this context. Then, the observer in human-centred design applies linguistic distinctions that coordinate the linguistic distinctions related to the artificial experiences intended by other observer (the user of the product or service). The next move is crucial to connect bio-constructivism, design theory and the student experience. Considering that the intended higher education students are human beings –a proposition which I think will find general consensus- then education can be understood as involving intentional human interaction. In consequence, following a contemporary design perspective, (formal) education can be understood as a branch human-centred design which should involve processes of evidence-informed understanding of the contexts, needs and educational experiences of students in order to ensure the validity of its design hypotheses and the safety and effectiveness of its practice. Recognising that the contexts, needs and experiences of students are unique to their own descriptions of their medium, other observers and themselves --i.e., cannot be observed by an external observer-,

(formal, higher) education institutions and educators must interact with students in order to learn about their contexts, needs, intentions and experiences from them. Likewise, for this to happen effectively, students must also learn from educators (and their institution) about their contexts, needs, intentions and experiences in order for them to enlighten their own reflections about their education. In this way, students can more accurately understand their context, education and what transformational experiences they are both having and want to have. This also contributes to students sharing more informed accounts to educators, what could enhance their understanding of educational design hypotheses and ultimately lead to more coherent structural coupling, recurrent interactions and mutual co-transformation between students, educators and the institution. By (a biologically grounded) definition, such scenario should lead to more desirable or preferable educational practice --as distinguished by the above observers, and by extension, for States with popular-sovereignty). Recognising that the conceptualisations of the quality of (higher) education have failed to bring consensus, and that both multiple authors recognise the stake-holder dependency of quality definitions and that the views and voice of students has growth as a central element in the understanding of quality across different approaches and systems, it is possible to argue that such definition of education, and its theoretical implications that it can lead to preferable education as defined by its central stakeholders, to a large extent can be compatible with and useful for current quality debates.

Student experience, users and consumers

More specifically, in regard to widely but loosely used concept of student experience, the definition of education as student experience design, underpinned by bio-constructivism, design theory and human-centred design perspectives, enables to provide a systematic and epistemologically robust framing of the student experience in higher education –which, as we have discussed, seems highly under-theorised and to be urgently lacking in practice, academic literature and policy. It is also worthy to highlight at this point that both advocates and critics of considering the student experience as a central concept in higher education have largely missed the opportunity to link the ideas of user experience design and student experience. While the critique of student experience (e.g., Sabri, 2011) has focused on arguing student experience's associations to consumer-oriented perspectives, it has failed engage with the concept of user from human-centred design, which is at the heart of an experience design understanding. Consumers are frequently described as individuals who use a consumable product. Education is clearly not a consumable product: it is much more than that. Customer and clients, rather than users, are used to denote the individuals (or organisations) who pay (fund) the acquisition/generation of a product or service. Users are the ones who directly utilise the product or service and who experience their use. Users may or may not be customers (pay for product and service). Therefore, while analysis of the experience of a customer could be made, user experience (UX) design and research primarily focus on the interactions between the user and a product or service and in the related experiences (personal accounts and contexts).

Following these introduction ideas about bio-constructivism and contemporary design theory, education has been framed as an intentional (consensual) history of interactions and experiences which co-transform students, educators and the institution. In this way, the basic elements used to constitute a theoretical model of student experience (ontology) and its research (epistemology) are mostly laid down. The next subsections of this section present the essential ideas of collective sense-making, sense of place and extended cognition. These

theories are assembled to bio constructivism and design theory with the aim of enabling descriptions of how multiple observers can use a SXA tool support their making of collective sense of and decisions about complex higher education environments as a place of consented artificial learning experiences (co-ontogenic drift).

3.1.1.3 Collective sense-making

Making collective sense of complex situations

Educational experiences have been framed as linguistic distinctions used by an educator to describe the descriptions used transform the student in consensual and coherent ways. To do this, we have argued that educators and students need to engage in recurrent dialogue in order to understand what are the intended artificial experiences of co-transformation and the extent in which the educational activities, interactions experiences are producing these desired transformations. In other words, for education to be a mutually accepted co-transformational experience, from bio-constructivist epistemology, educators and students must engage in discussion, dialogue and negotiation to arrive at agreements about the design hypotheses related to educational decisions. At this point, a problem emerges: how do multiple observers – each with closed cognitive systems and linguistic domains- can interact and communicate in order achieve levels of collective sense that are required to make agreements about educational design hypotheses? From constructivism applied to organisational theory, the idea of (collective) s*ensemaking* will be used to address this epistemological and political problem.

The basic notion of sensemaking is that “reality is an ongoing accomplishment that emerges from [observers’] efforts to create order and make retrospective sense of what occurs […] in part to rationalise what [people and organisations] are doing” (Weick, 1993, p.635). Rationalise, from a bio-constructivism, can be understood as observers developing linguistic distinctions that produce coherent descriptions of the perceived events. In the case of an organisation (or team of people), sensemaking is about constructing a contextual reality that helps guide collective decisions. When events appear “surprising, inconceivable, hidden, incomprehensible” to a group of co-observers the collective sense is lost and co-observers fails to rationalise what is happening, a “cosmology episode”, or as personally preferred, an *ontological crisis*: the universe of events does not continue to occur in an known order. When this happens, co-observers struggle to construct and sustain a social reality, a consensual domain of interaction, and the collective structure and action. In this scenario, Kurtz & Snowden (2003) propose a framework to help organisationed observers to make and unmake sense and inform collective decisions. This framework is used to expand the conceptual distinctions used to theorise the student experience in order to include a description of how co-observer (e.g., teaching staff and student representatives is student-staff liaison committees) can develop consensual sense about their complex and unknown and unpredictable co-transformation.

Called Cynefin --a Welsh word similar to environment or context- the framework proposed by Kurtz and Snowden (ibid) sets four domains of situations faced by co-observers: known, knowable, complex and chaos. A known situation is when events can be consistently explained and predicted with linear rationales. The organisation can make sense of data and apply recurrent treatments and practices. In these cases, “structured techniques are not only desirable but mandatory” (p.468). If we recognise that artificial experiences, such as education, cannot be predicted as they are determined by the unique internal structure of observers, teaching staff rarely find themselves in this space. On the other hand, of central importance for the proposed

theory, complex domains are when there are cause and effect relationships between the agents that can be observed and identified ex-post, but both the number of agents and the number of relationships defy categorisation or analytic techniques. Then, when co-observers cannot create linear rationales (consensual domains) to describe and predict a universe of events of interest (e.g., such as when facing of complex educational experiences), the authors argue that decisions must be informed by exploration of different evidence and narratives and aimed at changing the stakes towards a more likely emergence of desired events:

"[the] decision model in this space is to create probes to make the patterns or potential patterns [(of events)] more visible before we take any action. We can then sense those patterns and respond by stabilizing those patterns that we find desirable, by destabilizing those we do not want, and by seeding the space so that patterns we want are more likely to emerge. Understanding this space requires us to gain multiple perspectives on the nature of the system. Narrative techniques are particularly powerful in this space." (ibid, p.469).

In synthesis, multiple observers need to make collective sense in order to recurrently operate as structurally coupled co-observers, such as in a mutually accepted co-transformational experience. Yet, in the complex settings of educational practice, there are many cases where there are no prescriptive ways to interpret these processes, or what decisions to take. Kurtz & Snowden (2003) propose for these cases to collect and analyse data, regarding the multiple narratives involved, to make patterns more visible and describable and aim for interventions that will both make desirable events more stable and undesired scenarios less likely. In the case of education and student-staff partnerships, these ideas allow to argue that partnership participants –such as programme teaching staff and student reps in SSLCs- face complex challenges when trying to evaluate and decide about complex educational experiences and related design hypotheses. The recommended process by this framework is to for co-observers to discuss evidence (data) about the educational experiences which pertains to the different available narratives until a consensus on desirable and non-desirable co-transformation and about the configurations that can increase the likelihood of these desired co-ontogenic, as well as the ones that can decrease then chances of undesired experiences and outcomes. While proposed solution does not provide the answer for every question and suggest the need of a repetitive and time-consuming process, it provides a systematic and hence robust approach for educators and students to engage in discussing their design hypotheses linked to the complexity of education and the experiences of students. Additionally, this model also links the use of data and different narratives in building collective, consensual perspectives and domains of coherent educational action and practice.

3.1.1.4 Sense of place

After describing education as co-ontogenic drift and suggesting a decision model for co-observers facing complex educational contexts, here we add the idea of sense of place in order to provide further distinctions which can be used to describe and understand (higher) education and institutions such as universities and schools. Sense of place is a widely used colloquial expression. The Oxford Reference notes that it is generally used to describe "[e]ither the intrinsic character of a place, or the meaning people give to it, but, more often, a mixture of both" (n.d.). While previous conceptualisations offered enable to describe how observers create linguistic distinctions to coordinate the coordination of their actions, and how co-observers may attempt to do so, these previous ideas only focus on description of recurrent interactions. Therefore, these ideas do not directly help to describe education and educational institutions --

such as universities- beyond the recurrent interactions. It is useful then to include the notion of education (and educational institutions) as the place in which these recurrent interactions occur. By doing so, it is possible to describe the sense of place of higher education as the meanings which co-observers give to a space of educational interaction where they experience co-ontogenic drift.

Sense of place became a widely used concept in architecture, urban design and academic research in the last decades. Hence, there are varied framings used in different disciplines. As noted by Cross (2001), sense of place in anthropology has been, among other, described as *place attachment*: "the symbolic relationship formed by people giving culturally shared emotional/affective meanings to a particular space [...] that provides the basis for the individual's and group's understanding of and relation to the environment." (from Low, 1992). A review of Beidler and Morrison (2016) concluded that "individual interpretations, environmental understandings, sociocultural encounters, and temporal experiences are ultimately intertwined in the transformation of space into place" (p.212). From this view, the consensual cultural, emotional description of a space of co-observer interaction determine how multiple observers constitute consensual descriptions of a place of recursive interaction and how they constitute a domain of possible relation of observers with their environment (which includes them and other observers). In simple words, from this perspective, the sense of place of higher education can be understood as observers' emotional descriptions of the space of educational interaction which determines how educational stakeholders understand higher education and, thus, selects the domain of possible relationships that can emerge in that space.

From the geographical perspective, sense of place can also be connected to the idea of topophilia (Tuan, 1974) which can be used by an observer to describe an "affective bond between people and place or setting". From architectural paradigms, sense of place has been proposed as custom created by observers and influenced by the recurrence of events: "It is the result of habit or custom.... A sense of place is reinforced by what might be called a sense of recurring events." (Brinckerhoff, 1994). Combining these positions, sense of place can be described as an affective bond that develops in an observer following their recurrent observations of events within what the observers describes as a space of interaction. After discussing these and other descriptions of sense of place, Cross (2001) proposed, on the basis of personal research experience, that sense of place is composed by two combined ideas. Firstly, the relationship to place describes the domain of ways in which observers associate to a space. Secondly, community attachment refers to the domain of bonding (as attachment) with a place. For instance, Cross adapted Hummon ideas of rootedness, alienation, relativity or placelessness (no attachment) to describe different types of bonding (community attachment) to a place. Overall, for the purpose of the presented theoretical model and this dissertation, the idea of sense of place is used to describe the emotional, affective connections to education and institutions (e.g., universities) as determinants of the domain of possible relationships and attachments within these places of consensual co-transformation. In combination with the idea of collective sense-making, educational observers (e.g., students and educators) can then follow the Cynefin decision model for complex contexts in order to for them to make collective sense of their spaces of recurrent, consensual co-transformation and the multiple narratives and emotions constituting them. This should help educators and students to create consensual domains to describe both what are the most and least desired educational experiences, and, how to increase and decrease the likelihood of the intended and undesired experiences, respectively. In consequence, education has been described from biological and social Then, it

can be concluded, with the addition of the ideas of sense-making and sense of place, the underlying bio-constructivist and design theory ideas, can be combined to construct linguistic distinctions which can be used to describe essential individual and collective aspects that can be described by observers as constitution education, the student experience and the context of student-staff partnerships for educational evaluation and enhancement.

3.1.1.5 Extended cognition and thing knowledge

After establishing the philosophical background regarding education, the student experience and partnerships, I can finally return the attention to prototype analytics application which sits at the centre of this study. With the aim of exploring the potential impacts of the use of data analytic tool in student-staff partnerships for evaluating and enhancing the student experience of higher education programmes, the questions about the possible roles and consequences that the use of such an instrument by educational observers could trigger, are at the heart of the discussion in this study. In this sense, adding ideas about extended cognition and knowledge offer linguistic distinctions about how a data analytics system can integrate in the work and understandings of educators and students. These linguistic distinctions fill then a final theoretical gap for the presented theoretical model: how do data analytics relate to the collective sense-making about their educational experiences and places of co-ontogenic drift.

Charbonneau (2010) proposes a model that integrates subjective and cognitive domains of the mediation by scientific instruments of observers' understanding of the external world. In synthesis, Charbonneau offers a complement to Baird's (2004) "thing knowledge" which suggest that scientific instruments are constructed based on the functional properties of what is publicly recognised by the scientific community as objective description of the external world. Charbonnaeau suggests that if a system (e.g., physical digital object, artefact, scientific instrument, analytics app) external to the biological system (i.e., not part of the body) performs actions that the biological system has integrated with its cognitive systems as trustworthy representations of the external world, then these objects become part of the operation of the cognitive system of the biological (autopoietic) observer – or extended thing cognition. Figure 7 (from Rates, 2015) illustrates this theory.

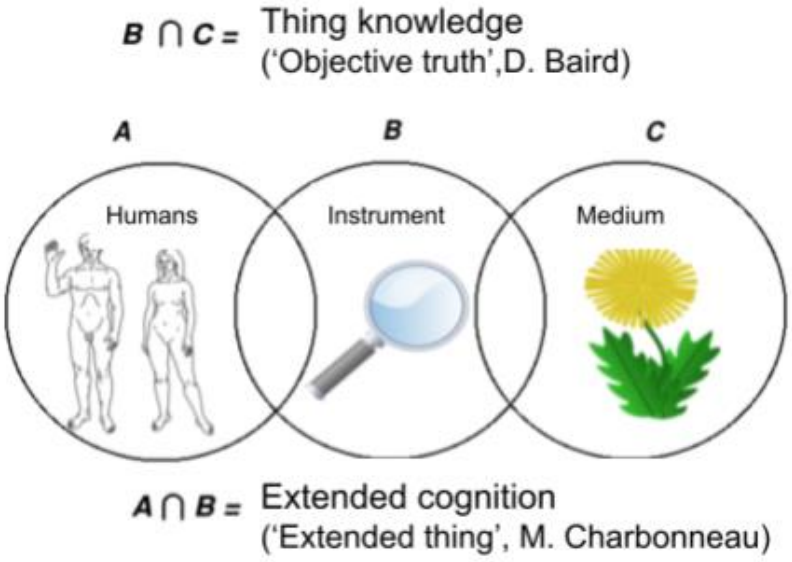


Figure 7. Extended thing knowledge (from Charbonneau, 2010).

Extended educational knowledge

For the case of an analytics app aimed to help descriptions of the student experience, whilst not necessarily a scientific instrument as publicly recognised by the expert community, it can be described as an instrument for extended educational cognition if it offers trustworthy representations which become linguistic distinctions about educational events, experiences and places, thus becoming part of the operation of the cognitive system of educators and students. In other words, the prototype of analytics app at the centre of this study can be imagined as a potential part of the cognitive and sense-making processes of educational observers which can influence their individual and collective understanding of their recurrent educational interaction, and therefore, lead to changes in the related design hypotheses and decisions. Furthermore, as education can be considered as defined by observers' desires about transforming society and the external environment, the use of such an extended cognition analytics app can also have implications in how education ultimately drives change beyond the educator and the student. With this adaptation of Charbonneau's idea of extended thing cognition associated with the use of instruments for the collection, analysis and communication of digital data related to the student experience, we can now proceed to propose a definintion of what the student experience is,how can we learn about it, and what roles can analytics play in such context.

3.1.2 Theoretical model of the student experience and its research

3.1.2.1 Theoretical definition of student experience

Following the review of the concepts of autopoiesis, learning, knowledge, co-ontogenic drift, language, education, design, collective sense making, sense of place and extended cognition, it has finally been made possible to articulate a formal and robust theorisation of the student experience, and the use of data and analytics to understand it.

Student experience

A) The student experience can be defined as what educational observers (educators and students) interpret as students' description of their participation in educational events, activities and places. Students' description of their education is construed on their own and unique history of learning linguistic distinctions to participate in interpretate these events, activities and places. Educational events, activities and places --and thus, the student experiences- are both exclusively intentional – designed- and consensual – situated in a scenario of mutual-acceptance between, and of coexistence of educational observers. Being intentional and consensual, the student experience (what observers describe as students' description of their participation in educational actions, interactions and relationships with other students, educators and the physical and digital places in which these occur) can be defined as propositional or evaluative design hypotheses related with these actions, interactions and places. Following these definitions, student experiences (as design hypotheses) are necessarily informed and validated by the collection and analysis of student feedback, that is, what an observer interpretates as data associated to linguistic distinctions used by students to describe their educational intentions, actions, interactions and places. Then, in temporal terms, the student

experience as a propositional design hypothesis gives shape to educational plans, events, activities and places and is later transformed after validation based on data from student feedback. Finally, considering education as consensual and thus as a democratic space, student feedback can be generated at individual and representation levels. Thus, in synthesis, student experience can be formally defined as hypothetical interpretations of both what is consensually intended by educational observers, and what is later confirmed by what individual students and student representatives describe about students' participation in and interpretation of their education. In accordance with this theorisation, the student experience can be represented as part of a co-transformative (co-ontogenic) feedback loop between educators and students as represented in Figure 8 and composed of the following iterative cycle.Educators' analysis of student feedback to understand the context and needs of students,

B) Educators' formalisation of design hypotheses about the intended educational experiences,
C) Implementation of educational activities and interaction and development of students' experiences
D) Educators' analysis of student feedback (with students) to evaluate the student experience
E) Educators' internal cognitive and linguistic changes product of the (co)evaluation of design hypotheses related to the student experience
F) Educators iterate design hypotheses about the intended student experiences

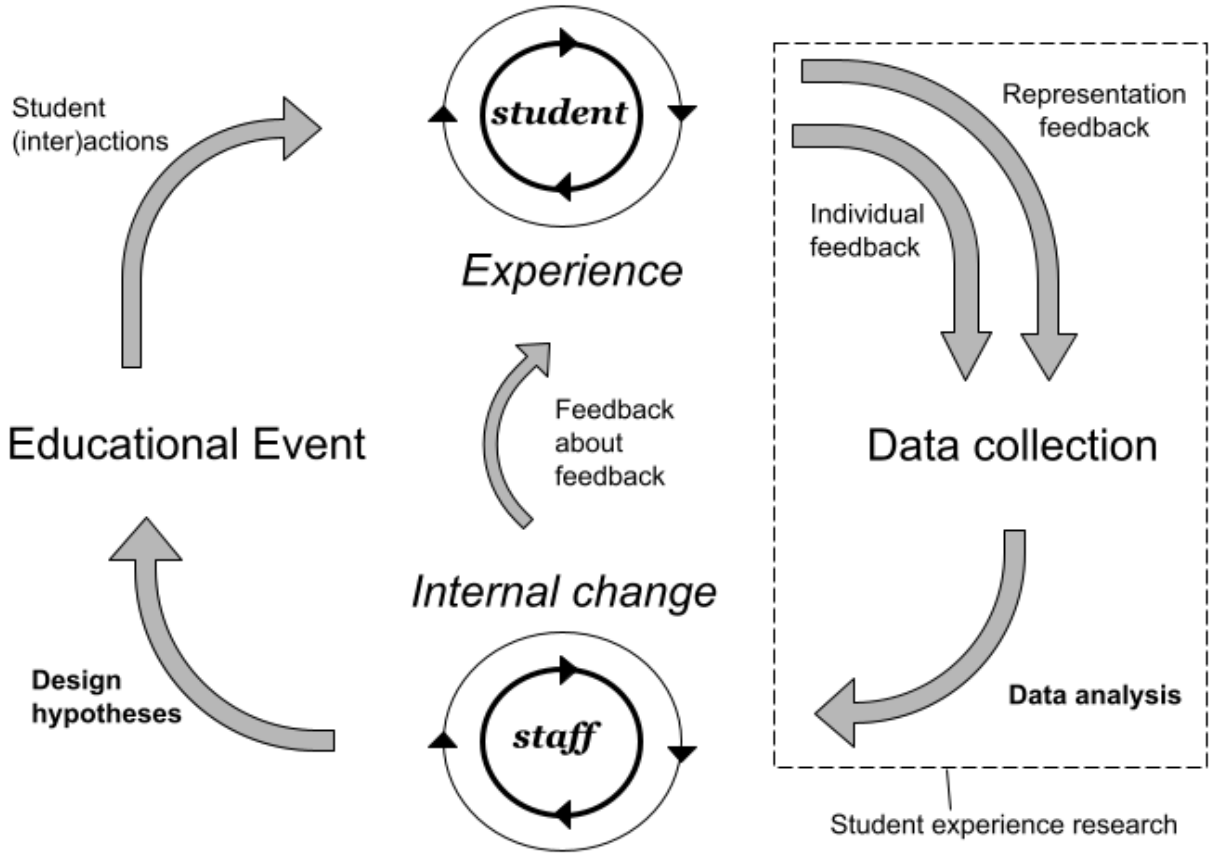


Figure 8. Theoretical model of the student experience.

While the theoretical framework (linguistic distinctions) proposed to describe the student experience are by definition both abstract and limited, it offers a systematic description to an under-theorised concept which is widely used in higher education practice, debate and policy. Moreover, thanks to its abstract and observer-dependent characteristics, this model of the student experience can be argued as able to accommodate context-sensitive articulations that respond to the uniqueness and autonomy of higher education observer-participants, institutions and regimes.

3.1.2.2 A theoretical model of student experience research

By defining student experience as the descriptions used by educators to describe the descriptions that students make about their participation in educational activities, as represented in the feedback loop in Figure 8, it is possible then to define how observers, and particularly educators, can learn about it. From this understanding of student experience, student experience research can be distinguished as the collection and analysis of data and student feedback to inform, validate and evaluate design hypotheses related to the participation of students in the educational activities and interactions and the descriptions that students make about their participation in these educational events.

The student experience research process is part of the student experience design iterative loop and starts with the collection and analysis of data to create a collective sense about the context and needs of students to inform and validate what can be described as intended educational experiences for students (create design hypotheses, steps A and B). Then, student experience research continues during and after the implementation of educational (step D and E) by collecting and analysing data and student feedback about student participation and descriptions of their participation in order to evaluate design hypotheses. These processes occur with the participation of students in a space of mutual acceptance which consider that students and educators are different but egalitarian observers (partnership) and start again with the iteration of educational design hypotheses driven by changes that the evaluation of the student experience have in educators' understanding.

3.1.2.3 A theoretical model of student experience analytics

Following the above definitions of student experience and its research, student experience analytics can be defined as the tools aimed at collecting, analysing and communicating digital data and student feedback to support student experience research. Then, in other words, student experience analytics are digital and data-centred artefacts that are used by educational observers in other to support processes that inform the generation and evaluation of design hypotheses related to the participation of students in educational events and places and the descriptions that student use to describe their participation in these places, activities and interactions. Then, from this perspective, student experience analytics are ultimately defined by its operation as instruments for extended cognition of educators and student, that is, when these educational observers integrate such tools in the recurrent operation of their individual and collective interpretation and interaction and become part of their mutually accepted co-transformation (i.e., co-ontogenic drift).

3.1.3 Use of this model in this dissertation

As already introduced, the use of this theoretical model of the student experience, its research and analytic tools, is led by the exploratory research approach adopted. Most studies aim to provide accurate descriptions, explanations and predictions and use theory to deductively analyse a data corpus based on a theoretical framework. Exploratory inquiry, however, faces little studied topics where there is still a lack of relevant theory and data is analysed inductively in order to find new patterns and questions of interest for more sophisticated research. In consequence, this dissertation –adopting an exploratory approach- primarily attempts to explore the possible impacts of the use of student experience analytics in higher education based on inductive analyses (of contextual interview data) of the responses provided by participants (academic staff, student representatives). The main reason for, not seeking to use this theoretical model to apply deductive analyses to the data as research objective (e.g., explanatory analysis) is because due to the limited previous research and conceptualisation it is not possible to plan a robust data collection and analysis plan which can be informed by existing on-topic literature. Therefore, I recognise that the conceptual and methodological quality of such study would be inadequate to sustain the deduction of reliable and valid claims, making such a study a meaningless pretention of research. Alternatively, at the light of little previous research and conceptualisation, in first instance an inductive and exploratory approach is adopted and acknowledged upfront in order to produce relevant findings and discussion which can adequately inform more sophisticated research. Yet, after doing that, in a second instance, this theoretical model is used to analyse the inductive findings obtained with the intention of offering a theoretical reflection about these exploratory results. Additionally, this theoretical analysis is complemented by a critical analysis of these findings, in the aim of deconstructing the resulting discourses, with a particular emphasis in issues of power and the creation of subjectivity. The next section of this chapter describes some of the main references used for this critical analysis.

3.2.1 Critical framework

Critical backgrounds

As discussed in the extended literature review in Appendix A, in the post-war and cold-war context of the last century the fields of critical theory and research emerged as intellectual contestation of contemporary structures of power or “liberat[ing] human beings from the circumstances that enslave them." (Horkheimer 1982, p.244). This includes a critique of knowledge and the scientific paradigm construed in the enlightenment (Horkheimer and Adorno, 2002):

“Knowledge, which is power, knows no limits, either in its enslavement of creation or in its deference to worldly masters. Just as it serves all the purposes of the bourgeois economy both in factories and on the battlefield, it is at the disposal of entrepreneurs regardless of their origins.” (p.6).

A more recent definition positions critical analysis as “the analysis of the institutionalised patterns of knowledge that govern the formation of subjectivity” (Arribas-Ayllon & Walkerdine, 2008, p.110). In complementation of the exploratory analysis of potential impacts of student experience analytics and the analysis of these findings from the presented model of the student experience, in this project I wanted to expand the appraisal of these data-technologies across the domain of the political power of discourse. In awareness of the growing debates about contemporary statecraft, datafication, and higher education policy, in general, and specifically about the quality, student experience and use of analytics in the higher education sector, it is

clear than interests and calls for critical analysis of the socio-political implications of these issues have increased in the last few decades. The so-called current contemporary curriculum crisis (appendix A) offers a perfect summary. Accordingly, I think that exploring the implied discourses of power constitute a highly important contribution of contemporary exploratory design research, in so far it challenges its own biases and blind spots and acknowledges the existence of related risks and problems. With this intention, the findings and theoretical analysis are complemented by a critical reflection exploring the ideas and narratives developed in this study.

To do this, I rest in some critical references (pun intended). Firstly, Foucault's ideas of normalisation and biopower are used to offer descriptions that coordinate a) the description of analysis of discourse as creator of power relations, and, b) the contemporary State predilection for biological power. Then, I briefly discuss basic ideas about actor network theory and socio-material perspectives and present a diagram representing speculative socio-material assemblages which could be speculated to be produced by the use of SXA in higher education (from the reference of the Scottish and UK contexts).

3.2.1.1 Foucault's discipline, internalised normalisation and biopower

Discipline

Foucault's influential work *Discipline and punish* (1995; original from 1975) is a key reference of the definitive turning point in the philosophical thinking of the second half of the last century. Central to this publication and Foucault's thought are the ideas of *discipline* and the *disciplinary society*. In brief words, Foucault's reviewed the history and modern evolution of the penal system, Prusian military and public health responses to the plague and proposed that, while bodily harm and forced labour were broadly used to punish and discipline throughout pre-modern history, in the enlightenment of the eighteenth century this paradigm changed. Foucault argued that in the pre-industrial modern society, the State shifted its approach to social discipline towards more efficient mechanism based on the expansion of systematic surveillance:

"Nothing so weakens the machinery of the law [(i.e., state's social control)] than the hope of going unpunished […]. Rather than imitate the old system […] and be 'more severe, one must be more vigilant'. Hence the idea that the machinery of justice must be duplicated by an organ of surveillance that would work side by side with it, and which would make it possible either to prevent crimes, or, if committed, to arrest their authors; police and justice must work together as two complementary actions of the same process" (ibid, p.96).

Foucault's quote suggests that since the eighteen century it was recognised by the State apparatus that both effective and efficient disciplinary mechanism ---thus social control- required an agile coordination of surveillance and punishment operation which avoided deviations go unpunished in order to deter individuals from acting against social norms, and therefore, what is also established by law (the State). Foucault suggested that surveillance mechanisms and structures somehow became a crucial need for the economy of the modern State: "Discipline […] arranges a positive economy; it poses the principle of a theoretically ever-growing use of time: […] by deploying its internal elements under a gaze that supervises them, the more one can accelerate an operation, or at least regulate it according to an optimum speed; (ibid, p.154)". In other words, "[d]iscipline is no longer simply an art of distributing bodies, of extracting time from them and accumulating it, but of composing forces in order to obtain an efficient machine" (ibid, p.164)

In the case of education, Foucault also offers the example of ‘mutual improvement schools’ designed as mechanism in which:

“different groups of pupils under the direction of monitors and assistants, so that each passing moment was filled with many different, but ordered activities; and, on the other hand, the rhythm imposed by signals, whistles, orders imposed on everyone temporal norms […]’ 'the sole aim of these commands . . . is to accustom the children to executing well and quickly the same operations, to diminish as far as possible by speed the loss of time caused by moving from one operation to another' [(from Bernard)]”(ibid, p.154).

Foucault suggested that modern discipline was constructed in the design of three coordinated mechanisms: observation hierarchies (e.g., supervisors and supervisees), norms (which define observers should judge as normal and abnormal) and examination (processes to demonstrate compliance). About examination, Foucault described it as a nornamilising gaze which manifests the essential objectifications of those who are examined: “It is a normalizing gaze, a surveillance that makes it possible to qualify, to classify and to punish. It establishes over individuals a visibility through which one differentiates them and judges them. […] At the heart of the procedures of discipline, it manifests the subjection of those who are perceived as objects and the objectification of those who are subjected.” (ibid, p.184-185). Foucault argues that the systematisation and wider expansion of disciplinary mechanisms and structures beyond prisons, hospitals and the military had significant implications for the operation of social activity, including influencing the establishment of epistemological perspectives in education: “And just as the procedure of the hospital examination made possible the epistemological 'thaw' of medicine, the age of the 'examining' school marked the beginnings of a pedagogy that functions as a science” (ibid, p.187)

Furthermore, of critical relevance for this dissertation, the implementation of examination as part of modern disciplinary mechanisms and structures, Foucault proposed, also lead to involvement of documentation, records and therefore data, as basic elements of disciplinary mechanisms:

“The examination leaves behind it a whole meticulous archive constituted in terms of bodies and days. The examination that places individuals in a field of surveillance also situates them in a network of writing; it engages them in a whole mass of documents that capture and fix them. The procedures of examination were accompanied at the same time by a system of intense registration and of documentary accumulation. A 'power of writing' was constituted as an essential part in the mechanisms of discipline. ”(ibid, p.189)

For the case of education, Foucault discussed that documentation and records (data) were instrumental “to define the aptitude of each individual, situate his level and his abilities, indicate the possible use that might be made of them: '*The register enables one, by being available in time and place, to know the habits of the children, their progress in piety, in catechism, in the letters, during the time they have been at the School*' (M.I.D.B., C4).” (p.189). Foucault notes that while these early codes were relatively ‘crude’ they marked a first stage in the 'formalization' of the individual within power relations“ and “to classify, to form categories, to determine averages, to fix norms” (p.190). The implications of the design of surveillance and recording systems, Foucault argued, is that it opened up possibilities for establishing individuals as an analysis object under the disciplinary gaze and for enabling to record descriptions of the different groups of individuals and wider populations.

For this study, Foucault's ideas about examination and disciplinary mechanisms and systems and the roles of systematic documentation and records open up questions at multiple levels. The history and evolution of (formal) higher education (see appendix A): to what extent it may have been influenced by the disciplinary systems of the modern and post-modern State? To what extent evaluating and improving the quality and student experience can be described as a disciplinary mechanism that States implement for its economic and political gains? Could the use of digital data and analytic tools to appraise the student experience and quality lead to more efficient forms of the State's objectification (discipline) of higher education, academics and students? What wider implications could these possibilities have? Will research, design and development of these technologies be ultimately beneficial for the people concerned and the broader society? Attention to these questions will be given in the critical analysis of the potential impacts identified from the analysis of prototype-focused interviews with academics and student representatives.

(Internalised) *Normalisation*

After introducing the concept of modern discipline, Foucault analysed a particular example which became a synonym for his scholarship. This example illustrates, Foucault argues, how disciplinary mechanism and structures were 'perfected' into automated machines which operated in a much more efficient manner. The panopticon refers to a prison design pattern in which prisoners' cells are distributed in the perimeter of a circular building. At the centre of the building, with a clear and direct line of sight to the all the cells and prisoners, lays a surveillance module. A point in which all cells can be examined at all times, and which is always also visible ---- by prisoners. There is a particular additional feature in this design. With the use of backlighting (or the windows of this module are polarised (tinted) glass) people within this surveillance module can see prison cells but prisoners cannot see inside the module, thus, prisoners cannot see from their cell whether there is anyone inside surveilling them or not. Subsequently, the panopticon's design allowed that prisoners could feel surveilled even if no one was looking at them. Then, in consequence, this design deterred prisoners' abnormal behaviour by making them think that they were being surveilled –in other words, by making them to internalise the normalising gaze within their own conscience. In Foucault's (1995) words, cells become "like so many cages, so many small theatres, in which each actor is alone, perfectly individualized and constantly visible. {…] Visibility is a trap" (p.200). The individual subjected to panopticon architectures find themselves "in [their own] place, […] securely confined to a cell from which he is seen from the front by the supervisor" (idib, p.200). In the case of education, "if they are schoolchildren (or older students), there is no copying, no noise, no chatter, no waste of time; if they are workers, there are no disorders, no theft, no coalitions, none of those distractions that slow down the rate of work, make it less perfect or cause accidents" (ibid, p.201). Again, all thanks solely to the design of a disciplinary system which internalises discipline within the individual: "the perfection of power should tend to render its actual exercise unnecessary; that this architectural apparatus should be a machine for creating and sustaining a power relation […]; in short, that the inmates should be caught up in a power situation of which they are themselves the bearers" (ibid, p.201).

Foucault argued that this model of disciplinary mechanisms and structure enabled the modern State to apply novel ways of subjugating individuals and exercising control:

"A real subjection is born mechanically from a fictitious relation [...] He who is subjected to a field of visibility, and who knows it, assumes responsibility for the constraints of power; he

makes them play spontaneously upon himself; he inscribed in himself the power relation in which he simultaneously plays both roles (i.e., the observer and the observed); he becomes the principle of his own subjection." (ibid, p.202).

Foucault notes that Bentham suggests that the panopticon should be thought out beyond a prison architectural design and considered as general pattern of political technology:

"The Panopticon [...] must be understood as a generalizable model of functioning; a way of defining power relations in terms of the everyday life […] the Panopticon must not be understood as a dream building: it is the diagram of a mechanism of power reduced to its ideal form[...]: it is in fact a figure of political technology that may and must be detached from any specific use. It is polyvalent in its applications; it serves to reform prisoners, but also to treat patients, to instruct schoolchildren, to confine the insane, to supervise workers, to put beggars and idlers to work." (ibid, p.205).

In the light of the idea of the panopticon and internalised normalisation as a general architecture and mechanism of social control by the modern and contemporary State, a number of critical questions can be raised in connection with the discussion of this dissertation. To what extent can the quality policy which establishes student-staff co-evaluation of the student experience be interpreted as a disciplinary agenda based on their coercive internalisation and performance of disciplinary mechanisms aimed at making higher education more productive for the State? To what extent can data analytics contribute with novel surveillance mechanisms and structures that relay the normalising gaze to the consciousness of academics and students? In other words, could the implementation of contemporary data analytics apps aimed at evaluating the student experience operate as a panopticon type of disciplinary technology and mechanism of power where educators and students know that they are rendered visible and operate as both observers and the observed, thus internalising the disciplinary mechanism designed by the State? And then, which consequences could these possible changes of the visibility of student experience generate for students, academics and higher education as a (autonomous) community? What kind of wider social impacts could these implications lead to? Based on these ideas of discipline and normalisation, and the related emergent questions, this dissertation gains the possibility to examine --pun intended- how student experience analytics, and their construed narratives, could influence the domain of power relationships between educators, students, higher education institutions and the State. The next subsection adds a final idea from Foucault which analyses how State-society relations can be interpreted around the idea of biopower.

Biopower

When the systematic discipline of the individual across all different areas is analysed as a whole, Foucault suggested, it is possible to interpret them as part of the State's general strategy for governance. Foucault (2004) referred to this as a strategy to control the bodies of the populations which constitutes the State as biopower or biopolitics: "[w]here discipline is the technology deployed to make individuals behave, to be efficient and productive workers, biopolitics is deployed to manage population; for example, to ensure a healthy workforce." (p.238). For Foucault (2007), the shift to biopower is related to the modern State framing of human as living, biological beings and species: "the set of mechanisms through which the basic biological features of the human species became the object of a political strategy, of a general strategy of power [which takes] on board the fundamental biological fact that human beings are a species. This is what I have called biopower."(p.1). This is a new form of positive, non-

disciplinary power (Foucault, 1990): “[A] power that exerts a positive influence on life, that endeavours to administer, optimize, and multiply it, subjecting it to precise controls and comprehensive regulations.” (p.137). In other words (Foucault, 2004): “Unlike discipline, which is addressed to bodies, the new non-disciplinary power is applied not to man-as-body but to the living man, to man-as-living-being; ultimately, if you like, to man-as-species.” (p.242). For the case of education, Hope (2016) concludes: “online data could result in hyper-surveillance schools, wherein institutions engage in predictive analytics of student’s ‘data double’.” (p.898). While Hope focused on compulsory education, parallels can be drawn with the case of data about the student experience in SXA apps in universities. In synthesis, biopower describes the modern State as regulating and fostering the life and biological power of individuals. Public services (health, transportation, water, electricity, education, pensions, security and policing), institutions (hospitals, universities, courts), law (penal and civil code) and policy can be understood as deployed to respond to the biological needs of the population in order to increase and multiply this biological power. Thus, Foucault called all of these biopower mechanisms “behaviour control technologies" aimed at developing a disciplinary society which optimises the increase and multiplication of the biological power of the population.

This higher-level perspective helps to finish the framing of the State as an influential and permeating system which can, as part of a learned general strategy of governance, play invisible roles in establishing power relationships and behavioural control in higher education. In this way, it helps to (re)position higher education as a mechanism towards increasing the biological power of the population governed by a national State. Similarly, higher education quality policy and the student experience can be interpreted as sets of mechanisms for the same purpose, or in Foucault’s words, as “behavioral control mechanism”. Such an approach has obvious links and contrasts with the biological propositions of Maturana and Varela. They are connected in defining humans as biological beings and positioning society as shaped by biology. They differ, however, in that while Maturana and Varela focus on consensual interactions of humans as biological beings and education as a consensual co-transformation, instead Foucault highlights that modern society is constituted by the “behavioural control” and disciplinary mechanisms of the modern State –where, as Foucault argued, education is no exception. In this way, the idea of biopower leads to questions about the extent of the consent and autonomy of educators and students and the possible connections between the modern States’ quest to expand the normalising gaze in order to grow their biological power and the use of data-machines to inform student-staff evaluation and the improvement of the student experience and quality of higher education quality. These questions are important if we consider that in the previous literature review higher education quality policies have been recognised as driven by the national governments, to suggest intent of controlling the sector, and, in the case of the UK Quality Code and its emphasis on the student experience, of being claimed as a product of comprehensive consultation with institutions and stakeholders. This last point related to the production of the Quality Code highlights the possibility of interpreting such a narrative as an effort to persuade educators and students to internalise norms and surveillance mechanisms because the sector –and that involves them! - has freely, and willingly, agreed and consented to this particular regime in which educators and students must collaborate as the bearers (observers and observed).

Socio material assemblages and actor-network theory

Another reference to critical analyse the relationships and narratives of power in this dissertation is the analysis, from the perspective of actor network theory (ANT), of the socio-material assemblages which could be created by student experience analytics. Law (2009) defines ANT as a “disparate family of material-semiotic tools, sensibilities, and methods of analysis that treat everything in the social and natural worlds as a continuously generated effect of the webs of relations within which they are located.” (p.141). ANT " describes the enactment of materially and discursively heterogeneous relations that produce and reshuffle e all kinds of *actors* including *objects*, *subjects*, *human beings*, *machines*, *animals*, *“nature,” ideas, organizations, inequalities, scale and sizes, and geographical arrangements*.” (ibid, my emphasis). In other words, ANT describes socio-material networks of human and nonhuman elements (actors) which are source of material or semiotic action in the network. Fenwick and Edwards suggest that ANT’s analysis can offer insights into the complex networks of socio-material relations of education: “ANT approaches can enact questions and phenomena in rich ways that discern difficult ambivalences, messy objects, multiple overlapping worlds and apparent contradictions that are embedded in so many educational issues.” (ibid, p.IX).

For the case of this dissertation, these ideas are used in two ways. Firstly, a basic representation of possible actor-network diagram related to the hypothetical use of SXA apps is presented in figure 9 to help conceptualise the potential sociomaterial assemblages surrounding the use of these tools. Secondly, these ideas are also applied in the reflection of some of the potential impacts of SXA identified from the analysis of contextual interviews. This analysis aims to add a perspective about the socio-material webs of relations that could be associated to these data-technologies and the resulting scenarios could influence educational practice and power dynamics and structures of higher education. In this way, this dissertation attempts to bring some initial critical reflections on the potential impacts of student experience analytics which might inform further research and discussions related to these technologies as situated in the complex network of relationships within and around universities.

Figure 9. Potential socio-material assemblages of SXA in higher education.

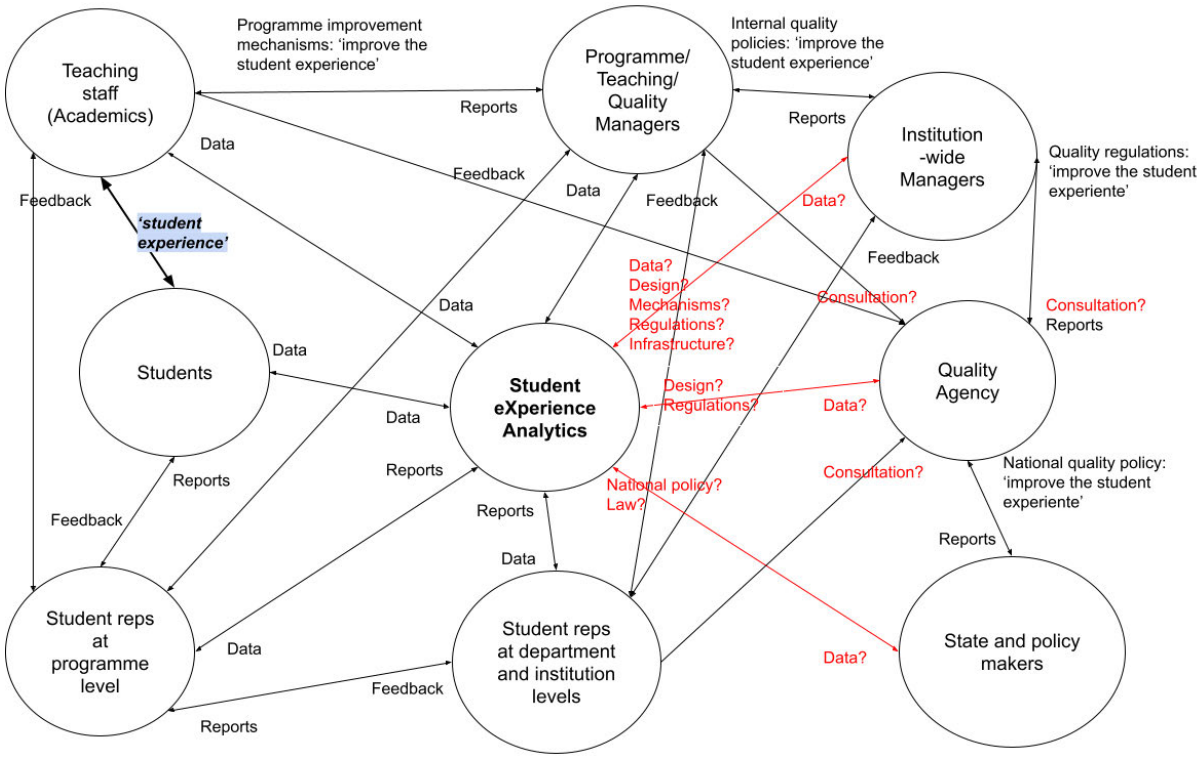


Figure 9. Potential socio-material assemblages of SXA in higher education.

Figure 9 shows a basic representation of some potential sociomaterial assemblages of human and non-human actors surrounding the hypothetical implementation SXA apps in higher education. In particular, this sociomaterial network represents the case of Scotland (and UK in general) where the government implements its regulatory and monitoring mechanism through national quality agencies (QAA and QAA Scotland) and autonomous institutional policies and mechanisms. The diagram represents some main potential actions between SXA apps and students, teaching staff, student representatives and academic leaders at programme, department and institution-wide levels, a national quality agency and the state and policymakers. The diagram also represents some of the actions between these stakeholders, yet with a focus on quality mechanisms by no means in an exhaustive way. It is important to note that some critical interactions between these stakeholders are not represented in the diagram, among other things, the flow of money (student fees, state funding and subsidies, salaries, etc.). It is also relevant to remind that possible changes to data access and control would seem to trigger different actions of SXA apps and actors, and between them. Of critical significance, lines and tags in red point to the question of access and control of data by actors in the centre left (academics and students and their representatives and leaders) and by actors in the right (institution-wide management, national quality agencies, the state and policy makers). In the light of critiques related to the idea of surveillance and power of modern states over human populations, these questions highlight the risks of SXA apps and their data to contribute to the exercise or marketised dynamics, state monitoring and influence over higher education, and a loss of student-staff data sovereignty and educational autonomy. While not market in red, access to data by students or academics also emerges as a point of reflection and debate about the *sociomaterial* conditions that could be triggered (e.g., greater access to data translating into

more intense fears of academics and students of being categorised or affected in their studies or careers).

Chapter 4. Method

How to identify the potential impacts of the use of SXA apps in higher education? After describing the limited literature about use of analytics aimed to support the improvement the student experience in higher education and the objective of developing exploratory investigation on the potential impacts of such tools, this chapter presents the methodology used in this project to address this aim. Firstly (4.1), this chapter starts by stating the ontological and epistemological stance towards education and educational research and the consequent exploratory design research approach which guided the methodologies used by this study. The following section (4.2) describes the research design, the sequence of research activities and methodologies used. Details about the participants and data collection and analysis methods are provided. The final section (4.3) of this chapter synthesises the purpose, structure and limitations of the research methodology implemented.

4.1 Philosophical and research positions and approaches

What is education? What is educational knowledge? What is educational research? In order to identify potential impacts of the use of SXA in higher education, and define the methodology to achieve this research objective, it is first necessary to establish how (higher) education and educational research are positioned and approached in this dissertation. This project follows an interpretivist (constructivist) stance influenced primarily by the experimental findings and biological constructivism philosophy of Maturana and Varela just mentioned in the previous chapter. As mentioned also in the previos chapter, this positioning was selected due to my familiarity with and personal adoption of bio-constructivism since almost 20 years ago. In brief, this position assumes that, due to our own biological characteristics and limitations, it is not possible for us -- observers (researchers)- to describe our environment, our relationships with our environment, or ourselves, beyond our own language, thinking and cognition. As Maturana and Varela (1987) proposed, the following sentences sum it up clearly: *Anything said is said by an observer.* From this philosophical stance and its understanding of knowledge and learning (described in Chapter 3), (formal, higher) education is primarily understood as a linguistic distinction used by observers to describe and coordinate teacher-student interactions, when thesr are understood as mutuall-acepted transformations. The definition of education is then subject-dependent. As described in the previous chapter, for Maturana and Varela (2006) –and to what I subscribe- education must involve consensual interactions between educators and students, and thus interactions within a space of mutual acceptance. In consequence, I understand educational research as the investigation of the consensual teaching and learning interactions involving teaching staff and students. Additionally, adopting ideas from design theory (Simons, 2019), education –similarly to medicine or architecture- is considered an artificial science or design discipline and educational research as (primarily) design research focused on educational design hypotheses: hypotheses about the consensual teaching and learning interactions involving students and teaching staff. Furthermore, following bio-constructivist and design philosophies, education can also be recognised as public service which has been internationally agreed as a human right: every citizen should be offered access to education as a student, and hence, to participate in consensual learning interactions

supported by an educational institution and teaching staff. Therefore, educational research can also involve investigating the degree to which (higher) education is a human right (Talvit, 2008; 2009; UN, 2014) and place (Cross, 2001; Beidler and Morrison, 2016) of consensual co-transformation that is being safeguarded and fostered by governments and policy. These fundamental perspectives are the most coherent with my own beliefs and thinking, an essential factor for choosing and philosophical and research position for this PhD project. Additionally, the biological constructivist philosophical position about education and research in general are backed by important scientific understanding of living and human beings (1987) and have been also able to inform valuable investigation in education and many other fields. While I acknowledge that other philosophical and research positions may be validly used to investigate the potential impacts of using SXA in higher education, it is my understanding that a bio-constructivist lens integrates essential and largely undisputed biological knowledge of humans being living organisms, and thus, offers solid and powerful empirical and theoretical foundations to understand education and educational research.

Following these positions about education and research, my intention with this research project *is not* to claim objective truths which are independent of observers. Instead, *my intention* is to provide a response to the research question about the potential impacts of using SXA in higher education which is coherent with my own understanding in order serve as a reference for other observers (e.g., researchers). Having said that and ceding all that epistemological ground and responsibility, I believe that being transparent about my thinking (chapter three) and methods (this chapter) is crucial to enable other observers to make their own (and unique) critical distinctions about the relevance and trustworthiness of the ideas and findings offered. In simple words, while I recognised that the interpretations of the findings presented in this dissertation are biased and subject dependent, I think that other observers may examine the coherence of my arguments and by sharing my process and interpretations I allow other observers to better appraise how the results of this study were construed, and, subsequently, to better assess the extent in which they are coherent for them. Now, after acknowledging that this dissertation contains nothing more than subject-dependent exploratory descriptions of the potential impacts of SXA apps in higher education, that it does not claim to offer generalisable or dominant knowledge, but which still can be a relevant reference to support more sophisticated research and discussion in the academic literature, next is discussed the associated research approach(es) adopted in this study. In particular, following the limited research about SXA and the philosophical and research positions, this study adopted an exploratory research approach enacted with design research philosophy: what I describe as an exploratory design research approach.

4.1.1 Exploratory approach

As already mentioned in the introduction and start of the literature review, in order to identify potential impacts (benefits, negative impacts and challenges) of the use of analytics to improve the student experience in higher education this study adopted an exploratory research approach. Table 1 summarises traditional descriptions of the main research approaches. While research is frequently referred to as the validation of (explanatory) hypotheses, that approach is only representative of so-called confirmatory or explanatory research (see Table 1). A broader description of the research enterprise must be provided in order to clarify the characteristics of exploratory research. In fact, there may be a particular emphasis for doing this due to the less-known or less-seen details of this type of research. In the words of Jaeger and Halliday and

from a biology perspective (1998): “we have observed instances where a manuscript received unfavorable reviews because referees were not aware of the intentions of the author. This sometimes is caused by the author failing to state whether the research being reported is confirmatory or exploratory in concept.” (p.64).

Confirmatory or explanatory inquiry analyses data in order to test (e.g., validate or confirm) explanatory hypotheses (e.g., causal relationships i.e., A causes B):

“Confirmatory research proceeds from a series of alternative, a priori hypotheses concerning some topic of interest, followed by the development of a research design (often experimental) to test those hypotheses, the gathering of data, analyses of the data ending with the researcher's inductive inference […] to gain some measure of confidence in the validity of those hypotheses” (ibid, p.64). On the other hand, exploratory research works in the opposite way: collects and analyses data in order to suggest new hypotheses (or questions or insights) --instead of starting from hypotheses and collect and analyse data to confirm them: “Sometimes […] an author is not attempting to achieve strong inference; the attempt is to determine what novel hypotheses might be generated from a previously unexplored biological situation” (ibid, p.64). In other words, it can be suggested that exploratory research contributes by providing inputs/supplies/raw materials (e.g., hypotheses, insights, questions) which feed confirmatory research: “Explicit hypotheses tested with confirmatory research usually do not spring from an intellectual void but instead are often gained through exploratory research. Thus, exploratory approaches to research can be used to generate hypotheses that later can be tested with confirmatory approaches” (ibid, p.64).

Table 1. Different types of research approach.

Approach	Use case	Aim	Previous literature?
Exploratory	New/unstudied phenomena.	Generate initial descriptions, questions and hypotheses to inform more sophisticated studies.	Scarce/limited/insufficient.
Descriptive	Lack of detailed, accurate empirical description.	Generate accurate and trustworthy descriptions of phenomena.	Abundant exploratory literature desired.
Explanatory /Confirmatory	Insufficient evidence for causal explanation of phenomena.	Confirm hypotheses (causal relationships) and theories.	Abundant exploratory, descriptive literature desired.
Theoretical (pure)	Lack of theory, or limitations of existent theory.	Produce novel/improved theoretisation and explanatory models.	Abundant exploratory, descriptive, explanatory literature desired.
Design (i.e., applied)	Intention to solve problems, seize opportunity.	Evaluate design hypotheses (related to artificial phenomena).	Design problems/opportunities are discussed or can be inferred from literature
Critical	Interest in questioning	Analyse discourses about power.	Oppression, discrimination,

	narratives and structures of power.		contradictions are discussed or can be inferred from the literature.

Note: Own production for reference purposes.

Waters (2007) offers similar conceptualisation, noting that "[r]ecent philosophical research on exploratory experimentation began with the observation that experimentation in science is not always guided by theory, that sometimes experimentation is exploratory in nature" (p.275). Waters referred to Steinle's (1997) analysis of initial investigations on electromagnetism where some famous experiments did not have theoretical references to follow, and instead, were guided by systematic exploration of collected data: "Some experiments were designed to look for specific effects, which were expected because of theoretical ideas about electromagnetism. But other experiments were set up to discover rules governing electromagnetic behavior about which the investigators had no theoretical ideas, and hence had no specific expectations" (p.275-276). Waters then further highlights that research designs are thus different and, while confirmatory research uses theory to focus on limited meaningful questions, data collection and analysis, instead exploratory inquiry is more flexible and less restrictive so researchers can adjust the investigation based on what they find along the way:

"[t]he exploratory experiments were set up [(i.e., designed)] in ways that enabled investigators to intervene in a variety of ways. This made sense because investigators did not enter the inquiry with ideas about which kind of interventions were likely to influence the phenomena and how they would influence the phenomena. In contrast, experiments directed by theory were set up in ways that restricted the ranges of intervention […] to focus on the most promising interventions, that is, most promising from the perspective of their theoretical ideas about the phenomena being investigated." (p.276).

Following these ideas, Waters suggest that the purpose of exploratory research is to produce insights about a phenomenon which is acknowledge, but not yet theorised: "Roughly speaking, *the aim of exploratory experiments is to generate significant findings about phenomena without appealing to a theory about these phenomena for the purpose of focusing experimental* [(e.g., empirical)] *attention on a limited range of possible findings.*" (Waters, p.279).

Beyond research designs, Jaeger and Halliday (1998) also suggested that the structure of reports and manuscripts of exploratory studies should not mirror the traditional format of confirmatory research. Jaeger and Halliday suggested that in biology journals, there was a prevalence of explanatory studies and manuscripts. As such, journal editors were inclined to review the submitted articles following expectations and criteria related to confirmatory research, which sometimes lead to misinterpretation and unfavourable judgements for explanatory studies. At the light of their differences and the reviewers and examiners habit of appraising explanatory research, Jaeger and Halliday recommended that authors noted that the structure of manuscripts reporting exploratory research should not resemble that traditional organisation of confirmatory research. Specifically, Jaeger and Halliday (ibid) asserted that while confirmatory research uses the introduction and discussion to present the hypothesis and inference, respectively, exploratory inquiry should utilise the introduction to describe the lack and relevance of research in an understudied area, and the discussion section to raise the emerging (inferred) new hypotheses (questions, insights):

“First, with confirmatory research the hypotheses are in the Introduction and the inferences evaluating those hypotheses are in the Discussion. For exploratory research, the Introduction merely states the novelty of the biological situation and makes clear why the novelty is important to elucidate; the Discussion then poses the hypotheses gained from the data analyzed, and these hypotheses are themselves the inferences” (p.64).

For the case of social world, a search in Google Scholar suggests that Stebbins’ (2001) ‘Exploratory research in the social sciences’ is, by far, the most prominent reference about this kind of inquiry. Like Waters, Jaeger and Halliday argued for natural sciences, Stebbins (2001b) also notes that exploratory research has also been little discussed and underestimated: “In the social sciences, including even qualitative research circles, the idea of exploration is usually mentioned, if at all, only in passing” (p.2). One of these early references is quoted by Stebbins (ibid) and helps illustrate the approach of this dissertation: “Boulding *(1958)* wrote about the need to “travel over a field of study” with the object of extending “the reader's field of acquaintance with the complex cases of the real world” *(p. 5)*” (p.2). Here exploration is described as a journey towards a little known (if at all) world, which the researcher needs to get acquainted with before studying it in detail. In other words, exploration can be described – following this traditional idea- as a necessary step between the unknown or little-known phenomenon and the capacity of the researcher to produce further detailed studies which can make it a known. Stebbins (ibid) offers his own definition of exploratory research, which emphasizes the intentional, systematic effort to discover and describe domains of the social world:

“Social science exploration is a broad-ranging, purposive, systematic, prearranged undertaking designed to maximize the discovery of generalizations leading to description and understanding of an area of social or psychological life. [...]The emergent generalizations are many and varied; they include the descriptive facts, folk concepts, cultural artifacts, structural arrangements, social processes, and beliefs and belief systems normally found there” (p.3).

Stebbins suggested that exploratory investigation –in the social sciences- is implemented in the light of little previous literature on the subject of study (ibid): “Researchers explore when they have little or no scientific knowledge about the group, process, activity, or situation they want to examine but nevertheless have reason to believe it contains elements worth discovering.” (p.4). The process, Stebbins suggest, must be flexible, open-minded but oriented towards generalisations via inductive reasoning: “[t]he outcome of these procedures and the main goal of exploratory research is the production of inductively derived generalizations about the group, process, activity, or situation under study” (ibid). Taking into account these ideas about exploratory research, this study aims to explore the potential impacts of using analytics to support the improvement of the student experience in higher education. More specifically, the purpose of this study is to (inductively) identify potential benefits and negative effects of the use of analytics in student-staff co-evaluation and enhancement of the student experience of Scottish higher education programmes. In the terminology of Stebbins, I attempted to produce inductively derived generalisations of the both the positive and negative impacts and the challenges for the adoption of analytics by academics and student representatives to inform their collaboration to improve the student experience of their programmes. In other words, by adopting an exploratory approach, I sought to collect and analyse data which could help me identify and discover possible consequences of the use of analytics by student reps and academics to enhance the student experience in Scottish universities (and to reflect about

higher education in general). Hence, I tried not formally or systematically prescribe ideas of what the related positive and negative impacts and challenges could be, nor collected and analysed data to try confirming the validity of such pre-existing hypotheses. In this way, the central results of this study are not de confirmation or negation of certain possible impacts of the use of analytics to improve the student experience. On the contrary, the main contribution is the suggested identification of potential impacts related to the use of analytics to improve the student experience, which can be further investigated in future studies.

In conclusion, I hope that, the readers will take into account the characteristics of exploratory research and the differences –in research design and report structure- with the purposes and standards of other forms of inquiry. Importantly, as stated in the literature review and theoretical and critical frameworks, the exploratory approach also influences the way theory is used in this study. Yet, in connection with philosophical positioning also discussed earlier, I conceive education is best described as a design or applied science –and not a social or basic science *per se*, such as sociology or anthropology. Thus, the exploratory approach in this study is combined with a design research approach and does not seek to produce theoretical knowledge of the social world --such as a ground theory approach may seek to by linking the generalisations produced (for more detail see Stebbins, 2001b, p.4.) Abundant discussion of design research has been already offered in the theoretical chapter, so a brief rationale for its adoption is presented next.

4.1.2 (Agile, human-centred) Design research approach

As mentioned in the previous chapter, design research has been suggested as different to basic natural and social inquiry (see Table 1). Again, design research focuses on the artificial world and design hypotheses related to an artefact or prototype which the (designer) observer creates to produce the maximum influence in its environment (Simons, 1969). This approach differs from the idea of an observer aimed to learn about how its environment operates independently of its own observation. As already mentioned, I think that formal education is better described as a design science, because it is created by observers to modify their environment, instead of something that happens independently of observers. Therefore, a basic social science or sociological approach to education research, in my view, falls short of understanding formal education, its intentional and artificial nature, and the position and role of the research observer. Accordingly, a basic science exploratory approach as generally described by Stebbins, Jaeger, Halliday and Water is unsuitable for educational research and this dissertation. Furthermore, with the aim of studying the potential impacts of data analytics tools for educational settings, these systems being design artefacts too, considering a design research approach can be argued as a twice needed. Moreover, a design research approach also offers the important advantage of enabling to explore the potential impacts of a prototype through the building and testing prototypes with real users in ‘realistic’ simulations (see in the case of educational research McKenney & Reeves, 2018; for an example from material design see Campbell et al, 2012). The advantage offered by this approach is that it allows to evaluate the potential of these possible new technologies based on advanced evidence of characteristics and use of these tools in –simulated- practice, which brings added findings that are crucial to explore their actual potential, but other research approaches could only aspire to speculate. In this way it is expected to provide a useful reference to identify advanced theoretical and practical problems for further research. Subsequently, combining design research with an exploratory approach afforded to \identify potential benefits, concerns and challenges related to the use of analytics to

improve student experience from the collection and inductive analysis of highly relevant data. Such argument worked as a general guide for this study.

In addition to the exploratory design research approach, it is important to clarify the influences of contemporary human-centred, agile design perspectives and methods. Firstly, human-centred design was already introduced as a philosophy related to the design of systems for human interaction which recognises the critical importance of investigating the contexts, needs and problems of the ultimate users of a particular artefact or tool, as well as testing and iterating prototypes with users in order to validate their experiences of use and related effectiveness. Following these ideas, education is seen as a human-centred design practice (see theoretical framework in previous chapter). Additionally, the data analytics app prototype is also considered to be a system which involves human interaction. As such, its design sought to be grounded on the understanding of the contexts, needs and problems of its users (academics and student reps) and its effectiveness to be evaluated based on their perspectives. This understanding of education and analytics apps as human-centred artefacts determined the methodology adopted. Regarding the 'agile' approach, contemporary design practice has evolved rapidly in the last decades, shaping some core beliefs and methodologies linked to design processes, particularly in software development. The agile manifesto was proposed in 2001 by a group of software developers to illustrate a shift in thinking of design and development process towards decreased emphasis and efforts in documentation and procedures and increased attention to delivering valuable solutions:

"*Individuals* [(i.e., users)] *and interactions* over processes and tools;

Working software [(e.g., services or products)] over comprehensive documentation;

Customer collaboration over contract negotiation;

Responding to change over following a plan.

That is, while there is value in the items on the right, *we value the items on the left more*." (Beck et al., 2001; my emphasis).

From the same manifesto, a quote further details the critical methodological stance which characterises agile design philosophy:

"The Agile movement is not anti-methodology, in fact, many of us *want to restore credibility to the word methodology*. We want *to restore a balance*. We embrace modelling, *but not in order to file some diagram in a dusty corporate repository*. We embrace documentation, *but not hundreds of pages of never-maintained and rarely-used tomes*. We plan, *but recognize the limits of planning in a turbulent environment*." (ibid; my emphasis).

The so-called agile philosophy is a response to problems and shortcomings of traditional, so-called waterfall design and development processes. Waterfall process organise productive processes in autonomous phases or stages in which analysis, design, development, implementation and evaluation proceed linearly and in segmented ways, with plenty of documentation at each step. Agile philosophy is based on a critique to this linear, fixed operation in design processes and proposes an alternative based on recursive movement between different stages in iterative ways by using low and middle fidelity prototypes (e.g., from evaluation of prototypes back to design) in order to focus efforts in creating highly refined –and thus informed and valuable- prototypes. While there are various specific frameworks and

workflows, the crux for agile approaches resides in their focus on validating of design hypotheses as quickly, easily and cheaply as possible, so when artefacts are built, design assumptions have been already identified, put to test and iterated. Beyond the economic interest in efficiency, agile approaches and methods pursue intensive design research which decreases the biases and untested assumptions which are carried through the processes of design and into our artificial world. Design is always situated in a context of limited resources and agility is understood as maximising the design knowledge that can be obtained within these limitations. Consequently, an agile approach was adopted in order to make the most of the scarce time and human and material resources related with a PhD project. This is reflected across al the research processes conducted, but particularly represented by the rapid prototyping process. Without this approach, it would not have been possible to design and evaluate potential impacts of a user-informed prototype, as each stage of the process would have taken several years if conducted as segmented studies.

4.1.3 Critical (post? Post-post?) approach?

Whilst the exploratory design research approach of this study has been discussed, as introduced in the previous chapter, I have also attempted to include a critical approach in the analysis of findings. Firstly, by seeing to identify potential negative effects related to the use of analytics to improve the student experience I am explicitly highlighting the need to be sceptical of the possible consequences of integrating data-technologies in educational practice. However, beyond that, I also analyse the inductive, exploratory findings (potential benefits, negative effects and challenges) from a critical perspective. As discussed earlier, Horkheimer's (1982) quote of *liberating humans from the conditions that enslave us*, and a cynical stance against knowledge as a enlighten project (Horkheimer and Adorno, 2002) sums up the main interest of critical research. However, in this study, the critical approach is positioned as dominant or hegemonic –it has to coexist with the exploratory design research approaches mentioned. This means that, while I tried to be attentive of discourses and structures of power and conditions that could lead to inequalities, discrimination and oppression, etc., I did not flatly assume a cynical position about education, collaboration, technology and data. As such, it is possible to contest the idea that this is critical research (I have put it as a question instead of a claim). One of the motivations for not committing to making critical inquiry the central and dominant and self-claimed object of this study is that, while open to some of its profound reflections, I think I am sceptical of 'critical research' as a project when defined as an end in itself, particularly about its impressive ability to critique every grand narrative, except their very own. For me, it seems that critical research has, on many occasions, become a performative exercise –as much as it critiques about other forms of inquiry- which justifies itself –and excuses itself to demonstrate practical relevance- as being an act of resistance, as a kind of political statement to an evil *other*. Such a standing, I tend to suspect, does not commit to offer relevant contributions that are needed to amend serious problems in and deeply problematic state of contemporary educational practice, policy and research. I personally feel uncomfortable with the feeling of not trying to contribute to practice. Then, I would say, it is my personal choice to (attempt to) take a critical perspective as companion to an intellectual quest to support current and future practice (thus my involvement in this dissertation with design research and descriptive and normative theories such as bio-constructivism). This can be interpreted as surrendering to the hopes of the enlightment paradigm –a sin which I would have to confess. Secondly, but very important, I also believe that critical research needs something that can be critiqued. Deconstruction needs constructions to tear down. In my humble and ignorant understanding, critique is focused on

questioning pre-existing narratives. For this study, due to the limited previous literature focused on the use of data analytics to improve the student experience, I found it necessary to first conduct exploratory (design) research, in order to produce inductive findings about the potential associated impacts, and theoretical reflection, which can then be critiqued. Following this rationale, the critical approach, if it can be considered one, is implemented in the critical analysis of these exploratory results and theoretical analysis presented.

Finally, it may be relevant to disclose my research position in regards modern/structuralist/humanist and post (modern/structuralist/humanist) stances. After the theoretical framework offered, particularly the adopted ideas from Maturana and Varela (1987), I think this study is aligned with a multiplicity of realities which is not compatible with traditional principles of structuralist and modern philosophy (e.g., universal knowledge). Accordingly, this dissertation may be, to some extent, classified as post-structuralist or post-modern philosophy. On the other hand, post-humanism –with the influence of critical theory- tends to be associated going beyond the enlightenment humanism and the Vitruvius man and by thinking that other animals and non-human entities also exercise *agency*. Whilst some of these tenants are coherent with my view (e.g., the agency of animals and other living beings), I am skeptical of some of these premises, such as the departure from inspiring humanist ideas as well as plainly attributing agency to material objects. About the latter, I personally recognise that 'material' objects can influence individuals and society to a great extent. Nevertheless, from a perspective that everything is said by an observer, I believe that it is incorrect to assert that this influence is due to them *having* agency within their isolated material 'existence': for me, the influence of material objects lays in the linguistic distinctions that observers use to describe them and the network of systems and people they are connected to, both things which can trigger action --'agency'- in and from these objects in different ways, that ultimately rests both on their interconnectedness to a larger net of living actors and of the cognitive structure of living and human beings, which are unique and dynamic --*beauty is in the eyes of the beholder*.

Having been born and raised in Latin America, post-colonialism is a group of ideas which I can relate to much more. Yet, international or ethnic aspects are not as central in this study for postcolonialism to take central stage. The scope given to this project was constrained to the experience of students, the use of data and student-staff partnerships for the higher education improvement: problems which throughout this study I did not consider the need to be primarily framed as a post-colonial matter. Still, there are many postcolonial elements which can be considered, starting by the relation between myself, as a researcher coming from where is said to be 'the global South', studying how to make Scottish (British) higher education better, and the associated ramifications (even if this being an independent project based on my own original thinking). In all, in this dissertation the critical approach (if it can be considered in this way at all), as said, is not central but an important complement to exploratory design research. In this way, it can greatly enrich the exploration of and reflection about the potential impacts of using data analytics to improve the student experience in higher education. By doing this, I think this doctoral thesis could lead to relevant insights that can be further examined in future studies.

4.2 Research design, process and activities

Following the (human-centred, agile) exploratory design research approach adopted, this study aimed to answer the research questions using a sequence of methods or research process. After a first year of preliminary literature review and a preliminary exploration of the activities and data used to evaluate and enhance the student experience in this and other Scottish

universities (e.g., Rates and Gašević, 2022) it was decided to conduct a research process centred on three phases totaling four steps, illustrated in figure 10 (Note: some additional research activities were also considered as options, yet, due to time constraints, the presented activities were conducted).

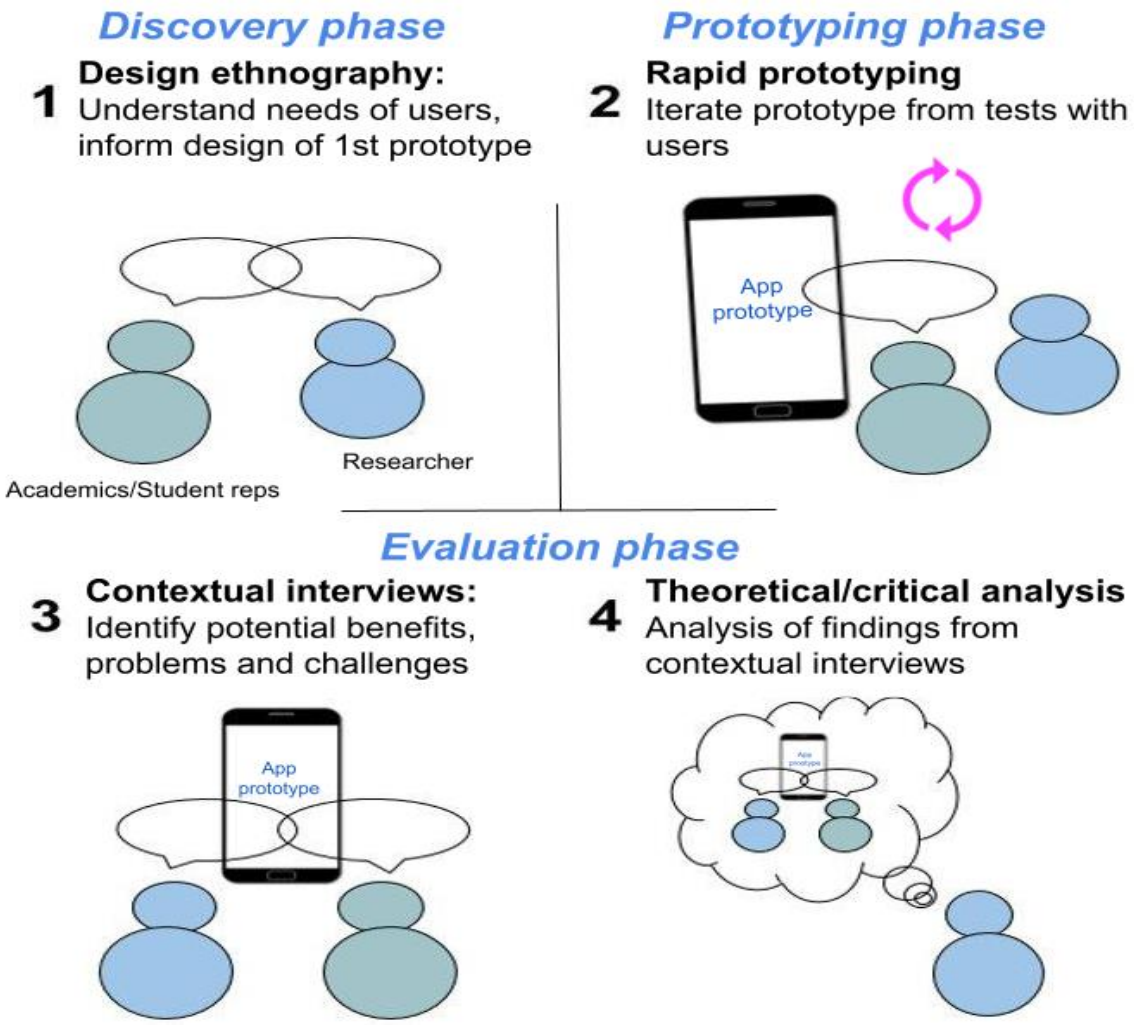


Figure 10. Overview of exploratory design research process and activities.

In order to identify potential impacts of the use of data analytics to support student-staff partnerships for the enhancement of the student experience of higher education programmes, an agile, human-centred exploratory design research was followed. Firstly, included a design ethnography based on interviews and focus groups were used to understand the contexts, needs, problems and data needed by academics and student representatives in the contexts of student-staff liaison committees at programme level –the discovery phase. Then, the insights from the previous phase were used to inform the design of an initial prototype app of a data analytics tool – a prototype which was later iterated following feedback from user testing –the prototyping phase. After the refinement of the prototype, contextual interviews presented and discussed the prototype with senior academics and student representatives in order to identify potential benefits, problems and challenges related with the hypothetical use of the data

analytics prototype app in their different universities. These potential benefits, problems and challenges (inductively) identified were then theoretically and critically analysed with the help of the models and ideas and discussed in chapter three –the evaluation phase. Overall, this research process allowed me to conduct an exploration of the potential impacts of the use of data analytics to inform the improvement of the student experience (SXA) in higher education through the creation, iteration and evaluation of a practice-informed research prototype. In this way, while multiple limitations are acknowledged, it is considered that the research process produced relevant findings for the research questions and literature gap addressed by this study. In consequence, I believe that the results of this research process may offer an interesting reference to inform more advanced research and practice in this area. In the next subsections, each of the activities of the design research design are discussed in detail. Appendix C presents examples of data collection instruments used.

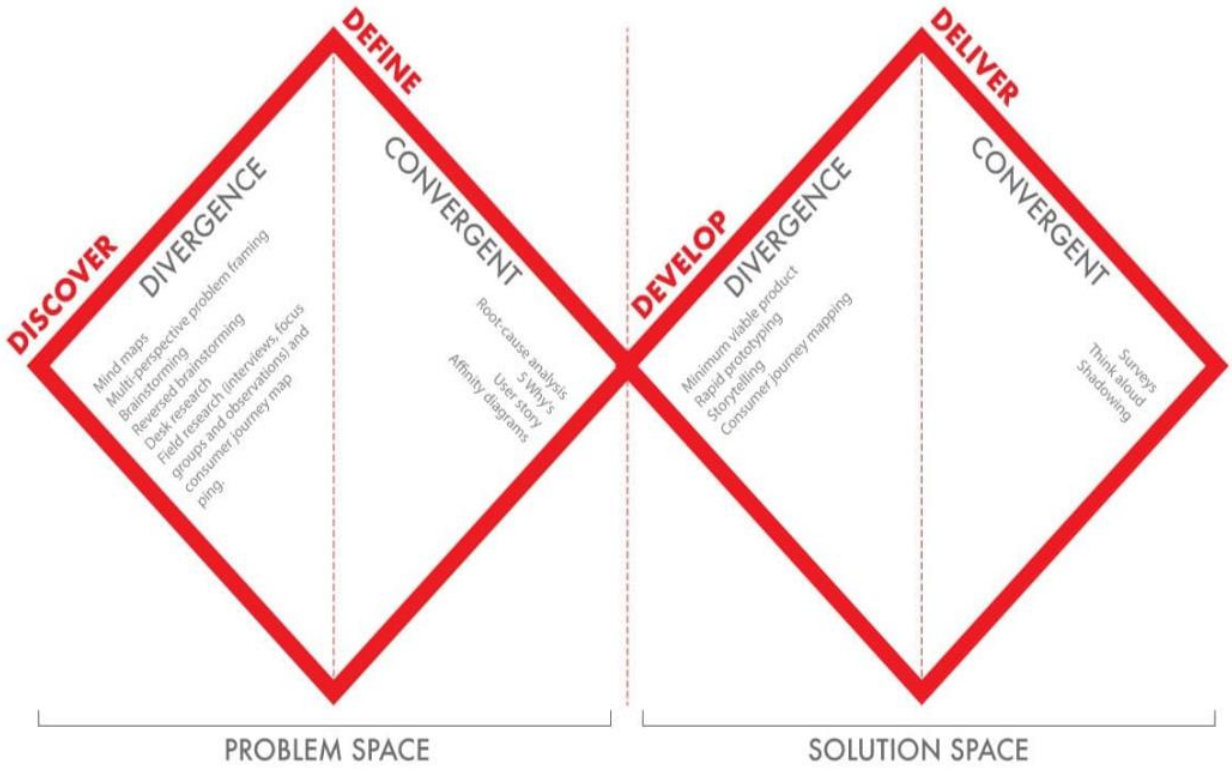


Figure 11. Double diamond design process. Adapted by designorate from the Design Council.

4.2.1 Discovery phase: design ethnography

The term discovery phase has been widely adopted to describe the starting phase of contemporary, agile, human-centred design process in which the design team builds an initial understanding of users, their contexts, problems and needs: a vital step which will inform the following design activities. Figure 11 shows the famous double diamond process (Ball, 2019) which begins with the discovery phase. The “official” description of the Double Diamond design process by the British Design Council (their creators) states (2019) that the double diamond process organises a sequence of inductive exploration and deductive synthesis: “The two diamonds represent a process of exploring an issue more widely or deeply (divergent thinking) and then taking focused action (convergent thinking).”. The discovery phase is the initial and

inductive, focused exploration of contexts and needs of people (intended users) in which data is collected and organised so the design team can gain insights into a number of problems which could addressed by the design team: in this phase, designers “understand, rather than simply assume, what the problem is. It involves speaking to and spending time with people who are affected by the issues”(ibid). This research-informed understanding leads to the defining phase where deductive analysis is used to scope and formulate the specific problems which will be considered for the design of a prototype and the development of validated solutions.

The online UK Government Digital Service’s (2016) ‘Service manual’ implies that the discovery phase is necessary for successful public services "before you commit to building a service [(or a product such as a student experience data analytics app for academics and student reps)] you need to understand the problem that needs to be solved.”. This manual says that the discovery phase involves learning about “your users and their context, the constraints that affect your problem or the wider context you’re working in - and any opportunities to improve things.” (ibid). The design playbook of the Victoria State Government (Australia) (2020) suggests the discovery phase as a “period of learning using qualitative, ethnographic and human-centred research to understand the behaviours and desires of stakeholders” (p.14). Accordingly, the research conducted in the discovery phase is an essential aspect of agile design as it gives the designer the opportunity to gain insights to understand the problem which is to be solved as well as its context (note: the next section of contextual interviews sheds more reasoning behind the importance of the discovery phase). In a real service or product design process (for instance, see Shah, D. (2014), it is expected that a team of people –lead by a specialised user researcher- will engage in multiple data gathering and analysis methods, such as observation, interviews, focus groups, review web analytics and previous user research (see also some examples in the discovery phase in figure X). For the case of this project, for the discovery phase I implemented a design ethnography. Details of this methodology are next discussed.

4.2.1.1 Design ethnography

In order to create a research-grounded understanding of the information and data needed by academics and student representatives to evaluate and enhance the student experience of their programmes, the discovery phase of this study was based on a design ethnography. As it names suggests, the method reflects the appropriation and adaptation of ethnographic methods for design research (Segelström and Holmlid, 2015). Ethnographic research is a well-established, broad and growing field which has been widely used in social sciences and beyond, but there is no agreement on definitions (e.g., Hammersley & Atkinson, 2007, p.1-2.). Some traditional features involve the researcher having close contact with certain groups of people (e.g., members of an exotic, ancient or urban culture), and through observation and/or interviews or conversations with members of these groups, and any other relevant data found, the researcher produces a description of the shared activities, views, and narratives in relation of a particular topics of interest. Salvador et al. (1999) argues that design ethnography “focuses on ([identifying)] the broad patterns of everyday life [or activities] that are important and relevant specifically for the conception, design, and development of new products and services” (p. 36). A famous example to illustrate design ethnography in practice is the article of Bentley et al., (1992) which reports the investigation of flight controllers’ work aimed at informing the design of systems which display key information that help them control passenger jets traffic (where small mistakes can put the life of hundreds of people at risk). In his fine book, Muller (2021) says that design ethnography can be described as “passively observing social situations in order to alter

them afterward through intervention, and then observe them again, etc. It is not a linear but an iterative process, in which observation, analysis, and conception are inextricable." (Chapter 4, p25).

While ethnographic research is a crucial influence for design ethnography, their differences are well-discussed and help to understand this method in better ways (for a great overview see Segelström and Holmlid, 2015; for further reference see also Dourish, 2007; Blomberg and Karasti, 2012; Randall et al.; 2005; Nova, 2015; Priestner, 2017). The term ethnography comes from the ancient Greek *ethno* (foreigners, i.e., people of different places and culture; some other, different to me) and *graphe* (drawing, description): to describe foreigners. As mentioned, ethnography seeks to describe the social world of a certain group: it is aimed to describe the world construed by others; a world vision 'independent' of the observer. The observer must get immersed in this world –the research field- to describe it. The value of ethnography per se is related to social, cultural theory and academic knowledge. On the other hand, design ethnography focuses on describing the workplace or personal life in relation to design problems and opportunities: a vision of a world that can be changed by the designer through the creation of a tool, or in other words, a (artificial) reality that can depend on the designer. The value of design ethnography is not primarily associated with social and cultural academic knowledge, but with producing insights about observers views which can help to create tools that transform their world. Design ethnography is not employed to make designers more *wise*, *enlightened* or *literate*, or to help them publish an academic article. Instead, as it emerges to fill a specific, scoped and practical epistemological need of designers, or in other words, "because designers create artifacts for workplace contexts about which they know very little" (Muller, 2021, p.35; from Blomberg). Therefore, design ethnography was adapted and implemented in this study in order to learn about the contexts, needs and problems of academics and student reps in connection to their collaboration for evaluating and improving the student experience of Scottish higher education programmes. In other words, the design ethnography methodology was designed to learn, as fast as possible, about the experiences of student reps and academics while learning about and trying to enhance the learning experiences of higher education students. Hence, the objective of the initial design ethnography and discovery phase was to investigate the needs –particularly in relation to accessing data- of these stakeholders from their own perspectives and viewpoints.

More specifically, due to the concerns of intervening student-staff collaboration with the presence of a researcher, the difficulty in obtaining participants for long interviews (particularly senior academic staff) and the significant limitations in terms of human and material resources of a PhD project, the method was adapted to what is called a 'rapid' or 'quick and dirty' design ethnography. As their names suggest, these versions of design ethnography research are carried out in (comparatively) very short time periods and, consequently, cannot delve into exhaustive detail, analyses or documentation: "[t]his refers primarily to *quick forays into the field*. Such ethnographies are "dirty" because they are not very detailed. This process *can provide an overview of an area that has been defined in advance*." (Muller, 2021, p.36, my emphasis). While such approaches have been critiqued as failing to capitalise the full potential of ethnographic methods –an idea which I subscribe and a feeling that I experienced while conducting research- these 'agile' or 'guerrilla' adaptations of design ethnographic research respond to the aim of informing an initial agile prototyping phase and several important constraints experienced by the nature of the field and, especially, of a PhD research project.

4.2.1.2 Participants of the initial (rapid) design ethnography

With the aim to create a quick initial understanding of the context and needs related to student-staff co-evaluation and enhancement of the student experience in order to inform a first prototype, academics and student representatives from multiple Scottish universities were recruited to participate as key informants. In line with the purpose of design ethnography, I sought to directly ask questions to and have dialogues with individuals who participated in the activities (e.g., meetings) and groups (e.g., committees) of interest (i.e., student-staff co-evaluation and improvement of the student experience at programme, department levels).

Recruitment

Due to the scarce time and resources available for this study, recruitment followed an agile strategy focused on quickly exploring the most effective and efficient channels to invite both academics with teaching leadership roles and student representatives from Scottish universities. In particular, the initial focus was to include programme directors and programme-level student representatives, as preliminary exploration indicated that they have direct participation and responsabilities in programme-level partnerships for quality enhancement at a ground level. After early exploration, I concluded that finding public details about academics' roles in the institution site was possible in many cases, but in a much lesser way for student representatives at ground levels. Following these findings, it was decided to send invitations to potential participants (whose work/representation details were publicised in their institution's website) and to other individuals from these institutions which were thought to be able to forward invitations to potential participants in their department or institution (e.g., leadership from academic departments, student representatives at department or institution levels). Lists of the above contacts were built with around three hundreds email addresses of contacts from of all the 19 Scottish universities. Email invitations were sent to these potential participants and contacts which may have forwarded the invitation to their internal networks. Following ethical research needs and regulations, email invitations included an attachment with information about the study for participants which introduced the purpose and characteristic of the research activities, including details about participation being anonymous and the right for participants to withdraw their participation and data at any time. After little responses were received in the first week, weekly follow-up emails were also sent for three additional weeks. Snowballing was also used to gain additional participants. Additionally, data from a number of focus groups with academics from one university was also used. These focus groups were organised as part of an internal research grant from the University of Edinburgh which intersected with some topics of interest (participants of this focus groups were consented to the use of focus groups discussions for this study).

Participants' details

Invitations by email allowed me to reach a few dozen interested individuals, which ended up with 28 participants for one-to-one interviews. A total of 18 participants took part in focus groups (a few of them also participated in the interviews). Overall, participants of the interviews were members of five (near a quarter of the 19) different Scottish universities (again, participants from the focus groups were only from one university). Of the 28 participants in the interviews 13 were academics while 15 were student reps. Four of the academics were programme leaders (e.g., (co)directors) whilst nine had teaching director roles at subject or department levels. Preliminary exploration suggested that the latter oversaw student-staff collaboration for quality

enhancement of programmes withing their subject and department levels, and therefore, that these individuals should be well informed about ground level coevaluation and enhancement of the student experience and could provide useful insights to understand related context and data needs of student-staff partnerships. For the case of student representatives who took part in the interviews, eleven represented students at programme level (e.g., class rep, programme rep) while four represented the student body at department level. It is important to note that, while there are multiple areas of student representation in Scottish universities (e.g., disabled students, international students, LGTBQ+, sports, activities, societies), participants of this study had formal, voluntary student representation roles related to educational matters (i.e., teaching and learning at programme or department levels). For both academic and student representatives, a diversity of disciplines and academic departments was sought in order to explore the perspectives of participants from heterogeneous academic backgrounds. Focusing on reduced disciplines and academic departments may be considered desirable in order to gain more detailed insights of specific educational practices and perspectives with may have unique patterns. However, recognising that different academic subjects may have distinct characteristics, the purpose of studying practices and perspectives of heterogenous contexts can help to appraise potential patterns of common and differing experiences, as well as covering the scenario of a hypothetical centralised institutional tool aimed to be used across academic departments –and the wider potential impacts, risks and challenges. In all, participants came from departments and subjects such as history, engineering, veterinary medicine, foreign languages, geography, mathematics, physics, accounting, economics, business, social policy, computer science, religious studies, architecture, medicine, art and design. In synthesis, whilst the sample was a very small one and the selection was not randomised nor controlled, participants came from very varied backgrounds and provided a rich array of perspectives to learn about the context and needs of student-staff improvement of the student experience in Scottish higher education programmes.

4.2.1.3 Data collection and analysis

Preliminary exploration

It is important to note that, at its beginning, the specific target users for the prototype app had not been selected. It was by way of preliminary exploration that I delved into thinking of student-staff partnerships becoming the context to evaluate the potential impacts of using student experience analytics apps. In the first year of my PhD, as usual, I was reading and reframing the initial and broad research proposal of exploring student experience analytics and finding the scope and focus of the project. After some months, perhaps influenced by a desire to unleash myself into hands-on, people-centred investigation, I planned to do some preliminary exploration to probe orientations which may emerge from contact with individuals which evaluated the student experience at a ground level and participated in related design decision-making. The kind of ideas and plans you can make after taking courses in qualitative research. By serendipitous coincidence alone, I realised that student representatives –who I knew normally participated in student-staff meetings and liaison committees in Scottish and British universities- could be a very valuable source to start getting information about the institutional labyrinths and processes related to the improvement of the student experience.

I recruited participants via online channels and snowballing, managing to conduct three face-to-face interviews and one email correspondence with online distant student. This preliminary exploration helped to introduce me and learn in much greater detail about student-staff

collaboration to improve the student experience at programme level. I realised that, while academics are at end professionally responsible of teaching decisions, programme-level student-staff meetings and collaboration constitute a critical space of dialogue where academics' understanding and decisions about the student experience can be enriched by the student body. Accordingly, I thought that the best place to evaluate a student experience analytics app prototype would be student-staff partnerships at programme and department level, and subsequently, that the target users would be academics with teaching roles and student representatives at these levels. The main findings of this preliminary exploration were recently published, and more details can be accessed there (Rates and Gašević, 2022). In synthesis, thanks to preliminary exploration activities I was able to start my introduction to the context and data needs of partnerships in a Scottish university, from where I was able to identify academics and student representatives at programme and department levels as strategic target users of the prototype and for the design ethnography.

Interviews

As introduced, to collect data and insights about the contexts, needs and problems in ground-level student-staff partnerships. Figure 12 illustrates the implementation of interviews. I conducted 28 interviews. Interviews were one-to-one, semi-structured and had a duration between 30 to 60 minutes (most of them around half an hour long). Most interviews were held via recorded phone call, but some face-to-face interviews were also carried out. To experiment with the modality, one interview was done via a texting app. Interviews were guided by a list of questions but were also open to focus on emergent topics. Before starting the interview, participants read a document with details about the interview and study and confirmed their consent to participate. The list of questions covered two main areas: the roles of participants in and context about student-staff partnerships, and the topics of student-staff discussions and key information used in them.

I took notes and recorded the audio of conversations. Recordings were listened to after the interviews. Due to the limited time and resources and the agile approach, interviews were not transcribed or content-analysed in detail. Insights were analysed via notes of my own reflections from the interviews and when listening to them. Inductive analysis and iteration helped me organise the messy insights obtained about the participants and partnership activities and problems. Insights from interviews were also enriched by the analysis of focus groups. Specifically, the analysis identified the common roles and activities of academics and student representatives as well as the key data used by them to evaluate and make decisions to improve the student experience in their related contexts. These insights allowed to inform the design of the first prototype to begin the next prototyping phase. A summary of the analysis from the design ethnography is presented in the results chapter.

Focus groups

As mentioned, data from focus groups with academics was also used to complement the analysis of interviews. These focus groups were organised as part of an internal research project founded by the University of Edinburgh in which my supervisor, another researcher and myself took part. Four focus groups were held with (18) academics from 13 different academic departments. Focus groups had a duration of one hour and followed a list of questions about participants' activities in curriculum improvement and the key data used in this work. Discussions from focus groups were audio recorded, transcribed and analysed using thematic

analysis. A list of themes was used to build a template coding scheme to support the thematic analysis. The initial themes included activities, stakeholders, data used, concerns, challenges, to name a few. As earlier indicated, some findings from focus groups complemented the insights from interviews.

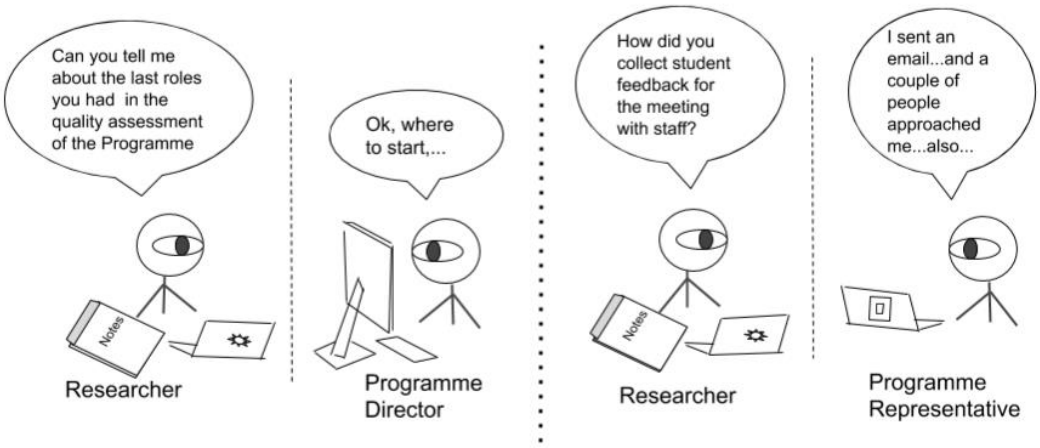


Figure 12. Design ethnography's remote interviews

4.2.1.4 Researcher reflexivity

Contemporary ethnographic research acknowledges the roles that the views of researchers bring to the analysis. Accordingly, it is normal to include the researcher's reflection and disclosure about their "ideas and experiences which can be used by readers to judge the possible impact of these influences on a study" (Reeves et al., 2013, p.7). In the words of Lichterman (2015): "Ideally, reflexivity invites a dialogue with readers about the worth of our interpretations and explanations" (p.35). Recognising the importance for readers of disclosing the personal ideas and experiences which might influence my interpretation, I proceed to do so. Firstly, there are many personal experiences and ideas that I consider influential for the selection and development of this project. Perhaps too many to describe them in detail. I have then organised and summarised them in Appendix G in order to provide a brief but comprehensive reference for readers. My suggestion is to, if interested, read this disclosure after finishing the dissertation. In this way, this shared reflexivity can be used to reexamine the claims suggested instead of creating biases for the creation of their first impression.

4.2.1.5 Limitations of the (rapid) design ethnography

As with any research methodology, it is essential to consider its associated limitations. Firstly, both the small sample size and non-probabilistic selection of participants implies that the data collected from interviews and focus groups cannot be considered a reliable and accurate description of the views, perspectives and ideas of academics and student representatives from Scottish universities. Thus, the insights obtained from the design ethnography cannot be claimed as representative of Scottish higher education. Furthermore, as participants voluntarily participated in this study, a self-selection bias may imply that participants had more positive inclinations towards the use of digital and data apps in education compared to broader academic and student reps' populations. A second important limitation to note is the interpretative nature of qualitative and ethnographic analysis. My personal experience and

perspectives were a direct influence on the analysis of participants' discussions. This implies that the analysis and hence findings of the initial design ethnography (and later methods too) are subject dependent and influenced by biases and blind points. Accordingly, this limitation means that the findings of this study do not offer truth or a reality that is independent of observers and thus universal. A third significant limitation is the lack of use of observation methods to support ethnographic analysis. Observation of the field is widely discussed as an essential and irreplaceable aspect of ethnographic research. Due to fears of impacting student-staff meetings with the presence of a researcher, I did not persist in the idea of obtaining 'physical access to the field'. This is almost a sacrilege for ethnographic research, because physical presence in the field is almost a ritual for this type of inquiry. This limitation was mitigated by using one-to-one, confidential interviews to ask multiple participants to discuss student-staff meetings. Observation of a hybrid meeting that I was invited took place. In all, ethnographic research also includes cases in which participants cannot be physically contacted. Design ethnography uses ethnographic research but is not really focused on social or anthropological understanding of participants, nor the observation and detailed description of the field of study, or ritualistic traditions of social researchers. Finally, no cue suggested that relevant aspects needed to be observed in first person (e.g., participants' descriptions seemed reliable and open, at least to the extent of things that I could have witnessed in a student-staff meeting).

A fourth important limitation to recognise is related to the rapid and agile nature of the adapted design ethnography. Two main implications can be discussed. Firstly, the limited time to collect and analyse data (in order to produce quick inputs for the next phases) implied that the analysis was implemented almost on-the-go. This kind of analysis, and thus, findings, is way below the standard for ethnographic research and even for design ethnography. Secondly, the limited time also meant the lack of systematic or exhaustive documentation. Nevertheless, the relevance of this limitation is mitigated by considering that the design ethnography was only meant to become the initial input for a prototyping and later evaluation phase. In this sense, the findings of the design ethnography were only to provide some initial insights for me as a design researcher because subsequent research activities would help to further inform, analyse and validate the initial insights obtained. Finally, limitations linked to the wider exploratory nature of this study are also relevant for the design ethnography (and later methods). As already reiterated multiple times, exploratory research represents an immersion in areas with little previous research. By definition, that implies exploratory research is poorly informed and, even if it is based on contingency planning, it must be open and relies on iterative improvisation through research process. Accordingly, the analysis of design ethnographies suffered from these problems and, as part of exploratory research, its insights could only be used to inform more research.

4.2.2 Prototyping phase: rapid prototyping

After carrying a discovery phase and learning about the context and data needs of the academics and student representatives for their collaboration to improve the student experience, the gained insights were used as main input to begin the prototyping phase. Considering the agile, human-centred approach adopted earlier described, the prototyping phase was based on the iteration of an analytics app prototype that used a rapid prototyping methodology. The prototyping phase can be argued as representing the first half (develop) of the second diamond (design) in figure X. The last part of the illustrated double diamond process

(deliver) cannot be described as being implemented in this research, experimental project because the aim of this project was to investigate with a high-fidelity prototype and not delivering working software for specific or general higher education institutions.

On the other hand, what may be more accurate to say is that an iterated, high-fidelity (interactive) prototype was delivered and the end of the design stage for its use in the contextual interview –where it was presented as an advanced conceptual prototype of a tool which could be hypothetically used in the context of participants.

4.2.2.1 Rapid prototyping

In order to design a tailored prototypical analytics app to evaluate the potential impacts of the use of such educational technologies in student-staff co-evaluation and enhancement of the student experience in Scottish universities, this study used a rapid prototyping methodology. Rapid prototyping is a term (Campbell et al., 2012, p.255) initially coined in the 1980s to define –back then- novel design methodologies and related technologies focused on progressive, iterative creation and testing of prototypes of products for the manufacturing industry (today, some refer to this field as *rapid manufacturing*). These methods and technologies changed previously slow, assumptions-ridden design processes of the time by focusing on creating the quick, iterative, progressive development of simple and very cheap prototypes to test and validate the existing design hypotheses before mass production. To explore how users could use a system before building a full-fledged system is the essential purpose of rapid prototyping: "[s]ometimes users are not sure they want certain functions implemented until they can actually try them, or they may not know they need certain features *until actual use exposes an omission or inconvenience*." (Gordon and Bieman, 1995, my emphasis). Although user research can provide an important understanding of users and their needs, iterative creation and user-testing of quickly made prototypes allows designers (researchers) to obtain relevant data to validate (design) hypothesis embodied in the prototype's design. Additionally, it also allows to identify novel insights from the exposure of users to the prototype which inform new design hypotheses which may have not been identified without the creation of the prototype and the tests with users. By being an iterative process of creating prototypes and testing them with users, design hypotheses and prototypes become more fine-tuned.

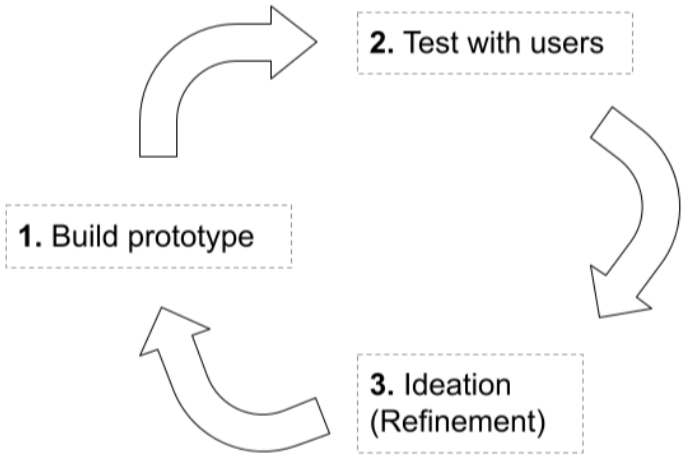


Figure 13. Rapid prototyping process.

Figure 13 illustrates the main steps of the rapid prototyping process. Figure 14 shows an illustrative example which provides a practical reference of the rapid prototyping methodology in manufacturing and service design. In its beginnings, rapid prototyping was associated use to the of specialised software, machines and materials that allowed automated creation of prototypes of products or physical parts:" RAPID PROTOTYPING (RP)—also known as solid freeform fabrication, automated fabrication, layered manufacturing, and so forth— consists of a range of technologies that are capable of taking computer-aided design (CAD) models and converting them to a physical form or part. This process is automatic, generally independent of the model geometry, and does not require special tooling or fixtures." (Bourell et al., 2001, p.383). In the last 25 years, rapid prototyping has become a generic design research methodology which has been used in multiple industries and fields, including medicine, education and digital apps design.

In medicine, in recent years rapid prototyping technologies and design methods have been described as triggering a new era of medical practice in several areas including surgery, prosthetics and anatomical modelling. For instance, McGurk et al. (1997) discussed --a quarter of a century ago- that rapid prototyping was used to design and produce tailored maxillary implants (acrylic plate cemented to the teeth to treat the genetic progressive deformity in the mandible of a girl aged nine: "[t]he design and accurate placement of the [implant] device within the limited space available would not have been possible without a preformed model. Further, [by manipulating the initial prototypes] the team gained immediate insight into the relative movements of the mandibular fragments needed to optimise the occlusion; this had not been apparent from the images available and was a major factor in the design of the procedure." (p.172). Nowadays, the most advanced prothesis for medical treatments are made using rapid prototyping methods and machines (see Torabi et al, 2015).

Figure 14. Rapid prototyping in product and service design. Note: Top) Series of prototypes of wristwatches. Source: Image with Public Domain Creative Commons (CC) License. Centre) Lego prototype of co-workspace service for role play. Source: CC, https://sidlaurea.com/2013/10/20/work-and-play-a-possible-combination/ . Bottom) Real-size low fidelity prototype of customer service for role play. Source: CC, https://medium.com/@jonbarnett/what-makes-service-prototyping-unique-8fa7d0af5149.

In the case of digital products and services, rapid prototyping methodologies have also been long and increasingly implemented (e.g., Gordon and Bieman, 1994). Rapid prototyping has been discussed as a fundamental design process for Google apps and wearables. I completed

a rapid prototyping (practical) online course co-produced by engineers and designers from Google a few years ago (there are many professional videos about rapid prototyping which can be found in platforms such as *Youtube*). Tom Chi, former chief of the innovation branch of the company (Google X), proposed some of Google's rapid prototyping principles in a TEDTalk (Chi, 2012). The first principle for rapid prototyping - 'Find the quickest path to the experience'- is linked to its essential idea of putting designer's thinking and hypotheses to test via experience as early as possible: "[t]hinking about a particular experience doesn't get you very far in the process of building it right. Because you're only working with assumptions and probabilities." (ibid). This is associated with the second principle proposed by Chi - 'Doing is the best kind of thinking'. Chi argues that, while researching and analysing the needs of users and best design options is necessary, it also has evident limitations which design action can help overcome: "Instead of forever debating on the experience, start building a very simple prototype. By building and exposing it to potential users, you will gain significantly more profound insights. Because action leads to insight more often than insight leads to action." (ibid). The last principle offered by Chi --'Use simple materials'- highlights that rapid prototyping is linked with creating simplified prototypes which can be created and tested quickly and with minimum, sometimes marginal costs. This allows designers to spend more time testing and learning about the prototype, rather than taking plenty of time building complicated models which then are difficult to discard. Thus, simplicity and *low fidelity* are also central aspects of this methodology. In the example of the Google Glass, basic elements were used to build the device and create augmented reality projections for testing: "The headpiece was made out of paper, modeling wire, and clay that had the same weight as the electronic pieces that would be used in the final product. […] the prototype of the Google Glass headset only took 1 day, whereas the prototypes of the projections for the device were ready in 45 minutes." (ibid).

In the case of education, rapid prototyping has also been discussed in relation to educational design methodologies (e.g., Tripp & Bichelmeyer, 1990; Mei et al., 2021) and it is possible to think that it might not take long for this design research method to become an established curricular and course design within higher institutions. Overall, these references can be argued as situating rapid prototyping as a generic contemporary design research method which is used in a multitude of areas, and which creates revolutionary possibilities for the creation of physical, digital artefacts and hybrids which can themselves have important implications. For the case of this dissertation, a rapid prototyping process based on the initial insgihts obtained by the (rapid) design ethnography was used to create and iterate a SXA app aimed at assisting academics and student reps from Scottish universities in the evaluation and enhancement of the learning experience of their higher education programmes. Details of the participants, design and testing of the SXA prototype –called Hypatia- are presented next.

4.2.2.2 Participants of prototype testing

Recruitment

In order to test and iterate prototypes with potential users (i.e., academics and student representatives), I followed the strategy and channels (emails, snowballing) from the design ethnography to recruit research participants. It is important to note that student representation roles normally have a one-year duration, new reps have started in their roles when the prototyping phase started (October 2020). Some participants from the initial interviews also took part in tests.

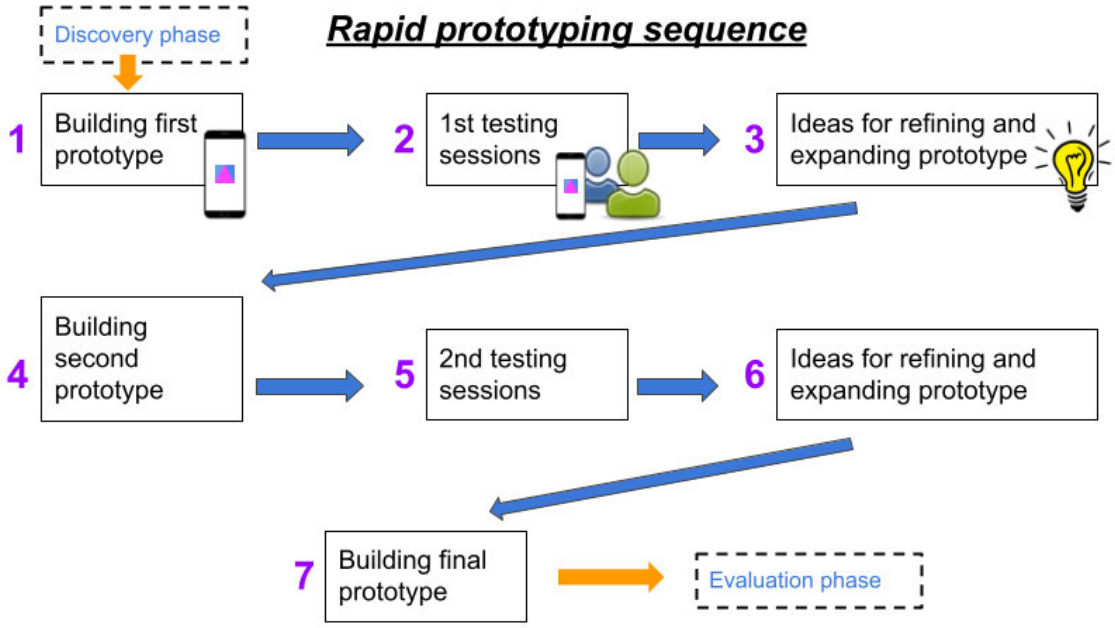
Participants' details

The prototype was tested and iterated in two sets of testing sessions, which required recruiting participants for each time. The first was in October 2020 and involved eleven (11) participants, of which four were academics and seven student representatives. Two academics were programme directors and two directors of teaching and quality at department level. Two participants were programme-level student representatives and five were department level (who oversaw programme-level student representation in their department). After iteration of the prototype, a second batch of testing started in March 2021. These testing sessions (of the iterated prototype) involved ten (10) participants fro five different universities: three academics and seven student representatives. One academic was a programme director and two were teaching directors at department level. Two student representatives had roles at programme-level, whilst five at department level. One participant of the first testing sessions also participated in this second sessions. Overall, 21 tests with 20 users were conducted.

4.2.2.3 Design and data collection and analysis activities

Following my learning about the needs and contexts of academics and student reps from the quick discovery phase, the prototyping phase started with the design of the first prototype. The rapid prototyping conducted involved two iterations based on the analysis of tests with the participants above discussed. Figure 15 illustrates the two-iterations rapid prototyping sequence employed in this study.

Figure 15. Rapid prototyping sequence used



The design of the first prototype was made using paper sketches first and then creating interactive mockups produced with an open-source prototyping tool. The testing sessions (starting in October 2020) evaluated this first prototype. The feedback and insights obtained from these initial testing sessions helped me to think about improvements that were implemented in the first iteration of the prototype. This iterated prototype was then tested in the second testing sessions (March 2021) with another batch of participants. The findings from

these testing sessions informed a final iteration of the prototype with the version that was used in the contextual interviews of the evaluation phase. Details of these activities will be discussed next.

Design of the prototype(s)

Following the design ethnography and my initial understanding of the collaborative evaluation and enhancement of the student experience by academics and student representatives at ground levels, I reflected on what should an analytics app attempt to do for its intended users. After giving it good days of thought, my general interpretation was that academics and student reps needed to have quick access to multiple datasets for their discussions and co-analyses to save significant time to retrieve key information, face fewer limitations due to lack of evidence, and therefore, to be as constructive as possible. The broadly different types of data that preliminary exploration suggested as relevant for students and staff were further emphasised in the interviews and focus groups. These ideas lead me to start by focusing about the wider architecture of the prototype analytics app, in terms of facilitating easy access to many categories of information –what is known in the industry as information architecture, IA. The diagnostic mentioned made me think that the analytics app prototype should be designed to help academics and student reps to access and process relevant data as quickly as possible. I understood access speed as paramount due to partnerships being an additional task for academics and students who also had other bigger commitments with high time-demand (such as studying, teaching and researching, etc.). The case of academics was perceived as most acute: conversations with participants in the discovery phase, time and time again, highlighted that academics were overstretched in their diaries and their time shortage was severe. This posed a critical design problem in terms of the need of any new system to reduce the time of its tasks to a minimum: I was told too many times that if it is hard and slow to get and process the data wanted, academics may simply not be able to use because they do not have time. In the light of this analysis and prioritisation, emerging orientations helped to construe a main initial design hypothesis for the prototype: the app should aim to offer quick access and analysis of relevant data for users in their co-evaluation and enhancement of the student experience. Consequently, I thought that the app should enable academics and student reps to search and analyse these data.

After construing this first design hypothesis, I started doing paper sketches of the prototype main sections (i.e., navigation menus). Several quick sketches were made by iterating the sketched ideas. Doing this, I applied a minimalistic approach in the sense of seeking simplicity ahead of overwhelming exhaustivity (e.g., lots of types of data needed to be organised into not too numerous branched categories). After realising that a basic design pattern for the main menu of the prototype seemed promising following several iterations, and that the secondary menus (sections) also seemed effective, I proceeded to creating an interactive prototype. These interactive prototypes were created with the open-source prototyping tool ‘Pencil’. While there are multiple tools that can be used to build prototypes, in order to conduct research without proprietary barriers I chose an open-source alternative which enables anyone to repeat a similar design research process. However, on the hand, due to their similarities between them, the prototyping tool used is relatively trivial in technical terms. Regarding the building of the prototypes, like many other alternatives, Pencil allows to drag and drop elements of an app interface (e.g., buttons, frames, icons, text fields, forms) in order to create a mockup user interface. Mockups can be created for each section and subsection of the prototype’s interface

and elements of these interfaces can be activated as clickable objects that take users to the intended sections or subsections of the app, thus creating a clickable interactive prototype. These clickable prototypes can be exported and shared as a web page (HTML) or as a document (PDF). This was important as it allowed me to share PDF clickable prototypes with participants so they could interact and test them (remotely).

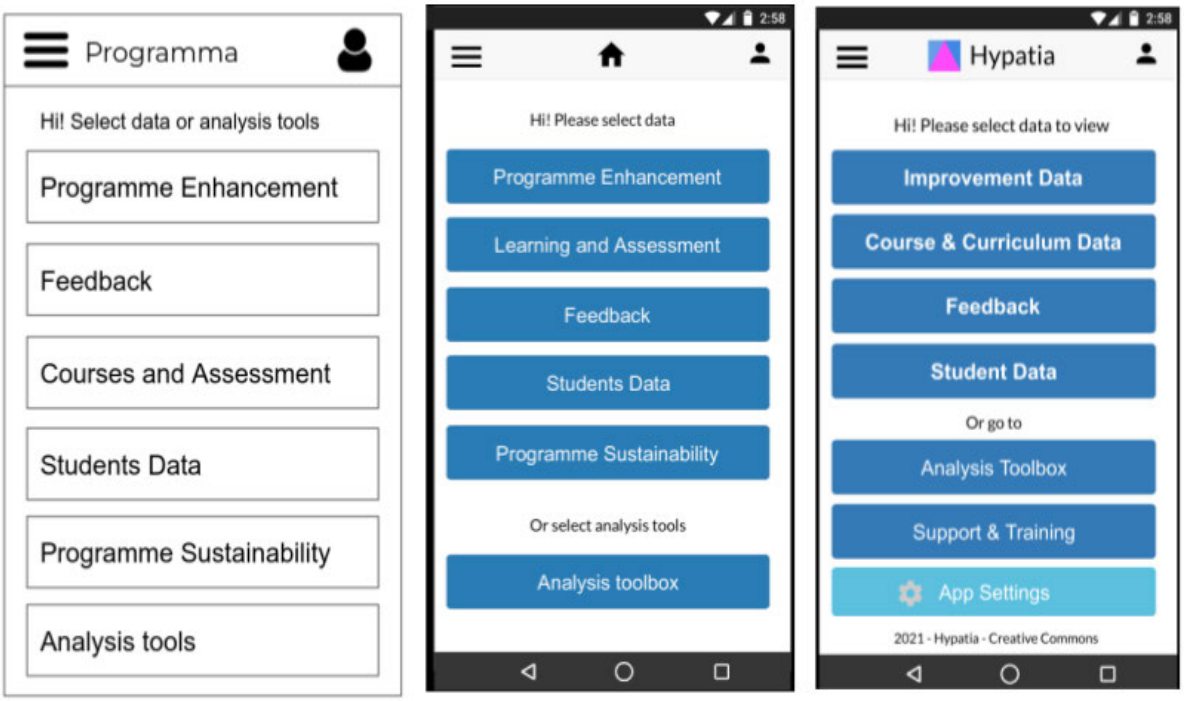


Figure 16. Different versions of the prototype SXA app. Note: Left: Initial low-fidelity prototype of main menu. Centre: Prototype used in first testing session. Right: Final prototype used in contextual interviews.

Images of different prototypes are presented in Figure 16. It included a number of sections and related subsections, but some areas were not fully defined in order to let tests and user feedback provide further, emergent orientations. The first prototype was built iteratively by my own periodic inspection and reflection suggesting refinements and ideas for expansion. The two main systems of the first prototype were dedicated to providing access to raw data and predefined data-analyses related to the student experience, and to a data analysis engine that could be used by users to produce additional analysis of the available data, respectively. This central concept, as said, represented the main initial design hypothesis to validate in the first tests with users. This general design pattern seemed to be valuable, effective and efficient following tests with participants, so it appeared to validate the initial design hypothesis and was maintained and refined in later prototypes. From these and other insights from testing sessions, the first prototype was iterated by remodeling and expanding some existing sections of the app mockup. This enabled us to create a more comprehensive and detailed prototype which was used to test more scoped and specific tasks and related design hypotheses. In particular, some aspects of the design seemed to raise conflicting opinions. For instance, access to quantitative ratings of programme's courses or modules was highlighted as potentially very useful but also problematic and risky. Considering this was a research prototype, I maintained or further defined some of these design patterns in the second version of the prototype in order to gauge

additional insights from the next testing sessions (note: if I were designing a solution to be implemented in practice, I may have reasonably avoided design patterns which appear that they could be problematic). After the insights obtained from the second testing sessions, the prototype was iterated a second and last time in order to produce a final version that could be used in the contextual interviews of the evaluation phase. The clickable PDF prototype used in the contextual interviews can be accessed in the following link: https://bit.ly/SXAclickablePrototype. A (fictional) demo video used to introduce the app prototype to participants can be viewed in the following link: https://bit.ly/SXAdemo. Next is discussed an overview of the prototype app designed followed by a synthesis ofthe prototype testing sessions. Both links can also be found in Appendix D.

In summary, as described in the demo video, the main features of the prototype app are three: a) to integrate and give quick access to relevant data about the student experience and its enhancement (data about students, programme'slearning and assessment activities and content, feedback from different stakeholders, and, evaluation and improvement activities and results), b) to allow users to apply basic, advanced and custom data analysis techniques to the integrated data about the student experience and improvement activities and impact, and, c) to support users to use, manage and customise both application's functionalities and governance. These main features can be accessed from the main menu (see figure 16, right image). In all, these design features were believed to (main design hypotheses) to give useful access to raw and processed evidence which could strengthen the collaborative evaluation and improvement of the student experience developed in partnership by academics and student representatives. These main prototype features were early devised from the early analysis of the user requirements identified in the discovery phase. Instead of being substantially modified or rendered unnecessary from the insights in the prototype testing sessions with potential users, learning from these instances lead to the further prioritisation, strengthening and refining these central design features. If possible, I encourage readers to explore the details of these main features by playing with the clickable PDF prototype.

Prototype testing

Testing prototypes is a crucial part of rapid prototyping. In particular, testing prototypes with users is the fundamental way in which agile, human-centred design and the rapid prototyping methodology put design hypotheses to naturalistic test and, therefore, can lead to creating more informed and effective artefacts. In the case of this study, as already mentioned, two testing sessions were implemented to test and iterate different versions of the prototype. Testing started with the creation of the relevant prototype's versions and the recruitment of participants (potential users, i.e., academics and student representatives). After contacting interested individuals, tests were done remotely via online video calls. Interested individuals received information about the research activity which detailed the purpose and characteristics of the prototype testing sessions. At the beginning of the video call with a participant I would summarise what the activity involved and ask participants to confirm their informed consent to participate. After this, I emailed the clickable PDF prototype to be tested to the participant and asked them to view the file in their screen and to share their screen in the video call, so I could see and record the participant's interaction with the prototype in their screen. When this was achieved, I started recording the video call.

Tests followed a structure of questions and tasks that participants should try to achieve with the prototype. Due to the challenges in getting participants, tests only had a duration of 20-30 minutes (it was difficult to get more time from potential participants, particularly from academics). The tests started with a couple of brief questions about the roles of participants in student-staff partnerships and quality enhancement. This helped to tailor (within the testing session) some of the tasks, instructions and questions in relation to the specific role and experience of participants. Then, tests involved asking participants to try to complete a few tasks with the prototype to examine if the prototype's features were valuable and easy to use. For example, for a programme director I could have asked them to imagine the hypothetical scenario that tomorrow they have a student-staff meeting to discuss about the student experience in the programme and then asked them to try to find information about a problem that they heard about the last assessment in the course/module X. Participants then started to explore and click-through the prototype while think-aloud and express their thoughts and doubts about what they were seeing. I took notes of the navigation routes being followed, the success of and time taken by participants in finding the desired information, and the opinions and ideas voiced by them. I asked questions when I saw some interactions or comments of interest (such as hesitation of how to proceed to the information sought) and at the end of completing (or not) a tested task. This combination of observation, think-aloud, asking questions and engaging in dialogue helped me to understand the extent to which the prototype's features appeared to be meaningful, easy to use, or potentially challenging or problematic for academics and student representatives.

4.2.2.4 Limitations of rapid prototyping and testing sessions

Again, a number of limitations must also be recognised for the rapid prototyping and prototyping testing sessions. Firstly, limitations discussed for the design ethnography influenced this second research phase. Secondly, like in the case of design ethnography (and the final contextual interviews of the evaluation phase), the small sample size and self-selection of participants implies that the insights obtained from the testing sessions with participants cannot be claimed to represent reliable and accurate descriptions of the views or perspectives of academic and student reps from Scottish universities. Thirdly, difficulty in recruiting participants meant that prototype testing sessions were kept as short as possible in order to incentivise more individuals to take part in the study. This translated in having only 20-25 minutes to for each test session. This time was not enough to test all the functionalities in each testing session, thus, with all participants. Additionally, the scarce time also meant that the extension of conversations with participants was limited and did not allow exhaustive and profound dialogues about all the topics addressed. Fourthly, the general time shortage and the need to iterate a few times implied that the analysis of testing sessions was done on-the-go with limited time for reflection and documentation. This limitation was mitigated by the iterative nature of the process and by considering that the output of rapid prototyping was still to be examined by participants in the evaluation phase. Overall, this was a very limited rapid prototyping process which only produced the minimum input for contextual interviews. The resulting prototype cannot be considered a reliable product or a promising early version of a future application.

4.2.3 Evaluation phase: contextual interviews, theoretical and critical analysis

4.2.3.1 Contextual interviews

How to capture thoughts about the potential impacts of the SXA prototype? After the prototyping phase where the app prototype was refined through user testing and iteration, a final version was evaluated using contextual interviews with senior academics and student representatives from a number of Scottish universities. The objective of the contextual interviews was to identify the thoughts of academics and student representatives about the potential benefits, concerns and challenges related to the hypothetical use of the prototype app in their higher education institution and context. Contextual interviews (or inquiry, research) are a method to evaluate the use of a system within its context of use. Duda et al., (2020) notes that contextual research was pioneered by Holtzblatt and Beyer and points to observation and dialogue with users while they use a system (or a prototype of it) to conduct task related to a specific professional or personal activity: “[c]ontextual research is a combination of observation and conversation with the user while the user is performing tasks at work or at home.” (p.33). As Duda et al., (ibid) mention, the traditional contextual interview is a semi-structured, one-to-one interview of 90 to 120 minutes long where the researcher sees the user acting with a prototype or existing system and, through conversation, attempts to gain insights about an in-situ situation and experience which may not be revealed by non-contextual experimentation. Holtzblatt and Jones (1995) sustain that contextual interview enable a collaboration of researchers and potential users to articulate an understanding of a porotype, its practical context and the experiences and perspectives of users which inputs design conceptualisation: “[contextual interview] is a technique for working with users to help them articulate their current work practices, system practices, and associated experiences. The technique contributes to initial design concepts by providing an understanding of the nature of user's work through inquiry with users.” (p.241).

This method is traditionally highlighted by its authors as valuable to discover the initial requirements of a system but can also be used to evaluate the potential impacts of an early or advanced prototype, such as in the adaptation of the method for this study. The traditional use also involves the participation of design and development teams (see Duda et al., 2020), yet, due to the characteristics of this PhD research project, only I participated in data collection and interpretation. Holtzblatt and Jones (1995) discuss that instead of specific procedures, contextual inquiry followed three main concepts: focus, context, and partnership. Focus related to a scoping contextual inquiry within an area of specific interest: “[r]ather than entering with a list of questions, we enter with a few areas of concern (the focus) which we share with users.” (p.244). Holtzblatt and Jones also note the focus on observing and dialoguing about the context of use of the prototype enables the designer to make distinctions about how the system design could be experience in practice: “Contextual inquiry focuses people on their work and tool experience in the context of actual, ongoing work […] Being present while the person works with the tool or with others allows the designer to witness the person's work and system experience while it occurs.” (ibid). Of crucial relevance, Holtzblatt and Jones (ibid) add that, in consequence, contextual interviews with low-fidelity prototypes can help users to think about the impacts of a system in their context: “Through the use of *paper prototyping* in actual *work contexts* users can imagine *effects* of a *potential system design* in *their work*.” (p.244 my emphasis). Although contextual interview is more frequently recommended for implementation in the first stages of a discovery phase when legacy systems are analysed to identify opportunities for a new tool, contextual inquiry is used in this study with a focus on gathering the thoughts of academics and student reps about the potential, hypothetical effects of the data analytics app prototype in their contexts of student-staff collaborations for student experience and quality enhancement. Moreover, due to limitations for witnessing student-staff related to the

intervention of the presence of a researcher in these internal, sensitive and political academic spaces or privacy issues related to accessing personal and academic data from the systems of participants' institutions (same limitations that affected the discovery and prototyping phases), the focus of this contextual interviews was to speak in private with participants simulating their hypothetical preparation for and participation at these meetings using the prototype.

After focus, context (of use) is the second concept for Holtzblatt and Jones (ibid) which orientates this method towards understanding the relationships between the user, the artefact, and their personal or professional activities environment: "[t]he definition of a system that supports and positively transforms users' work [(or life)] is derived from an understanding of users' work [(or life)]. Understanding users' work is, therefore, critical to system design." (p.241). Thus, the context-situated evaluation of the app prototype can be argued as providing more valuable evidence about the potential benefits, concerns of, and challenges for, using analytics systems to enhance the student experience in higher education –a major belief underpinning the exploratory, agile, human-centred design research approach adopted in this project. Lastly, the third guiding concept of contextual inquiry, as Holtzblatt and Jones (ibid) argue, is designer-researcher *partnership (s*poiler alert: attentive readers will likely give some thought about the use of the term partnership in student-staff relationships and their connection to the following ideas). Holtzblatt and Jones (ibid) highlight that, to create effective systems, it is required understand users' experiences and, thus, to engage in dialogue and establishing partnerships with them: "[t]o design effective systems, we need to understand users' experience of work and systems. This information is invisible: we [(researchers)] cannot access it by standing on the outside of the process, watching people's behaviour and writing down what happens. We need to talk with users to understand their experience. To have effective dialogue, we form partnerships with our users" (p.243).

Partnerships, Holtzblatt and Jones (ibid) proposed, are related to coming together to construe a shared sense: "[together designers and users create a shared understanding of work practice that reveals technological opportunities and problems that occur in work processes and in system use" (ibid). Furthermore, in line with user and human-centred design perspectives, Holtzblatt and Jones (ibid) acknowledge that 'the user is the expert': "[w]e recognize that in the area of personal experience and work, users are the experts. As such, users must act as informants in their relationship with designers. Designers do not know the users' experience; users must speak their experience" (ibid). The authors suggest that taking this epistemological position –of accepting users as legitimate sources- liberates design researchers from the expectation that they should already know, unleashing them engage in investigation. Additionally, this also should protect design researchers from misinterpretations caused by making reference to their own experience and interpretations to interpret users' behaviours and opinions: "[t]hrough dialogue we let users to shape our assumptions and the meaning that we derive from a situation" (ibid, p.244). Overall, in relation to this study, the concept of partnerships is taken as establishing a profound philosophical shift from traditional research in which the researcher normally stands as the expert and therefore legitimate authority. Specifically, it determines that this study seeks to evaluate the potential benefits, problems and challenges of using analytics to improve the student experience from the legitimate perspective of academics and student representatives. While perspectives of other stakeholders may exist and be a matter of investigation (e.g., educational experts, sociologists, economists, institution managers, policy makers, employers, students' family, professional bodies), the partnership approach followed establishes that it is practitioners' perspectives which must lead the

discussion about the effects of using data analytics to support the improvement of the student experience in higher education. Such is the assumption and intention of this project and the findings obtained shall be reviewed accordingly.

Participants of final contextual interview

Recruitment

Like in the discovery and prototyping phase, recruitment of participants used the same agile strategy and channels (email invitations, snowballing). On this occasion I aimed at getting over 20 participants. Additionally, with contextual interviews being expected to produce the data to evaluate potential impacts of using the prototype app, I sought to recruit participants with as much experience in partnerships as possible so they could contrast the prototype against the most informed perspectives. Senior leadership individuals (both for academics and student reps) had shown themselves to be a rich source of insights about in the discovery and prototyping phase. As these individuals liaise and oversee the work of multiple programmes and departments, they seemed to have gained knowledge of diverse experiences about student-staff evaluation of the student experience. Following this learning obtained through the research process, I focused on recruiting academics with roles of teaching and quality directors at department level. These academics tended to oversaw teaching and quality improvement process in academic departments, and therefore, had close contact and knowledge related to practices in the programmes in their particular contexts. In the case of students, I focused on institution-wide representatives with focus on education and learning experience –the most common title in Scotland for these representatives being 'vice-president (VP) of education'. These representatives were in most cases part of the executive board (officers) of the university's student union. This was then a full-time, one-year long and paid position focused on overseeing the student representation system and liaising with representatives from the departments across the institution. Additionally, these representatives tended to have high-level discussions about student representation with senior, institution-wide leadership, which expanded their understanding of policy and administrative issues, among other important aspects that ground-level representatives may not be as much exposed to. Accordingly, institution-wide student reps (VPs of education or similar) were believed to offer detailed understanding of ground level participation of student reps in partnerships plus extra exposure to institutional workings and standings.

Participants' details

A total of 24 participants took part in the final contextual interviews: 16 academics and eight student representatives. Participants came from nine Scottish universities (almost half of the 19). Two academics were programme directors and 14 were directors of teaching or quality at department level. Four students had institution-wide representation roles, three had department-level representation roles and one at programme level. Four of the student representatives had participated in previous phases. Seven of the academics had taken part in earlier research activities. Participants came from different academic backgrounds and disciplines. In the case of academic leaders, participants were affiliated to disciplines and departments of education, engineering, sociology and social policy, biomedical sciences, history and humanities, business and accounting, and veterinary medicine. Therefore, while small, participants represented a diverse and heterogeneous sample which could be argued as roughly resembling many of the different areas of a contemporary university in terms of academic and educational traditions.

Data collection

After recruiting a participant, an online video call was scheduled to conduct the contextual interviews. Interviews had an approximate duration of 30 minutes. While it would had been ideal to have conducted longer interviews, the experience gained during the research process showed the great difficulties to recruit (very busy) academics and student representatives, forcing me to request for shorter interviews to ensure I could get participants to volunteer. Prior to the video call, participants were informed of the purpose and characteristics of the interview. They also received a link to a five-minute demonstration video (demo) which I made to introduce participants to the prototype and study (a link to the demo video is available in the previous section and in Appendix D. At the beginning of the video call, I would summarise the purpose and characteristics of the contextual interview, highlighting to participants that the aim was to evaluate a prototype and its potential impacts on the basis of their knowledge about partnerships and student experience enhancement in their contexts, and not to assess them or judge their opinions. After participants confirmed their consent to take part in the interviews, I started recording the video call. Then, I emailed the final prototype –a clickable PDF- to participants and asked them to open the document and share their screen via video call (just like in rapid prototyping testing sessions). A list of questions was used to guide the interview in semi-structured ways. A couple of first questions started by asking participants about their role and about ground-level partnerships and their own specific link with them as part of their role. Following this, I asked them if they had seen the demo video prior to the call. If they did, the interview would start next. If they hadn't, I would ask them to watch the short video and then get back to the call (I asked them to mute their mic and stop their camera in the meantime).

The first focused questions continued by asking participants their first impressions about the prototype from the demo video, particularly in terms of the extent they thought that the tool was something that could be relevant for their context. With the time for the interviews (30 minutes) being very limited, the idea of the demo was to introduce participants and save some time compared to doing this introduction by myself during the call. My question about their impressions of the demo video were intended to analyse from their answers if participants had managed to understand the intended purpose of the tool and some of its main characteristics before proceeding a more detailed dialogue about their potential benefits, problems and adoption-related challenges. Sometimes long conversations followed from the question about the demo, but most times it was shorter answers before asked them to view and click-through the prototype. To discusses about the prototype in detail, I guided them to click-through to specific sections and subsections and asked them about there could be benefits, problems or challenges associated with academics and student reps in their institution using the particular features examined. In this way I was able to focus the dialogue related to specific design patterns and assumptions as well as associated potential impacts that were raised by participants in the prototyping phase. While examining a particular section, participants were encouraged and tended to click and explore different parts of the prototype, which left passing comments or questions that participants asked. Due to the limited time, in each interview I managed to review three or four sections of the prototype with participants. Due to the multiple sections of the prototype, no participant was able to explore the tool in its entirety: but by rotating the two dozen of participants to review different sections, I was able to gain feedback about many of the functionalities presented in the prototype.

When exploring with participants the prototype and its potential impacts for their contexts, I normally started by asking about possible desired impacts, followed by potential undesired consequences and challenge for adoption. Nevertheless, participants many times expressed their first ideas, for instance, highlighting a crucial barrier for adoption or an emergent concern. In any case, I tried to ask every participant about any potential good or bad outcome of using a tool like the prototype and the difficulties that may be faced for a successful implementation and usage. When the time for the interview was close to expiring (2-3 minutes before the scheduled end for the call) I asked participants to wrap up any final comment after seeing the prototype and our conversation. Then, I would thank participants for their participation and help, end the recording and hang up the video call. Video recordings were transcribed and anonymised for analysis.

Data analysis

To analyse the data, the recordings of the interviews and notes taken were reviewed and the produced transcripts analysed using exploratory, in vivo thematic analysis. Thematic analysis has been described as a widely used but loosely defined data analysis methodology (Braun and Clarke, 2006; Terry et al., 2017). Braun and Clarke (2006) simply defined it as a "method for identifying, analysing and reporting patterns (themes) within data" (p.79) and offered a more formal six-step procedure. The six steps proposed are: (1) familiarising with data; (2) creating initial coding of the data; (3) searching themes; (4) review themes; (5) defining and naming themes, and; (6) producing the report. My process was relatively similar, except that I had initial themes (potential benefits, concerns and challenges) from the start. Thematic analysis can be inductive or theory-driven (ibid). Thematic analysis can also be described as experiential or critical (Terry et al., 2017), with the earlier focuses on what participants feel and think, while the latter seeks to "interrogate dominant patterns of meaning" (p.19). Thematic analysis can also be semantic or latent, regarding its attention to explicit accounts or researcher's interpretation of accounts to identify latent topics (Braun and Clarke, 2006). For this study, the orientation of the thematic analysis was inductive, experiential, and semantic, or in other words, the analysis of contextual interviews primarily focused on patterns of participant's perspectives about potential impacts of using SXA tools that were explicitly discussed by them. Yet, when organising the themes identified, some latent themes also emerged and were considered.

The thematic analysis was orientated by a simple initial coding scheme template. The initial coding scheme was composed of the three wide themes at which this study aims: potential benefits of using the prototype in their context, potential negative impacts, and potential challenges for adoption (the latter is not discussed in the results for word-count reasons but is presented in appendix F for reference purposes). The first objective of the exploratory, inductive analysis was to identify and code fragments of discussions with participants in which they expressed views related to these potential effects (benefits, problems, challenges). This was achieved by reviewing the transcript for each interview and coding fragments indicating if they related to a benefit, negative effect, or challenge. Each fragment was also given a short title for handling purposes. Additionally, each fragment was tagged in relation to the relevant section of the prototype app. After reviewing and coding all the discussed benefits, problems and challenges by participants (in all of the interviews), the second objective of the analysis was to identify common patterns and redefine and reorganise the different benefits, problems and challenges (e.g., identifying and redefining categories and relationships, finding fragments discussing the same benefit or problem, etc.). This roughly mirrors step three of the process

suggested by Braun and Clarke (2006). To achieve this, the benefits, problems and challenges identified were grouped in a different document for focused analysis. An iterative and inductive review was conducted (Braun's and Clark's step 4 and 5) of analysis arrived at a detailed themes of potential benefits, problems and challenges of using analytics to support the evaluation and improvement of the student experience in higher education. Selected quotes from participants are used to describe the identified potential consequences (Braun and Clark's step 6). In all, in this way, I expected to provide substantial findings and valuable references related to the research questions and gap in the literature addressed in this project. Details of the results of this analysis are presented in the chapter five.

Limitations of contextual interviews

Again, it is important to acknowledge the limitations associated with the contextual interviews conducted and its analysis. Firstly, just like for the design ethnography and rapid prototyping, the small sample size and self-selection of participants means that the potential benefits and concerns related to the hypothetical use of SXA in higher education that were discussed by them cannot be considered to represent the case of Scottish universities. Again, the voluntary nature of participation might have also led to positive bias towards educational technologies and analytics. Secondly, similarly to the previous methodologies, the analysis of contextual interview data was interpretative and influenced by my own biases. Findings cannot be claimed as observer independent. Thirdly, the short time for interviews (like in the design ethnography and prototype testing sessions) resulted in a limited number of questions and topics that could be asked to each participant. Fourthly, the agile and multi-method research process implied that these contextual interviews enjoyed very limited time for analysis. For instance, a PhD project might be solely focused on analysis of a couple of dozens of interviews, whilst this study had to divide its time in a sequence of methodologies, which inevitably leads to a lower standard in terms of detail and depth of analysis. Additionally, as the literature about contextual interviews discussed suggests, these interviews normally include design teams working together to analyse and interpret findings: "Since the whole team is involved in the research and roles can be shared, either for the research itself, or at least for the interpretation of the interviews, the team members will contribute with different point of views and perspectives, and thus arrive at well- rounded conclusions regarding the design." (Duda et al., 2020, p.34). In this PhD project I could only do these tasks by myself, which reduces the internal and external reliability of results. Finally, like before, the exploratory nature of this study implies that limited literature helped to inform the implementation and analysis of this interview. This is a limitation to the quality of data and type of analysis that can be obtained. In consequence, its exploratory characteristics imply that findings cannot be taken at face value or be used to try to confirm or deny relevant hypotheses. Nevertheless, on the other hand, this limitation is also a mitigation factor for some of the previous limitations discussed: by recognising the exploratory nature of this study and the lack of intention to assert accurate and reliable observer-independent findings, related problems do not end up hurting the purpose of this study.

4.2.3.2 Theoretical and critical analysis of findings

The final step of the evaluation phase and research process was the theoretical and critical analysis of the potential impacts of SXA apps identified from the contextual interviews with academic leaders and student representatives. Theory is frequently defined as a set of ideas or abstract propositions aimed at describing and explaining empirical observations. Theory is widely considered the most creative and valuable contribution of research: it is indeed

considered pure or basic research in natural sciences (Greenwald, 2012). Furthermore, theoretical research assumed by many as superior: “more empirically or practically focused disciplines are seen as “technical” or “applied”—labels that most will see as implying lower status.” (ibid, p.99). Thus, as discussed earlier in this chapter, researchers frequently aim their research to formulate and confirm theory. For this exploratory study though, as already introduced in this chapter and chapter 3, the theoretical (and critical) analysis conducted did not attempt to use the data from interviews to test theoretical hypotheses and corroborate the external validity (Lucas, 2003) of the descriptive or explanatory power of a proposed theory. It was neither the objective of this theoretical analysis to create a ground-based theorisation (Glaser & Strauss, 1967) based on the themes (potential benefits and concerns of using SXA) inductively analysed, such as Stebbins (2001) suggests for exploratory social research. Instead, the theoretical (and critical) analysis developed used the proposed theory and critical references to develop additional interpretations and reflections about the potential impacts of SXA in higher education and generate additional ideas and questions that can be of reference for more sophisticated research. Rather than using the analysis of contextual interviews to generate a ground-based theory that provides explanation of the potential impacts of an SXA prototype – which may be the primary interest from an anthropological or sociological perspective- I think it was more relevant to examine these potential impacts from theoretical and critical perspectives in order to offer further interpretation of them and their potential implications. With a design research approach permeating the exploratory rationale followed by this study, the attention was focused on evaluating the theoretical and critical importance of the potential impacts inductively identified –and not producing explanation of the hypothetical or speculative social phenomenon described by these potential impacts. In the words of Klabbers (2006), design research evaluates artifacts: “[t]he design sciences build and evaluate artifacts for well-defined contexts of use and intended audiences“ (p.149). In this sense, the intention of using theory (and critical references) to expand the exploratory analysis and interpretation of the potential impacts of SXA in higher education is primarily aimed at expanding the possibilities in which these potential impacts --and their possible implications- can be understood. I reckon that such an approach is not very frequently used. Yet, its rationale is aligned with the exploratory (Stebbins, 2001) and design research perspectives adopted, plus, it is also coherent with the general argument of Klabbers (2006) about the contributions that theory can offer to design research: “[t]hat frame of reference provides a proper and suitable language to study and understand the internal dynamics of complex, multilevel, and open systems and to assess the effects of artifacts on the internal processes of social systems.” (p.150). Thus, the product of these final analyses was expected to generate new theoretical and critical angles and questions that expand the reflection of the potential impacts of SXA in higher education, and which, therefore, can offer additional references for future research. Details of how these analyses were conducted are described next.

Analysis process

After inductively identifying potential benefits and concerns related to hypothetical use of the SXA app prototype from the contextual interviews, each of these themes was briefly theoretically and critically analysed. The general objective, as just mentioned, was to use theory and critical references to offer interpretations of key ideas related to the benefits and concerns suggested. Specifically, after reading each of these themes, I first wrote an initial version of a theoretical description of the benefit/concern connected to the theoretical framework presented in chapter 3. One of the main ideas related to this presented theorisation is the ideas of

linguistic distinctions and education understood as a co-ontogenic drift (consensual co-transformative experience). Then, I wrote a first version of a critical analysis of the discourse associated with benefit/concern based on the critical references presented in the same chapter. These critiques revolve around the central ideas of discursive disciplinary mechanism and pursuit of power over human populations by the modern state (biopower). After finishing these first drafts of theoretical and critical analyses for each of the potential benefits/concerns identified I iterated and refined these briefs texts. The iteration and refinement sought to increase the relevance and clarity of these analyses. Finally, a new reading and iteration was conducted to link these analyses of the potential benefits/concerns with relevant discussions in academic literature. In this way, each of the theoretical and critical analyses of the potential impacts of SXA in higher education conclude by suggesting additional issues and questions that may be addressed by further research and debate. The resulting theoretical and critical discussion offered is therefore expected to offer additional possibilities to interpret the exploratory findings, and thus, the understanding about the potential impacts and implications of the use SXA apps in higher education.

Limitations of exploratory theoretical and critical analysis

The limitations related to the initial, exploratory theoretical and critical analyses offered must be noted. In the first place, as reiterated already, these analyses are based on exploratory, inductive analysis of the potential impacts of SXA in higher education. The limitations in regards previous literature (theoretical and empirical) about the use of analytics to evaluate and enhance the student experience implied that, as for any exploratory study, the data collection and analysis process did not produce accurate results from which a reliable theorisation can be grounded. This has been mentioned multiple times and is explicitly acknowledged. In this sense, the theoretical and critical analyses conducted cannot be generalised and can only be interpreted as a theoretical and critical exercise to fulfil their purpose of offering additional ways of interpreting the impacts of the potential use of SXA in higher education. While this is a major limitation for theoretical and critical analysis, in the context of exploratory research (e.g., limited previous literature) this limitation cannot be avoided and is dealt by acknowledgment and a focus on the reduced by valuable contributions that it can offer (e.g., providing relevant reference for further, more sophisticated research and debate). Secondly, in connection with the previous limitation, the analyses conducted generated speculative scenarios, which do not offer an accurate prediction of future events. This speculative nature must be recognised to avoid projecting discourses about future scenarios or events which to no degree have been deducted as expected to take place. A third important limitation to consider, also related to the previous ones, is that both the theoretical and critical analyses, even if they are used to suggest questions of interest for future research instead confirming the validity or a particular perspective, are still grounded in associated assumptions. For instance, the theoretical analysis is based on more benevolent and optimistic assumptions about education and human interactions (e.g., mutual-acceptance, consensual interactions). In the other hand, the critical analyses are influenced by much more skeptical or even cynical assumptions about knowledge, humans, higher education institutions, quality policies, and the State. A fourth limitation, as indicated for the other methods, and of highest importance, this exploratory design research project involved multiple methods and the time available for theoretical and critical analysis was much more reduced than other projects in which these analyses are their only or central dedication. In this way, these analyses are of limited extension and engagement with detailed and deep examination and reflection. In other words, like every methodology carried out in this

study, these analyses should be appraised not as separate, autonomous and independent methods: they should be examined as elements of a whole, interdependent methodology. Nevertheless, while this limitation and its importance are explicitly acknowledged, these brief initial analyses are still expected to achieve its humble exploratory objective of offering additional interpretations of the potential impacts of SXA in higher education, and therefore, may be considered fit for their established purpose. Finally, the last limitation to highlight is that I played both propositional and critical roles in these analyses. During the theorisation, I was also thinking that I was going to have to critique myself. When I was critiquing, I was also thinking that it was my own discourses that I was critiquing. This duplicity brings evident conflicts and limitations for each of the analyses. I tried to mitigate these problems by trying to ignore the emerging pressures and focus on embracing and enjoying the tensions, the conflicts, the Sisyphean drama, the unavoidable limitations and, more than anything, the intellectual challenge.

Chapter 5. Results and Discussion

This chapter presents and discusses the relevance of the findings of potential impacts of SXA in higher education identified in the contextual interviews (5.1) and the theoretical and critical analyses about these results (5.2). As commented earlier in previous chapters, section 5.1 discusses the main results of this study: the emergent benefits and problems inductively identified from opinions expressed by academics and student representatives. No theory or counter-theory was formally used to derive these themes. Section 5.2 then applies theoretical and critical thinking to analyse these identified themes presented in the previous section. In both sections) 5.1 and 5.2 I briefly discuss the relevance of these exploratory findings to recent academic literature. By doing so, I attempted to show ways in which exploratory study contributes to the present debates about student experience, learning analytics, higher education and beyond. In particular, as mentioned in the methods' chapter, after reading the first drafts of these sections I annotated some ideas that linked literature discussed in the literature review chapter as well as other emergent connections with other literature that I was aware of. Iteration helped me to round up these associations between the findings presented and some references from the literature. Nevertheless, while doing so, due to limitations of extension, biases, and opportunity, among others, the number of connections to literature had to be –very- limited. Whilst I could have expanded these discussions in great length and variety of angles, it is important to acknowledge that a narrow selection of references from the literature is used to portray the relevance of the findings of this study. I only linked back to what my thinking was able to suggest in a short period of time and within multiple other constraints. Importantly, following the ideas of Stebbins (2001) this can serve as a steppingstone for further academic inquiry and debate and this *weakness* is the best that exploratory research can offer.

5.1 Potential impacts of using student experience analytics (SXA) in higher education

Based on the exploratory analysis of conversations with participants of the contextual interviews, a total of six potential benefits and nine potential problems of using SXA apps in higher education were inductively identified. These are presented in Figure 18 and 19.

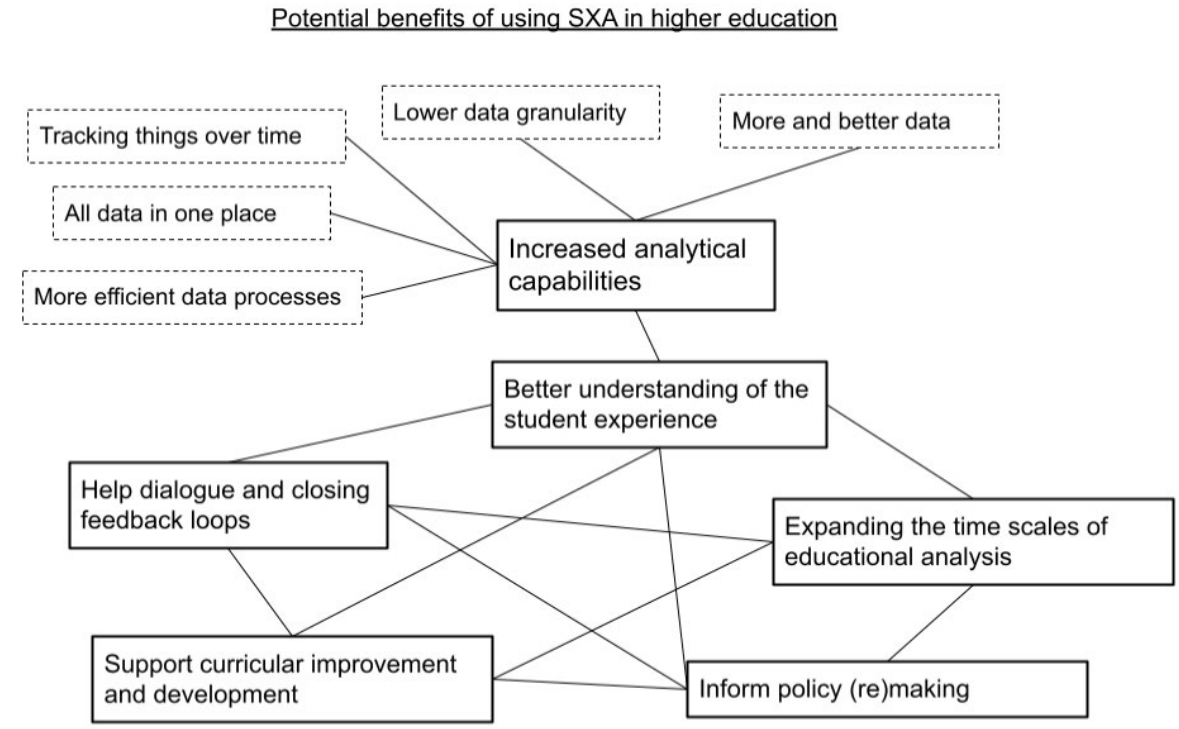


Figure 17. Potential benefits of using SXA in higher education.

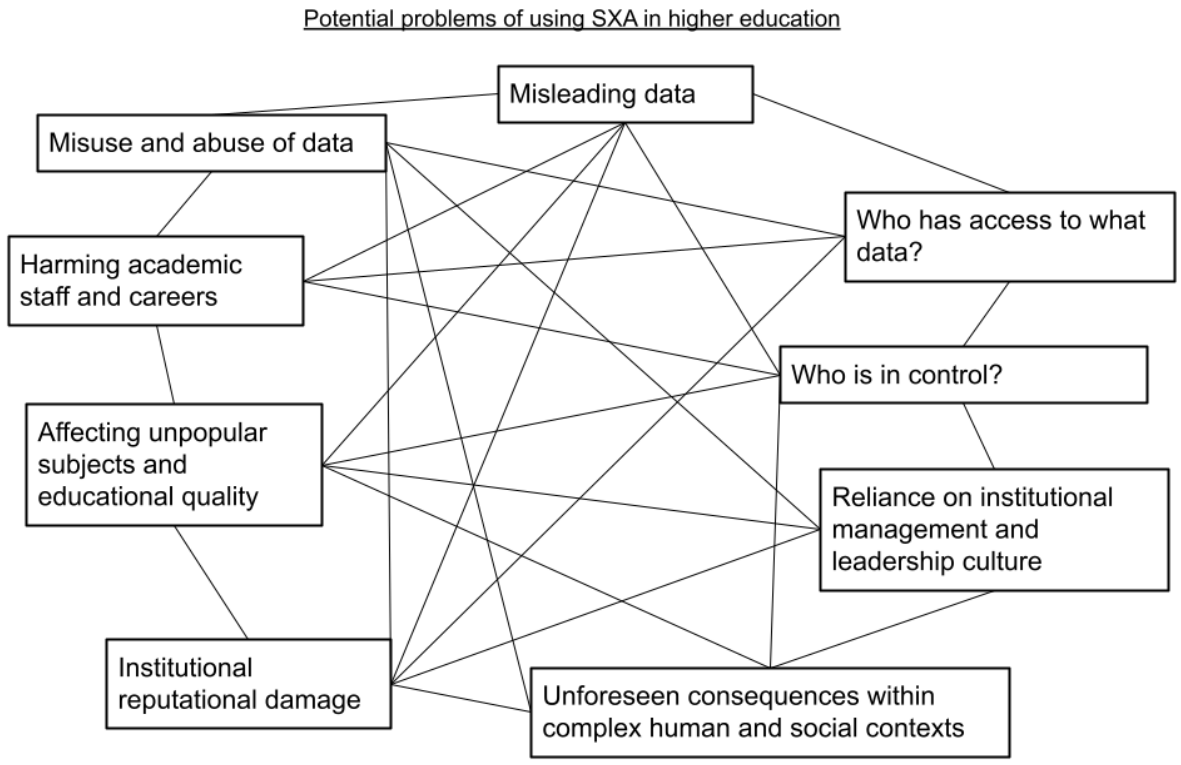


Figure 18. Potential problems of using SXA in higher education.

5.1.1 Potential benefits

My inductive analysis of interviews coded fragments in which participants discussed potential desirable (i.e., positive) impacts related to the hypothetical use of the SXA prototype in their context. These selected texts were iteratively reviewed and organised based on common patterns and topics and relationships between the different benefits identified. After achieving a degree of analytics saturation (when no new benefits or changes to the existing ones were identified following additional analysis), six main benefits were identified. Two of these benefits were articulated as one causal relationship. In consequence, next they are discussed jointly as one broader and central benefit. The first of these elements – increased analtical capabilities of academics and students- was interpreted as a primary, more direct benefit of using SXA in higher education. The second of these elements – better understanding of the student experience – was understood as a secondary benefit driven by the increased capabilities. While these beneftis were then interpreted as associated between them, both were mentioned independently, and also in articulation, by participants. One can describe them as an output (increased analytical capabilities about the student experience) and one its outcomes (better understanding of the student experience). The latter, however, must be emphasised as more central to this dissertation due to its more direct relationships with the other main potential benefits described, as well as with the posibble concerns, theorisation and critique that are used to discuss the potential impacts of SXA in higher education.

5.1.1.1 Additional analytical capabilities to understand the student experience

Several participants the suggested a number of combined potential benefits related to the hypothetical use of the prototype were linked to increasing the analytical capabilities, and therefore the understanding, about the student experience and the educational activities of higher education programmes. Such exploratory findings seem of significant interest for debates about the continuous improvement of the student experience (e.g., Harvey, 2005). Additionally, this exploratory result may be of relevance for debates about how the student experience and feedback are developed in higher education discourses and practice (Sabri, 2011, 2013; Staddon and Stendish, 2012; Naido and Williams, 2015, Wintrup, 2017; Gourlay, 2017). This also appears to be a central benefit which could drive other desirable effects that are discussed later. My analysis, whilst it cannot the assumed as exhaustive, identifies several possible sub-benefits that contributed to augment the analytical capabilities of users and obtain a better understanding the student experience and teaching activities: getting higher quantity and quality of data; changing data's granularity; gather all the required data in one place; increase the speed of data-processes; keep track of the student experience data and enhancement across multiple years. These are next discussed.

More and better data

Getting higher yields and more accurate data was frequently mentioned as a main potential benefit of the prototype. While it was several times indicated by participants that it was only an assumption (more about this later), both academics and student reps commented about designed features and the mobile nature of the prototype app which could lead to obtaining more feedback from students and greater integration and access to other existing data. Furthermore, participants elaborated that the prototype could also help users to access more accurate data, and why this might happen. The following words of a student officer summarise

the narratives about this potential benefit of hypothetically obtaining more and ‘better’ student feedback through the use of prototype app:

> *“I think one of the problems that reps have is they sometimes just don't know how to go about getting the feedback or they don't know what things they should be getting feedback on, whereas this kind of gives you almost the opportunity that all students have access to it and could kinda just […] like submit ratings or submit feedback kind of in time. Rather than retrospectively a month into the semester, hey, ‘how are you guys in this?’, and instead it captures that in time, which I think is even more accurate than anything that's retrospective as well. So, absolutely, I could see this being a really big benefit.*

Data granularity

In line with the previous potential benefit of more and better data, another important possible benefit several times mentioned was the hypothetical possibility of getting access to data with different granularity compared to currently available systems. Granularity is used to refer to the level of detail represented by data. In data science, higher granularity is referred to as more detailed data (e.g., data about each learning activity instead of data about the whole module. To note, in physics the origin of term granularity is used in the opposite way: higher granularity points to data representing a coarse-grained description – granularity refers to small things being agglomerated to form larger –more granular- system). Several reflections by participants touched on this issue, as well as on the speculative value for teaching practice. As expressed by a quality director from an academic department,

> *We don't have something like this [… we have] course feedback forms, […] they have questions that are more broad, you know, about the course, about the lecturer, but not as fine grained as this kind of information [in the prototype] that […] it was quite clear that you could have really specific feedback on kind of small little elements of the course. So I think suddenly I had actually is a really valuable idea.*

Another leader from an academic department reflected that this more detailed data could support people to better interpret evidence and to understand what it is representative of.

> *that kind of [targeted] information is always useful. And the more, the more tied to specific things, the easier it is to understand what’s been meant.*

A participant, with senior experience supporting curricular development of programmes and departments, also discussed the relation between more fine-grained data and an increasingly detailed picture of the quality of teaching activities.

> *I was in my subject network leader role and I was saying, say I got a couple of complaints[.] And I could drill down into this to look to see [the data in the prototype] that would give me, I'm using all these cliched words, that would give me more granular information on what the students are feeding back and what the overall picture of a particular course, how it was performing.*

Tracking things (student experience data and enhancement) over time

Easy access to past records and associated assistance with keeping track of things was suggested as another important contribution towards improved analytics capabilities and

understanding of the student's experience. The ability to quickly find key information and data from previous years and improvement activities and impact appeared in several thoughts shared by participants. This is well summarised by an academic leader at department level.

> *I think it would be really, really useful [...] you can just click on the button every now and again and go out what's actually happening, or particularly as a programme leader, it gives you an overview and the ability to kind of maybe chase up[.] So I think it could be it could be quite useful just as a, not as a negative monitoring tool or anything to be truly contrived. But just as a, a way of being able to quickly kind of see, 'oh, you know, what are we needing to do?'. Because if I'm being quite honest, I think sometimes having a document that's stored away and all the rest of it, you kind of forget about it, whereas [with the prototype] you could set up a kind of wee monthly prompt, or whatever and just have a quick look and everything would be there. And to see progress which roughly be being made and noted by lecturers on your team. And yeah, just, I think that could be quite useful.*

From the side of student representatives, a student officer shared a similar view that summarised a common position for student representatives:

> *Oh, absolutely, I mean, I'm even thinking about some of the work that we just do internally in the union. That's always a problem is that, you know, we will agree to something and we'll implement it but evaluation and coming back to, to monitoring it and making sure that it's still meeting what we originally wanted it to, it's something that I think sometimes falls behind or kinda gets forgotten. But that's really important. Like that's actually, probably one of the most important things is that we're making sure that our ongoing work is still being useful, it's still effective and it's still aiming for what we originally intended, or maybe it needs to change. And that's, I think another thing that this [tool] could maybe capture. If there's a need for a change, this could probably help record that and make sure that everybody knows what direction they're going with it then [...] and that's sometimes what actually gets lost, is one is going to a meeting or something and everybody is on a different page because they didn't realise that something had been update or something had been changed. [...] I think that ultimately this will just help keep everybody on the same page and […] to allow them to track how the progress is going and how things are progressing really.*

All data in one place

Gathering all data in one place seemed to be the most frequently mentioned benefit by both academics and student representatives. At first it may sound like a superficial or trivial matter. But participants clearly elaborated how this design characteristic was critical for their analytical capabilities. As briefly put by a participant – it could be useful to have data in one place so it can be looked at as a whole:

> *What I did like was the fact that everything was in one place. And you can access everything, because what I think for my experience is we have, we do have a lot of information about students... student retention data, student achievement, feedback from students, feedback from external examiners, feedback from staff. So, we have all of that information. But it's really useful if that*

can be in one place because […] all that information is there. But to me the benefit seems to be that this can all be in one place, so it can be looked up as, as a whole.

In a very similar line, another senior academic at department level added how this central access to data could lead to key transformation of the analysis of educational practices:

what you're describing there is, without doubt that's a problem, right? This dispersal of data that's in different forms, obviously that's always a problem of data management in different forms. […] And then it's so it's located and all these many different places. If a system, yes, I do think that could be valuable if there was a system that could usefully consolidate […] You know what I mean. So, […] the value would be if they can, if they can, [...] if it can both consolidates and organise the data in a way that makes it accessible but, but, but, but analyzable.

Other student representatives at department-level pointed out that having a centralised access to data such as the prototype could allow users to quicky find and share key data for discussions in student-staff meetings.

for SSLC meetings would be very, very helpful, you know, the staff are asking for feedback on the course and on, on the programmes and so on, it'll be very helpful to have it all in one place. Because generally now the system is, […] it's difficult to, first of all, make sure that we're saying exactly what they want to say[.] And second about such a limited amount of people. [...] I guess [as a student] this is data, in general, quite helpful for use in meetings and, and higher up meetings, college level SSLCs and so on. […]

In synthesis, while at first it may sound trivial, the material conditions of having access to all data in a single tool, participants suggested, could offer a major change in the way data is looked and analysed to inform discussion and decisions about the teaching activities and intended student experiences. This point now allows us to introduce a similar benefit that was also described as being critical to supporting the analytical capabilities of participants.

More efficient data processes

Findings suggest that the prototype –in great part by providing access to all data in one place- could assist in making data processes (e.g., collection, access, visualisation, analysis, communication) more efficient and easier to use. This efficiency gain could reduce the time dedicated to data management, and hence, increase the time academics and students could dedicate to analysis, discussion and decision-making. This senior academic manager at department level highlighted that facilitating quicker and simpler ways to collect and use data could be very beneficial.

I think this […] functionality of […] being able to already pull the information that we get in our online module survey feedback. So straight into that app, where you are then able to just click the buttons and sort of see the colour-coding and see overall satisfaction […]. So you'd be able to focus on it If able to go in it be able to see like the comments from the students. I think that would be really, really useful.

From the side of student representatives, the comments from a student union's vice-president of education of one Scottish university also emphasised a link between time-shortage, process efficiency and support to increase their capacity to be adequately inform their participation in discussions, decisions, and policy making.

> *we don't yet have an efficient process where we can gather feedback from. […] because it's not all in one place and it's not readily available. [B]ut if we have it all in just one single place, then it will make things much, much easier. And also it would make, it would help us basically to do surveys [and get more feedback] and that's from a student perspective. And now as an officer perspective, I was just actually talking with one of our staff […] a few months ago, that we want to have one single place where, or a single platform even, if we have a policy or we have something that we want to discuss with our class reps is much easier to send that to an app or send that to a platform. And then extract from that as, as much feedback as we can, rather than as I mentioned to you earlier, having to go to these different council meetings in each college to try then to get feedback from students. And sometimes I can't do that because I'm very busy in meetings. That's why in our case, a platform like this, it would be extremely useful.*

The student vice-president from the last comment provides further detail on the issues of time saving and how influential it is for the work of student organisations and the contributions that they can use their limited time on.

> *[F]or the students union, because there's hundreds of reps and we really do have kind of limited staff capacity, having something that could actually generate kind of reports or generate this kind of analysis on the go, would be super helpful […] because we just don't have time always to be doing that. And so seeing some of the features there as well, I think it could really save us the time, which means that we'd actually have more time to actually act on the feedback rather than just trying to collected and analysed it all the time. Definitely a time-saver[.]*

Beyond student feedback, the prototype also seemed capable of driving relevant efficiency gains in connection with the tasks required to stay on top of the discussions and decisions about improvements activities and their results. An academic commented:

> *[W]hen you are reflecting and you record your actions, yeah, how do you then pull them forward? How do you keep them somewhere? There's not buried in a document somewhere that you wouldn't find again 12 months later to see if you've done what you said you were going to do[.] I think that that type of thing in terms of keeping, keeping actions, your post-reflection actions, current, and somewhere obvious so that you can work on them, […] than you can easily go back to them the next year, I think we've been incredibly useful.*

In sum, the potential benefits related to the increased quantity and quality of data, the different data granularity, the ability to track things, the quick access to all data in one place, and the improved efficiencies and user-friendliness to complete data processes seemed to generate better analytical capabilities, and by extension, increase the degree of understanding of the learning experiences of students and the quality that the educational activities offered by academics and student representatives. The strengthened understanding of student experience could in turn enhance the student-staff discussions about what might next be improved and

how. This raises questions about the extent to which a data machine such as an analytics app with feedback gathering features might, as suggested by these exploratory findings, provide more and better data and enable greater power and accuracy for the datafication of student feedback and experience. The possible related implications for higher education practice, governance and communities also offer grounds for relevant questions linked to present debates in the literature. In relation to the influential words of Karl Schwab (20??), the chairman of the WEF, about data-machines being expected to transform the practice and relationships with others and our environments: could data-machines such as the prototype support better understandings of the learning experiences which lead to revolutionise how teaching and learning higher education and the relationships between teaching staff and students? For instance, could additional analytical capabilities related to the understanding of the student experience be then aligned with continuous quality improvement, such as with ELIR institutional processes and reports in Scottish universities? (Harvey, 2005). More specifically, taking Darwin's (2021) argument about troubled student surveys concentrating the attention of higher education quality practice and blocking interest in more effective methods to understand and foster student perspectives: could analytics apps help render student surveys obsolete? If so, what benefits and problems could this create? Noting the arguments highlighted by Ten et al., (2016), beyond cognitive aspects of learning, questions also may be suggested about the extent to which greater analytical power could help teaching staff in better understanding the context and interpretations of students, and the affective domains of learning within higher education. On the other hand, considering the ideas raised by Bloch et al., (2021), could the hypothetical stronger datafication of student experience facilitated by such analytics apps contribute to further the adoption of the student experience as an educational outcome? If so, how could this influence the future and quality of higher education? As Ryan (2015) suggest an international trend of increasing interest in student voice being incrementally heard in quality enhancement mechanisms and systems, to what extent the greater analytical capabilities hypothetically offered by student experience analytics apps may be of interest for contemporary higher education institutions and governments? Referring to van Dijk, could a naïve *dataism* –uncritical stance to data and giving data-power to corporations and governments– contribute to adopting seemingly beneficial analytical capabilities to understand the student experience ended up fostering the internalisation of educational dataveillance as 'a normal form of social monitoring' in higher education? Taking Sabri's (2011) concerns about the narratives surrounding student experience discussion in higher education: could greater analytical power and more detailed view of the student experience hypothetically offered by SXA tools contribute to homogenising, commodifying and impoverishing the understanding of students and their learning experiences? To what extent could SXA apps become a stick that elicits 'feelings of dread and anxiety' for teaching staff? In response to the arguments of Staddon and Standish (2012) could the use of SXA's generated increased analytical capabilities fall into consumerist discourses and performative exercises? In all, the discussions shared by participants about the potential increase in analytical capabilities to understand the student experience suggest several questions of interest in relation to various debates in the present literature.

5.1.1.2 Helping dialogue and closing feedback loops

The second main potential benefit identified was participants' speculation that the adoption of the prototype app could support student-staff dialogue and closing feedback loops in their contexts. Initial insights with this topic were identified in the preliminary exploration (Rates and Gašević, 2022), the design ethnography and prototype testing with participants. An academic

synthesised a position that was repeatedly voiced by participants: the dialogues with students did not seem to be as effective as they might, this in part being due to limitations related to the amount time which it takes to collect, process and communicate information back to students.

> *[…] in terms of feeding back and closing the feedback loop, I think something like this would give us, give us that real time ability to, to respond, that, that we're not very good [.]. I mean, we're getting a little bit better at it, but It's a bit of a struggle.*

This participant later provided further details highlighting how this benefit could intersect with the idea of partnership that they wanted to implement:

> *[…] students don't really have access to any of our data at the moment. But something like this... you could potentially [,,,] select what you want students to be able to see. And I think that idea of working in partnership, which we're really trying to drive forward to working with our student representative system, something like this would be really helpful because it would be so transparent because the students would have access to the data that we also had access to as members of staff. So, I can see a big, yeah, a big benefit there with something like this. Because at the moment we can't really give students access to most of the data that we have, we have to download it to, give it to them, you know, we don't have a thing where you could share [data] in this way.*

One of the issues that was also discussed is the possible impact of reps' access to data about improvement activities and the improvement processes:

> *I think being able to also share kind of what we're doing, why we're doing it is also really useful with class reps as well. So they can see the importance of improvement and feedback and how we use that to feed forward and make things better.[TD11]*

In this way, the words of this last participant could point to possible effects for the degree of information managed by student reps and the student body. In one hand this could mean more opportunities for student collaboration in partnerships and quality enhancement. In other hand this may create risks of additional problems. A student representative at departmental level argued that representation could receive valuable assistance to appraise what improvements have been already made in the past, which could evaluate and communicate to students if their student suggestions have already been proposed, whether any new idea is feasible at the light of previous efforts implemented, or if some of the feedback received is linked to modifications which are currently underway:

> *Being able to see what's been done in the past and how long it's taken to implement would actually be helpful to know what's realistic. Students are requesting things all [the time]. If they've asked for something...[I], as a student representative can say, 'Okay, this has been done in the past.' [Or] 'I know that these changes are in the process'.*

One academic offered more detailed elaboration on the assistance that the prototype could have to close feedback loops with students, and how that could support greater awareness in the student body of the work and changes which are carried out. In this way, the participant expressed, this could help address prevailing impressions and frustrations related to relevance of the feedback that students provide:

[F]rom the staff's point of view, but also from the student's point of view in terms of [having easy access to information about] shared actions, or actions even just for the programme team. Having to go back to the meetings' minutes where we've had, and go through the kind of action points and check it again and then come back to that piece of paper having something that's easier to access and pull out the actions, then [that] means that you can, you can progress these things quicker […] a more active in-the =-meeting context, we could be generating these tasks and having them out there, for things, even minor things to be improved. We can get them out [(in the app)] there quite quickly. When you get mid-course feedback, for example, you could say to the students, 'well you can see it now, we've already got it on the system. In response to your mid-course feedback. You can see it and then you can track what it is that we've been doing'. So being able to share that with the student cohorts so that they can see the progress is, is really quite good. And I'm thinking that option is great. I mean, we keep in contact with students by various different methods[.] So it's okay, but it could be better. And demonstrate that ongoing process that we have through the year that I think students are not aware of. So, there are [problems] that we're aware, when we can see that come up in a course […] and then, we can ping out, 'this is what we're going to change for next year or for the next course that you're in'[.] [...] But it is something that then shows to the students that there's that continual process of tweaking and changing and adapting based on what it is that they share with us from their feedback, so that we can then demonstrate that we are taking action on it. And it's all the things that students think, 'Oh, nothing happens', but there is, there is something happening, so it makes it more transparent[.]

The sensation of losing track of feedback was a common issue raised in the preliminary exploration (Rates and Gašević, 2022), the initial design ethnography, the user-testing of the prototype, and the final contextual interviews. As already mentioned, this recurrent problem for student reps was described as seemingly affecting their abilities to fulfil their roles in ideal conditions, particularly when feeding back to students, who they ultimately represent and are accountable for. This informational gain could then be argued to improves student reps' capacity to bridge that final leap which closes the feedback circuit back to the student body, with whom it should start again, and thus, arguably being a fundamental step with critical influence in the continuous feedback process. One student with experience as programme-level representative synthesised some of these issues.

I really liked the, the feature to kind of track progress on things that, I guess like staff and student bring up. Because I think one thing that was frustrating was, you'll, you'll go to a meeting and say, 'the students want this'. And then they'll say, 'Okay, We'll look into it' and then that's all you ever hear about it. I think having one centralised area to have, where you can see the sort of progress. I guess it's a bit like Trello, the app. And yeah, I think that will be very useful just to kind of keep everyone accountable.

One director at department level reflected on how prototype could contribute to discussions in meetings, from responding to students' interest to track things and moving the attention to delivering improvements:

What students often [say] and I have an issue with is that they have a committee, they say things, and then they say, 'well, nothing's happened with that'. 'There hasn't been an action completed from our "statements" [(feedback)]'. So that would be

something that would be worth recording and worth making sure that was in the app. So that whoever looks this app could say, "Oh yeah, well you asked this then we did it". So that in a sense is not just about gathering the information and collating it and reviewing it, but actually doing something about it. And to finally [people] see that, emphasise that point, there's no point in having a whole lot of sophisticated, fancy information gathering systems doing anything about it.

This decision-making and appraisal context described could be argued as an intimate moment, where participants and their self-images and self-esteem, from both sides of the partnership, are partially exposed to each other's questioning and judgement. Better access to information seems potentially capable of having some reassuring effect by giving everyone greater confidence with the process and bringing the focus to constructive action. In a similar line, other senior academic offered additional explanations on hypothetical benefits to guide dialogic approaches between academics and student reps about the student feedback received.

I think that [access to feedback in the prototype] would be useful for, [to give] the module leader or whoever might be looking at this data, either the opportunity to make changes if we feel that [if best to do them], but also to be able to go back to students to explain why, why's the setup like that. So, it's not a necessarily about making changes, but by having the, […] the dialogue with the students and having an understanding of how the students are receiving it. If that makes sense?

These described potential contributions to closing feedback processes and enabling increased capacities for dialogue seems to create interesting opportunities for critical and reflective higher education practices in general, and for student-staff partnerships in particular. By extension, it appears that this speculated enhanced collaboration could lead to more valuable contributions and outcomes for the improvement of the quality of higher education programmes:

[I]s about being able to, again open up that dialogue with students to say that these are the most popular [subjects or topics] and we understand why, however, why is [that subject or topic] important? So, [...] the positive side, it can really give you insights into what the students find most relevant, what's more popular for them, what they enjoy most, and what they enjoy least. And then have the conversations with students about [...] how they are thinking about the programme or how they are [thinking] about the profession, because it's not just about standing in front of pupils, is about understanding theory, about being critical about educational issues.

Overall, this exploratory finding about a hypothetical potential of SXA apps to help close feedback loops and foster student-staff dialogue raises interest in questions about the extent to which the use of such data machines could address and impact the discussed challenges in these areas (Shah et al., 2013; Matthews et al., 2019). In particular, the view of some participants about the importance of sharing data with the student body so students can learn about the relevance of both giving feedback and taking part in partnership's processes for quality improvement suggests that data access may play important roles as enablers of the effectiveness of partnerships and the enhancement of the student experience in higher education quality (Matthews et al., 2019). In this sense, by helping to close feedback loops these data machines also seem to have the power to revolutionise teaching and learning practices and teacher-student relationships in higher education. Regarding potential facilitation of student-staff dialogue, this exploratory finding points to questions about the degree of

influence which the use of SXA apps might have on building more emphatic and democratic higher education (Parkers, et al., 2019). Similarly, could it be possible that the hypothetical benefit to student-staff dialogue related to the use of SXA tools might contribute to strengthening academic core values (Gourlay and Stevenson, 2017), traditions and scholarship and respond to the issues raised by Staddon and Stendish (2012) about the subjugation of the substance of learning by the focus on producing feedback about the student experience? Or, perhaps the opposite, could the ultimate consequences data-machine mediated student-staff dialogue be detrimental in this matter? For example, noting the argument from Naido and Williams (2015) about student experience narratives pushing individualistic approaches to education, could the influence of SXA apps lead to student-staff dialogues being prescribed by data, for instance, to understandings of education that are reduced to the sum of individual experiences? Questions can also be suggested from Tomlinson's points (2017) about increasingly consumerist and transactional context surrounding the student experience and the limitations of this discourses to describe the extent of views of students: which effects could the use of SXA apps have in fostering or overcoming transactional interests which can direct student-staff dialogues towards meeting short-term student expectations (such as argued by Skea et al., 2017)? The arguments of Cloudry (2017) can also help to propose questions about the extent that the use of SXA apps could amplify attention in student-staff dialogues, feedback loops and partnerships towards 'observable student engagement' such as student interlocution or following instructions in potential detriment of other, less-datafiable forms of learning and teaching? Alternatively, could strengthened student-staff dialogues –by virtue of their dialogical interaction- help to shape higher education practice away from transactional, reflexive and individualistic perspectives and practices? Finally, from Wintrup's ideas (2017) about the threats of measurement of student experience and engagement to induce fears in staff and students of being judged, questions emerge about the possibility that SXA tools' hypothetical assistance to closing feedback loops could imply that their feelings and fears that data about the student experience ends up being acted upon in student-staff dialogues to be further increased and contribute to their internalisation of surveillance mechanisms to change their own behaviour (and game the system). On the other hand, it may be asked: could it be that strengthening the dialogical nature of student-staff dialogue would imply fostering shared control by teaching staff and students over the student experience and educational activities? In any case, this potential benefit identified appears to raise significant interest for further debate.

5.1.1.3 Supporting quality improvement and curriculum development activities

The third potential main benefit identified was the hypothetical support to make better decisions for quality improvement and curriculum development processes. These activities are normally in alignment with national policy and institutional quality improvement regulations. One example is a participant who linked having an overview of programme's curriculum as being useful in programme development:

> *I like this overview of the module, I really found, thought that would be very useful for analysing what's going on and […] programme development. And also like the variety in analysis, the options for different analysis, and then pulling that together.*

The gain in data capabilities that the prototype could offer was discussed by one academic as offering as a more consistent source of information to support educational improvement activities at multiple levels:

> *I think the other thing that something like this could potentially do is, I think at times we like some consistency in the way that we analyse things. [S]omething like a tool like this potentially means that it's easier to get consistency to see exactly the same data across your modules, across your programmes, between different schools within the university or within your own school. So, I think there's, yeah, there's potential [.] And then to be able to make better decisions.*

Another academic indicated how the use of the prototype could hypothetically help inform reflections about programme improvement:

> *[A]bsolutely. I mean, I think again, that [could form] part of the kind of self-reflection to see if it's, if it's something that's working as you intended to. [W]e're now currently getting into that stage of reflection in terms of how things have gone, was it successful, what could we do differently next year? So, something, something [like] that would be, would be very helpful.[XX]*

Another participant offered a similar perspective:

> *When you're developing on redeveloping programmes, just the ability to have that really high-quality data to inform [questions such as:] will we still run the module about microbiology[,] how many students have we had on that? What's the feedback been like?*

I think it is relevant to highlight two things. Firstly, directly assisting critical educational reflections of academic staff can be argued as a direct influence on how higher education programmes are interpreted and modified. Secondly, doing so could be supposed to imply major consequences for higher education, the way to select and distribute the most advanced knowledge and skills (Bernstein, 1973; Young, 2013), and therefore, could be speculated as potentially leading to deep cultural, economic and social effects. Finally, one participant also synthesises how the prototype could provide richer overview of the curriculum of programmes and its multiple elements, an idea expressed multiple times by participants.

> *[I]t is quite nice having the ability to see[...] being able to see [modules] by type of assessment, those kinds of things are useful. Because then you're able to see [whether] you've got quite a nice blend […] as appropriate to the subject that you're trying to teach[.] And to make sure that people are developing the required skills as they progress through the different years. That makes perfect sense.*

Discussions by participants about the potential of SXA apps to support the identification of learning and curriculum enhancement and development opportunities describe specific examples that reinforce the suggestion that these tools could assist the continuous improvement of the student experience, and thus, contribute to what Harvey (2005) noted as one of the main interests for contemporary higher education quality policy. More specifically, additional questions emerge in relation to the extent that the use of SXA tools could support improvement of the content, outcomes, processes and empowering aspects of curriculum of higher education programmes (Linden et al., 2017). Nevertheless, as speculated by a participant, by assuming that the increased analytical capabilities to understand the student experience could help academics' reflection about the extent to which learning activities and the curriculum are working as intended, it would be logically implied that SXA could be directly

influential in relevant decision-making and enhancement. In this sense, questions arise about if the use of data from SXA may offer meaningful assistance to improve learning and the curriculum and avoid problems reported for student surveys such as reductionist focus on student behaviour, omission to consider student's reflection and autonomy, and failure to provide reliable insights and predictions to support well-informed decisions (Hagel et al., 2012). For example, could the use of SXA apps help to make improvements that recognise the different backgrounds and needs of students, or bringing the critique of narratives of student experience by Sabri (2011), would these 'enhancements' be grounded on understandings of students as a tabula rasa? Or, following another point raised by Sabri (ibid; from Clegg, 2011), could the SXA-informed enhancement of higher education curricula be reduced to 'employability' gains or meeting the short-term expectations of students (Skea et al., 2017)? To what extent the curricular changes informed by SXA could lead to the homogenisation, commodification or precariousness of higher education? Again, considering the ideas of Staddon and Stendish (2012), to what degree could the use of these tools to inform learning and curricular enhancement avoid supporting performative exercise? Furthermore, bringing again the ideas of Wintrup (2017), to what extent the improvements informed by SXA would imply implementing judgements about academics and students that will make them feel exposed, internalise disciplinary mechanisms or game the system? Reflecting on the arguments of Mendes and Hamme (2020), how could SXA influence the contradiction and balances between the understanding of students as consumers and partners? Taking the suggestion from Budd (2021), could SXA apps support educational changes that drive positive forms of student agency and resistance to academic degrees becoming 'flatted out' into *datafied*, observable metrics?

5.1.1.4 Informing policy-(re)making

The fourth potential main benefit identified was the hypothetical contributions that the use of SXA tools could bring to inform policymaking at internal institutional level. While the central focus of this project was scoped to programme and academic levels, discussion with senior academics and institutional-level student representatives offered insights about possible benefits in making the institutional regulations that prescribe the practices at programme and department levels. In particular, participants noted that data from SXA apps could be used in different ways to inform policy-making discussions and decisions, potentially leading to creation of more effective and educationally sound policies for the higher education institution. The vice-president of the student union of one institution offered a brief example in which the app could be used to get student feedback about current policy or future proposals:

> *[I]f we have a policy, for example, and we want to put that policy [to analysis.] Yeah, I think [the app] could be very, very helpful, because for example, if we did have a policy here [in the screen], and so, then we had people, people rating a policy, some say 'yeah, so really good' ones say 'no, it's crap'. So, we have that here, which is very good, and then we have the comments as well[.] So, if someone rated it two stars and then they explain why they rated it two stars.*

In other words, as this previous quote suggested, the use of the SXA prototype could be used to change the way proposals and existing policies can be analysed and evaluated by students and academics. Such speculative benefit and the example illustrate a direct way in which SXA tools could produce changes to the ways in which the student representatives could involve the student body in consultations about institutional regulations, and hence, in the ways in which

students can participate as partners in higher education. Participants elaborated on both potentially desired and undesired implications (the latter are discussed in the next section). Another student vice-president explained how, for example, the ability to quickly gather relevant student feedback and other data could inform the institution-wide policy discussion. This participant then highlighted the that a tool such as the prototype could allow to have a more systematic analysis and save a valuable amount of time, pointing to the possibility to offer a better alternative to the procedures used at the time of the interview:

> *I'll be asked by the university to collect feedback on a certain issue, a certain topic, a certain policy. And then I just end up having to kinda sift through all the feedback I've kind of gotten and because I don't really have a system or kind of... I just use a word document and to be honest, I just kinda sift through that. And It's really not the best way of doing things, but we don't really have an alternative. So, in order to kind of be able to just quickly analyse [feedback] for specific issues, or for specific like a set of policies, that would just save so much time! And time is kind of the essence! If I'm honest, you know, so...[silence].*

From this last comment, it is also suggested that the existing capacities to inform policymaking may not be highly systematic or reliable, which be a cause of obvious problematic consequences. For instance, limited accountability could enable implementing or keeping worse than good policy decisions that drive persistent undesired but untracked effects to the educational community or student-staff partnership. In this sense, the prospects of potential contributions to empower academics and students to use data to inform institution's internal policymaking could be argued, at least in part, as promising exploratory finding. Following optimistic perspectives, this may be speculated to bring out more context-informed policymaking, in other words, better regulations, processes, and ultimately, educational quality in higher education. This potential benefit identified related to SXA giving hypothetical data-power to support the participation of students and academics in institutional policymaking can also be used to propose questions of interest for current debates in literature. For example, in the light of critiques to the problems that student surveys and feedback and quality policies can cause to teaching and learning quality, academic traditions and values, and professional and personal well-being for teaching staff (Sabri, 2011; Staddon and Stendish, 2012; Skea et al., 2017; Wintrup et al, 2017), could SXA apps support academics and students to use student experience data to drive relevant policy change or resist counterproductive regulations such as the ones critiqued in recent years? In other words, after identifying the potential of helping users to inform policymaking, could the use of SXA transform the political position of academics and students within their university? If so, how and to what levels and degrees? I believe these questions are of key interest because they focus the attention on the creation of possible tensions between the political influence of more powerful access and analysis of data, in one hand, and the established political hierarchies in higher education institutions, in the other. Could SXA apps be of assistance to counter harmful policy and the highly resisted persistent attempts by the state to control higher education (Harvey, 2005; noted by Cahill et al., 2010)? Could they be used to communicate evidence of how policies affect staff and students? Could this evidence be integrated into internal mechanisms bringing well-informed changes to institutional policies? Or, the ultimate test, could one day SXA tools provide data that helps students or academics to win a court case against a government or institutional policy? In all, these questions emphasise the possibility of data and analytics empowering academics and students to thrust their perspectives and oppose or even reverse the influence of and interests

of more powerful political stakeholders such as institutional and state authorities. Referring to the terminology of Zuboff (2019), this would resemble the datafication and appropriation of student experience by students and academics as knowledge to counter (data) power of the 'big other' (government and corporate bodies such as universities). In other words, this potential benefit identified suggests the idea of using the weapons of surveillance capitalism (data) to keep its data-machine enabled 'coup from above' at bay in higher education contexts. Yet, as a doubled-edged sword, this data power might also be used by corporate universities and states. Furthermore, with the suggestion by Mejias and Couldry (2019) that datafication –and subsequently, the datafication of the student experience- can trouble the notions of individual autonomy and the self as self, and the argument of Wintrup (2017) about student experience data driving the internalisation of disciplinary mechanism, questions also arise: to which extent could the use of data to informing policy change reduce the degree of autonomy and limit the domains of agency of academics and students? What could be the possible implications for partnerships and policy negotiations associated to such hypothetical impacts for the autonomy and agency of students and academics?

5.1.1.5 Expanding the temporalities of educational analysis

The last potential main benefit identified was the hypothetical power of SXA apps to enable the expansion of the temporal dimensions considered by educational analysis, and thus, to expand the domain of what can be discussed as education. Firstly, I identified descriptions by participants that proposed potential benefits associated with the ability to get data and respond to it in real time. Participants discussed common existing delays to collect and report information as significant limitations. In turn, several noted the impression that a tool like the prototype could provide on-demand access to data and dramatically the possibilities for its use. One academic leader expressed this potential affordance as a major benefit:

> *[…] probably even more important is that ability to kind of more, real time feedback, it's real time responding to issues that were coming up.*

Other academic leaders described in more detail how collecting feedback with minimum delay could allow partners to get more valuable and trustworthy data. Or, in other words, how changing the temporality of data collection can lead to feedback of more accurate data that can inform stakeholders in more effective ways:

> *So, the system, I mean, the system is, again, for me is more instantaneous. [The tool] may encourage [...] more student engagement in it, which is what we all want. Because module survey, analysis, module evaluation is notoriously poor. And lecturers want information, they want information from their students [(unclear)] to inform their delivery, to enhance practice. There's no two ways about that! The vast majority of lecturers want that from their students, and [if a system] could give a more accessible method for students to do that, […] because [now we] tend to look at it at the end of the end [of the module], [...] we look at it at the end of the module, not during it. I understand [this tool] is much more contemporaneous. That could add more granularity, also on demand because people have experienced [the issues at that time]... you asked him 'What do you feel?' now, rather than two months later.*

The words of other academic many times seemed to express an emphasis on how just-in-time feedback collection could change the temporality of the feedback loops and give insights about specific activities:

> *in terms of that ongoing feedback, [to gain] that ability to do kind of, you know, after the lecture just saying to students 'Can you just rate this lecture one to five?', that kind of just-in-time evaluation. [That could be r]eally helpful, yeah.*

A vice-president of one student union added a similar perspective from the side of student representatives.

> *A lot of reps have spoken this year that it's been difficult to engage students and get them to provide feedback. And so, I think that having all collated in one place and collected in [..] real time would be and would be really useful to reps.*

In sum, views expressed by participants point to possibilities of beginning to collect and use data in real time and that these new temporalities could provide a number of benefits for their work. The second hypothetical effect on the relationship of educational analysis with time is related to long term, multiyear processes which could be consolidated and examined with an app such as the prototype. A number of participants noted that the prototype affordances of accessing past records and planning data could translate into improving the *continuity* of work in time. A vice-president of a student union synthesised this argument in her own words:

> *in the video, obviously, it does explain some of […] the difficulties tracking change as well over time, I think one of the big things that we miss is the continuity from semester to semester or year to year. Having new reps coming in. It's difficult to track that! It's difficult to see what actions have been taken. So, I think this would be quite an improvement for consistency's sake. And kinda continuity's sake.*

It is important to remember that student representatives normally being elected each year it is particularly difficult for them to keep an eye on the historical records and consider what has happened in the last year, or in longer periods of time. As the participant noted, improving the ability to track things might provide student reps with the opportunity to be conscious of patterns across semesters or years, as well as support more consistent practices over time. Overall, this could arguably expand the temporal scales that student representatives can analyse effectively, and subsequently, also opening up a new dimension for the contributions of the student body as partners higher education. From the position of academics, a participant shared a similar perspective:

> *[A] good way of keeping track of what has been done or has something being done at all, is to look at student feedback from [,] you know, of a bunch of years and then see whether the same complaint has been repeating. Whether the students appreciate what has been changed and so on. We typically don't do this year on year in a sense, so we don't have data for last year. We collect that data, but I don't know where it vanishes. But if there is a system like this which keeps data for two or three years for student feedback and we can access that and compare that. That'll be very beneficial. [TD14]*

One participant delved into the hypothetical possibility of accessing a data trail running over multiple years and how that could help keep the feedback loops, keep the dialogue rolling, and in doing so, strengthen the continuity of their work.

> *Now, I really like this. Because... from the look of this, it looks like there's there's a data trail over a number of years. So, if we have a module running over a number of years, we would see that [data]. I really like this. And I am of the idea of having the to-do list and what's been done and what's been implemented. [Because] some of issues discussed get lost and don't impact [discussions] the next year. What this would allow us to do is keep that feedback loop rolling, of, you know "this last year asked for this", "this is why we've done it". And sometimes what we find this one [cohort] asks for something and we implemented and then the next [student cohort] go "Why did you do that? Because that's a rubbish idea. We want you to go back to what we used to do". And we then [(with this tool)] we'd have that trail there, that we have a wee bit of that in our module reviews. But that's a document that sits on our VLE, rather than being something accessible like this.*

This academic concluded by linking this expansion of continuity and consistency of quality enhancement with the recurrent of continuous improvement philosophies that are widely implemented, and the different recurrent cycles that are related to them.

> *It's almost it's like that audit cycle that you're going around 'plan, do, implement, revise'. [Y]ou know what I mean? The […] continuous improvement cycle.*

The potential of the use of SXA tools to expand the timescales and temporalities of data analysis –from details of student's interaction of fractions of a second to patterns across multiple years- can also serve to draw questions about current debates in literature. There are clear similarities between this benefit and the statements of the UN report 'A world that counts' (2013) about data machines offering possibilities for real time monitoring, in this case, of the learning experiences of students. Could the increase in such capabilities in the future lead to valuable new practices for educational design, teaching and learning in higher education? Clear risks could also be argued. Again, noting Harvey's point (2005) that quality policies have been mainly critiqued as attempts to control higher education, data about new timescales of learning could be argued as offering a unprecedent opportunities to monitor and influence institutions and teaching staff. From Zuboff's (2019; see appendix A for summary) argument of a contemporary context dominated by a rogue surveillance capitalism in which corporations (such as universities) and the state use data-machines to gain unprecedented knowledge and influence over the behaviours of citizens, questions surface about possible threats of producing material conditions that enable creation knowledge of (and hence, influence and control over) additional time-scales of students learning and teaching practice which could be exploited 'from above'. van Dijk's concept of dataism (2014) seems, again, an important factor: could an uncritical stance towards the sophisticated datafication of detailed student interactions and multi-year teaching records plus a naïve trust in the state and corporate institutions open the doors to the dataveillance of new dimensions of higher education, academic work and learning? Knox et al., (2019), Couldry and Mejias (2019) and Rouvroy (2015) also invite to ask questions about expanding datafication of behaviours into wider orders of magnitude, and the likely emergence of novel mechanisms to influence in these new dimensions, and thus, contribute to new forms of machine behaviourism (Knox et al., 2019). Wintrup's comments (2017) point towards the potential risk of an internalisation of disciplinary mechanisms by students and academics, but changes to quality policy could also drive overt institutional and state action. In this sense, such potential impact could also raise questions about the extent to which the concentration of such

data and knowledge could alter the political relations between students, academics, institutions, and the state.

5.1.2 Potential concerns

While the five potential benefits just discussed suggest that the use of SXA tools might bring positive impact in higher education, participants from the contextual interviews also suggested that the use of these tools could also lead to multiple important problems. After finding and organising the common problems indicated by participants, the analysis of interviews produced nine (9) potential main concerns which are described next.

5.1.2.1 Misleading data

The inductive analysis of the discussions with participants in the contextual interviews suggested a common and central concern about the risks of SXA apps sharing misleading data. The data obtained and analysed, and particularly feedback, was discussed as having the power (and thus create threats) to create erroneous interpretations and analysis by decision-makers. Several examples of this were expressed and a few are shared here. Firstly, participants expressed an awareness about *available feedback being scarce and skewed*, troubling the conclusions that could be inferred from this data and posing a GIGO threat (garbage in, garbage out) for the outputs of student experience analytics tools. For instance, if skewed feedback about an aspect of a programme is uncritically examined by a user such as a student rep or an academic leader, it may easily lead to misleading perceptions and interpretations which influence student-staff discussions and decision-making. This kind of examples were a very general concern. Almost all participants, to some degree, explicitly acknowledged this. It can be speculated that the widespread awareness of the risks of misleading data by participants is linked to this issue being widely recognised by academics and student reps. In such a case, this widespread recognition of this problem could then reduce some of the threats of users being misled by the information offered by an analytics app. Furthermore, this analysis also brought attention to the issue of the knowledge and skills needed to interpret data in reliable and safe ways (more of this was found in relation to challenges for adoption, see appendix Z for more details). An academic synthesised the central problem of collecting skewed feedback, which was repeated by participants countless times in contextual interviews, prototype testing with users, and initial interviews and focus groups:

> *[The students that give feedback], [i]t's either the people who are super-happy or the people who are super angry and people who are like so-so and don't really care all that much, well, they also don't care to fill out the forms. So, so the concern partially is well, what are these... what are this kind of scores, […] whatever metrics, what, what kind of scores they are really representative of, which is very hard really to assess.*

Another academic touched on the possibly skewed and misleading feedback which could be obtained by the prototype app if it allowed the collection and storage of data from each learning and assessment activity. The risks of collecting skewed and misleading feedback was discussed as a frequent barrier for academics and student representatives' ability to discuss, progress and act upon the information at hand. This participant also noted that hese threats of misleading feedback could also propagate to analytics tools:

> *in view of the fact that we get a poor response rate to this, to the module evaluation. So, and what will that mean? Who's the person who then responds on a weekly basis, so to speak. And [if data was collected in a weekly basis] how can the lecturer be sure that's the true representation, as you said, of how you're perceived by the cohort?*

A student representative at department-level also highlighted that problems of low response rates and skewed feedback needed to be acknowledged to avoid misjudgments:

> *I think also the response rates should be shown with those rankings [in the prototype]. Because we have some modules [that] you'll get two people feeding back and they will be negative, which I think obviously massively skews the rating (laughs).*

As the previous participants' quotes already suggested, a number of factors can be indicated as influential in skewing the data. Issues such as low response rates and sample sizes, the extreme motivations of the few students that give feedback –either so happy or too disaffected-, the uniqueness of cohorts and modules, wider social biases (about gender, ethnicity, social class), and personal preferences were all pointed out by participants as reasons that required to appraise feedback and data with a critical perspective, and not at face-value in order to avoid misinterpretations that can become the source of erroneous assumptions and decisions. One academic discussed how biases can influence recorded feedback about the experiences of students and why the need of not taking data at face-value:

> *So that might be a graphic here showing students' perceptions. And what we've got to keep in mind as the academic staff is, this is a student perception for that cohort. […] Depending on the module, that module may actually be more conceptually difficult than another module. […] So, [...] if you're a student social worker or a student teacher, you want to be in the field. So, the perceptions of being in the placement are often more positive than being in the university (laughs). So, there are a number of reasons why a module isn't seen as positive as others. I'm not making excuses[,] this is the reality. Not all modules will be conceptually identical. There will be challenges. And also depending on the nature the module, it could be a practical module as opposed a theoretical module. If again, this change people's perceptions. [TD8]*

Regarding the case of possible social discriminatory biases that may be present within broad populations, such as in the student body and other stakeholders, one academic synthesised the example of women and non-white academics receiving more negative feedback:

> *I mean, ultimately, I think it is recognised that student feedback is not an unproblematic tool. The studies have shown that in particular, female academics or academics of colour, it may well be negatively affected by student assumption or student ideas, which then[…] finds its way into and can sometimes be, as you said, disproportionate within the feedback […]*

As underscored in this quote, the implications of such discriminatory biases and the resulting misleading data may be hypothesised might be non-trivial. These questions are further discussed later in this section, but it is important to shift attention to these problematics early on.

As this participant indicated, the feedback collected from educational activities linked with individual academics from oppressed groups such as non-white, non-men academics, could be negatively skewed and generate an underestimation of their teaching performance. Subsequently, and as will be discussed later, such misleading data could lead to serious misuse and damage to these academics in particular, and the inclusiveness, diversity, talent and quality of academia in general.

Finally, misleading data can go beyond just imprecise, skewed, biased or unrepresentative data. An additional connected theme identified is the relation of misleading data and the creation of unrealistic expectations and undesired assumptions in some stakeholders, such as students and academics. This academic firstly describes how additional data can bring excessive student attention to immediate and individual aspects of learning and because of this mislead them to believe that such metrics really matter individually, or at face-value, when, instead, these could be things that need to be evaluated in context and as part of a holistic perspective:

> *I'm equally... I might be more concerned actually about another thing. And that's a thing that we've seen in the last few years and its impact on students' expectations. Because over the last few years... there's always been an element of satisfaction, satisfaction is a valid criterion, but it's been, it's been misunderstood sometimes I think, and it's very much about this immediacy. And that's a danger. Because if you, if you measure things and show students that we measure things, we suggest to them that we care about [these metrics], that that really matters. So, if we, for example, our students, if I stick with the most extreme example, every lecture I've got rated, the student's expectation would be that they should think about each lecture as an individual unit that should be rated a bit like a TV series episode or something like this. We don't want that! It would be the wrong signal to students, even if we said, we're smart enough to evaluate this in the aggregate and understand..., the effect would be there we would have signaled to the students that that matters. And students would think that is so, even if we asked them [to think] about the holistic, if at the end of the semester we asked them about to think about it holistically, they would have already thought about judging individual units and that's really dangerous!*

The participant closed this point by linking it to an underlying concern of collecting data about all individual things becoming reflexive behaviour, or in other words, routinised.

> *We've done this when we introduced the 15-day assessment turn-around [time], suddenly that there were... students got these statistics shown '89 percent have turned...' and sadly in our feedback form, students write, 'my course didn't return it in time'. Before students never said this. We got feedback from students about 'this took very long life. It really, really took long'. But they didn't care whether it was 14 days, 15 days, 16 days. So, I think I would be really worried about the system that our students to evaluate the educational experience only in terms of immediate, immediate evaluations. So that's the thing I would be concerned about at the extreme end of the spectrum where it became routinised, basically.*

The academic then added mention to how academic staff could also fall trapped in this undesired ripple effect.

> *I think there that it's not just the benchmark directly, then the student expectations that they didn't have... [then students communicating these expectations] to staff, then also staff starts..., it becomes like a self-fulfilling... unintended self-fulfilling prophecy at the end. And that, that I've seen that happen one other thing now and I would be really, really worried if that was the case [with collecting data about every learning activity], because that would end up distracting us from thinking about educational quality... into immediate satisfaction, more than we should.*

Synthesising this potential concern, almost all participants noted that data about the student experience, such as student feedback, was not a straightforward, accurate or highly trustworthy representation that can be taken at face value. Accordingly, participants repeatedly indicated that the data which could be collected, analysed and displayed by a SXA tool could create risks of causing serious misleading interpretations and design decisions about –and then direct implications for- educational activities and the learning experiences of students. These potentially negative decisions and implications are part of the other concerns identified and discussed next. In the light of the potential of SXA apps to be a source of misleading data and interpretations, several questions can be drawn in relation to the literature. Firstly, that participants expressed concerns about a persistent threat of misleading about the student experience resonates with the Kitchin's argument (2014) that data is produced by people and an intrinsically fallible abstraction. This begs the question about the quality of data, its interpretations by academics and students, and the resilience that may be required to overcome, or at least to responsibly manage the risks of student experience data --fallible abstractions- misleading student-staff dialogues, co-evaluation and enhancement processes, and agreements achieved. For instance, if academics and students are aware that data in the SXA app is misleading (which would fit with the views expressed by participants which allowed to identify this potential concern), could this lead to them experiencing higher anxiety, stress for being exposed to judgements from misleading data (Wintrup, 2017)? Another point for questions relates to the implications of misleading data for the confidence and operation of partnerships: could misleading data from SXA tools become an inhibitor of effective student-staff partnerships and dialogue (Matthews et al., 2019). In relation to the possible effects of misleading data on decisions and agreements, could these problems ultimately lead to bad decisions which, in opposition to the institutional interest in continuously improve the student experience (Harvey, 2015), end up harming the higher education quality and scholarship (Staddon and Stendish, 2012) In particular, in reference to the argument of Bolch et al., (2021), what kind of implications could be triggered by the use of misleading SXA data in context that the student experience is considered as a measurable educational outcome? If, as Tan et al., (2014) argue, attention is given to data about the contexts and the affective domains of the student learning experience, could misleading data from SXA tools also drive misinterpretation of the learning environments, relationships and emotions? If so, how could this affect higher education practices and communities? To a large degree, the answers to these questions can be associated to the ultimate use given to misleading data. Such is the focus of the next potential negative impact discussed.

5.1.2.2 Misuse and abuse of data

The second potential main concern identified was the possible erroneous or abusive use of data from SXA apps. Misleading data might be a root cause for this potential negative outcome. One academic synthesised some of the emerging issues and tensions related to the possible use or misuse and abuse of data and the fundamental purpose implied:

> *So, I think I saw it from a very positive point of view, from when I looked at it, but I do understand that depending on who's using this data, and then that's the same for all data that we use, it can be used for good or bad. Who's using it and the purposes of it. It could lead, could lead to things or changes being made and yeah, you know, students have a voice, and what they feel are the popular lecturers or modules that they just really enjoy. So, I think we have to balance that. So, I suppose it's around being, being very clear about the purposes of this data and how we use it.*

As this previous participant, several others argued that beyond the reliability or trustworthiness of the data offered by an analytics app, the impacts that this data will have will depend on who and how this data is ultimately used. One speculative example of how student feedback could be used in counterproductive ways was illustrated by other academic:

> *So, I'm going back to assessment [(section in the app)] and I can say, well, that person, let's say there were three assessments in that module, and lecturer 1 did it by assignment, and lecturer 2 did it by, by a test. By a practical test. And the 3rd assessment was an exam, and probably you would see that it would be more in the red for the exam because students may not like the exam because it was difficult. But uhm, the lecturer might say, "Oh, I'm getting poorer ratings than, than the other two people here. And I'd need to change my assessment". That may or may not be appropriate for the particular part of the course that they are teaching and assessing.*

This example presents an interesting scenario in which tensions and contradictions between educational decisions and data from SXA apps might developed. This participant then changed the focus to appraise this same example and added a more reflective pedagogical analysis. Yet, after only a few words in the reflection, the participant appeared to hit the critical problem of who uses the data (continuation of the previous quote):

> *But the lecturer may react in a different way. Then that may be absolutely philosophically fine. Because you might say, "Well, did you really need an exam? Could you examine them in a different way?" [...] but this information... who's... who's looking at this information?*

The participant then continued elaborating based on the example of this data being available by an academic manager:

> *You could have a manager saying that "lecture and in 3 and 4, lecturer delivering Lecture 3 and 4 has got an exam. Students don't like it and they don't pass [the exam]. 'What you're going to do about it?' And they say that to the team. So that's, not necessarily a bad thing because the*

> *team should reflect on what their assessment strategy is, and whether it's appropriate or not.*

While the possibility of data to trigger educational questions may not necessarily be a bad thing, as the participant reiterates, it could put academics in a position where counterproductive changes could be incentivized and made. Such speculative scenario would pose threats of generating undesired educational implications. One frequent topic, that was mentioned throughout the design ethnography and prototyping user-testing too, was the risks of the data available in SXA tools and data being utilised for performance management and hiring decisions. As briefly put by a participant, the value for educational decisions could be:

> *I mean, if a particular member of staff wanted individual feedback, that would be a good way to do it. And the way we run our modules is we don't just have one member of staff teaching in a module. We have maybe up to 10 or 12 members of staff teaching in a module. So, we don't often get that individual feedback on our workshops, laboratories, lectures. So, yeah, that could be useful for a particular member of staff. What you wouldn't want to end up with being used as is being used by management as a performance management tool.*

The majority of participants explicitly recognised that if the data shown by a SXA app is used to assess hiring and promotion decisions this could directly impact on the academic career and place teaching staff in a difficult position. Furthermore, as a noted by a student representative at department level, the availability of greater access to data about teaching activities and the student experience also means more exposure of staff's teaching decision to critique and related consequences (more on these issues will be discussed in the following sections):

> *So, I can understand why staff might be a little bit hesitant, [it] could potentially be problematic [...]. But equally, I think having that feedback is very important. And I just think it's... who gets access to it is the main factor. […] So, we have two or three class representatives, for each year group [in the department]. So that's, I think around 25 people. So, if all of them had access to that [data], I would be concerned that it's not necessarily kept confidential, that it could kind of get around a little bit and staff member put in a bit of a compromising position on the way that they deliver lectures.*

In synthesis, the potential misuse and abuse of data from SXA apps seems to be one of the most controversial and critical findings for academic literature. As noted by one participant, the purpose for which data from SXA apps is ultimately used, and who is using this data, appear to be of crucial importance to determining whether it is being used in desirable or undesirable ways. Accordingly, this finding highlights the importance of further academic debate on a number of key questions: what are the desirable ways of using data about the learning experience of students? Who defines what ways to utilise data are desirable and not? In connection to the question by Bernstein (1973) about curriculum being linguistic appropriation and the selection of what is valid knowledge: what is selected as valid learning and valid evidence of teaching and learning processes? How is this evidence of valid learning processes used in higher education practice? As noted by Sabri (2013) about student surveys, would it be desirable for data from SXA tools to be used as 'fact totem' (De Santos, 2009)? Or as a stick to

‘haunt’ staff to feel data as an emotional bag for which they are personally accountable? Would it be desirable to use this data from SXA apps to, like student surveys, try to aggregate disaggregated experiences? Would it be good to use this data and data machines be used to create more national rankings? Ultimately, it is possible to argue that using of student experience data for other purposes rather than continuous improvement of the quality of learning and teaching (Harvey, 2005) may be considered out of its original, relevant and legitimate intention –hence, worthy of the term misuse or abuse. Yet, what if the intended use is pedagogical but other, and perhaps contrary outcomes are effectively created? For example, taking the ideas of Staddon and Stendish (2012), might data from SXA be used as part of the ‘vicious’ exercise of directing teaching and learning towards achieving observable learning and satisfaction which subjugates learning to the generation of data about it? This brings another angle to question the extent, as argued by Wintrup (2017) for satisfaction surveys, that individuals may feel pressured to make decisions towards producing favourable data for SXA tools: for instance, could the stress and interests related to student experience data press academics into ditching relevant elements of a desirable educational design in order to obtain improved feedback from students? In terms of the critiques of Skea et al., (2017) and Tomlinson (2017) of current narratives related to student experience, could data from SXA apps be used to foster the reduction of higher education into transactional relationships towards students’ present satisfaction and future employability? If so, could the use of SXA tools generate indirect threats for the intellectual development of higher education students? Considering that studies argue of evidence of student ratings positively correlating to grading (e.g., Wang and Williamson, 2022), could the teaching staff and institutions resist temptations to influence and trust data for SXA tools? While the questions regarding what is defined as desirable use of student experience data and who decides may be considered as a priority for future research, the argument of Gourlay and Stevenson (2019) helps to frame a possible answer and ask more questions: to what extent could the misuse of data from a SXA app play against essential academic values such as promoting higher education as a public good, social justice, collaborative work and the critique of hegemonic ideas? Overall, these questions about the possible misuse and abuse of data highlight issues of importance for academic debate and the research and design of SXA tools with user-centred perspectives (Buckingham Shum et al., 2019).

5.1.2.3 Affecting less popular subjects and educational quality

The third potential main concern was that the use of SXA tools was speculated to generate direct and indirect negative impacts of the quality of higher education in general, and for less popular areas of study in particular. One of the key issues raised by participants was that attributing authority to student opinion could lay greater challenges for unpopular courses and subjects of study. Participants argued that while some subjects may not be the most popular across the student body, at the same time these areas could be widely recognised as a key part of the discipline or profession and thus for the formation of the graduates of a programme. In this sense, one teaching director synthesised this problem by linking student feedback data as a possible driver of critical imbalances of programmes:

> *I think I agree with the, the sort of notion that it can be used for, you know, it can be used to, I suppose, withdraw courses that are unpopular with students. It could affect the whole balance, I suppose, of your programme.*

Another senior academic pointed out a very similar narrative and noted possible tensions between the enjoyability and thoroughness and depth of learning activities:

> *I can see the dangers. I think the key there is what questions you ask. [S]o you know, if you ask a question, like, 'how much did you enjoy the lecture today, one to five'. Then, then you risk, you know, that kind of thing where, yeah, the student, the courses that are popular are the ones that are the most enjoyable rather than the ones that get the most learning for them.*

Another participant explicitly pointed out how these tensions courses or modules which are – comparatively and thus relatively- less liked:

> *I was agreeing with all the problems that you highlighted (laughs) and, and also, we all know that there will be courses that will be unpopular with students but are actually required. They might just not like [them].*

This apparently superficial situation was deemed a critical issue by some participants. Details are additionally offered by another senior academic. This participant reflected and shared worry about the example of such a system being exposed to unscrupulous usage such as deciding to 'scrap' a particular course or area of study from a higher programme with lower satisfaction ratings to get more happy students or better scores in national surveys:

> *Uhm well, I think it would be really interesting and really quite useful. What would worry me, as, as you already said, is that, and that's not a problem with the system... But I, I would worry that some people would then say, 'well, you know, that module there consistently does not rate very well, so let's scrap it'. And if that was module that was very important because it teaches certain skills or, or because, you know, it's a, I don't know, it's a topic... I don't know, say it's the only course in medieval history. And you know... it's important to sketch all the different types of history. And, but there might then be a chance that people say, 'well, let's just get rid of medieval history because students don't like it'. I think that concern would still be there. But if, you know, [...] that's not something that you can, uhm, be sure [that] will never happen. I think on this particular system [(curricular view]) it is quite a handy graph that overview. I would just be a bit worried about what people would then do with it.*

Following this example, it is possible to speculate that the use of SXA apps and data could force less subjects to face higher pressures than the ones that they may already face. Moreover, it can be argued that the idea of removing subjects or parts of the curriculum because they are unpopular for students is an extremely controversial matter that could damage academic freedom, the existence of unpopular disciplines and areas of scholarship, and consequently, to cap the knowledge base of future generations. Yet, overall, attention was also brought by participants to the tensions between comparing student experiences, the possible benefits available, and the fair interests in the improvement the quality of higher education. One student representative at a programme level argued that identifying less enjoyable experiences –such as comparing quantitative ratings of learning activities or courses and modules of a programme-

should be framed under the intention of ensuring that students can be supported in these areas where they might be struggling more:

> *I can see the concerns. I think for me that concern is kind of solved more by saying, I understand that there is an issue between popularity and like challenging, but equally, if your, if your purpose is to teach these students and the students, find that it's a hard course and they're not engaging, then that feedback should be relayed. I think […] if something is challenging [for students], then they should be providing the support to help with it. And […] like I think a lot of the feedback that we get will is things like, say, 'this essay was really hard, and when I emailed the tutor about it, they never replied, and so, I had to do it by myself'. So, I think, again, it's, I think feedback from students like this helps... even if it gives it a poorer rating, I think that's more, that's even more of an impetus for the teacher to reconsider how it's taught and how they can improve it.*

Regarding this particular interest on improving the quality of higher education, as already suggested by previous quotes, participants repeatedly gave examples in which the misuse or abuse of data could directly or indirectly damage the quality of the higher education offered in a department or institution. For instance, one academic noted risks of data from SXA apps creating pressures to make courses attractive by sacrificing academic rigour:

> *There clearly is this fear that if everything is driven by this data, then we end up making courses attractive to students and not really drilling down the academic concepts. Obviously, there needs to be a marriage between the two.*

Another participant, in continuation of an argument about quantitative ratings possibly pressing academic staff to change an unpopular assessment activity, indicated that there is a potential that data from a SXA app might lead to modifications that can result in decreasing total learning and educational quality:

> *And you could see people being influenced by that is not necessarily to the to the benefit of the overall student learning. If you see what I mean […i]t could be to the detriment of their overall learning because that [comparatively lower-rated option] may be the best way to teach them, […] to get that knowledge and understanding.*

Such arguments, in my view, strongly resonate with Wiers-Jenssen et al., (2002) discussions about complacent experiences and the need to challenge students in ways that allow deeper transformations. Another participant linked these potential popularity pressures to decisions leading to lower overall educational quality, particularly for non-tenured staff:

> *So, the sort of thing, you know, who's the lecturer who gets the best scores type stuff on a daily basis and so on. Because it would, it would have an impact that would be lecturers, especially lecturers who still, who are not promoted yet, we're not tenured yet. Who would then think about what do I have to do to get better scores rather than what's the best thing for my teaching. And that's dangerous because […] there are courses that*

> *are more popular. A course on current political discourse is going to be more popular than a course on statistics. And that's fine. That's okay.*

Another academic leader who oversaw all the undergraduate programmes of a large engineering department offered further testimony of a similar threat to the quality of the curriculum and on the way stakeholders' access to data could change its significance:

> *We know that we've got some courses... programming skills to Python is, it's a core engineering skill. It's unpopular with students [who] struggle to... everybody struggles with coding to start with, and it's natural that people struggles with coding. So that one always comes out as a lower ranking. And I'd be concerned if we're changing the course so that it stops students struggling so it gets a high ranking.*

Finally, a more extreme hypothetical case of a concerted manipulation of data was brought forward by an academic leader. This example illustrates how SXA, and data could be exposed to complex social reactions that generate additional problems and threats to educational quality and relatively less popular learning activities or subjects:

> *I'm trying not to be Machiavellian about this. But it could...let's say you had two or three exams in a, in a module spread over the semester. And the students could get to gather on a group chat after the first exam and say, "Whoa, let's make this red and make it, make it so that they have to change the assessments so we don't have exams for the second and third outcome" [.] Anyway, it's not as straightforward as that. So, so as ever, the information that students would [see] needs to […] be looked in [as] an overview, and you just need a wee bit careful that you don't get a knee-jerk reaction to instantaneous data.*

Summing up, participants raised as a central concern that the potential misuse and abuse of the data processed by analytics systems could generate negative impacts for unpopular subjects and learning and assessment activities and to damage the educational quality of higher education programmes. Several participants indicated examples of how access to data by different stakeholders could create different conditions determining these risks. Overall, this exploratory finding suggests a number of questions for present debates. Previous questions related to prior findings, such as the potential misuse and abuse of student experience data earlier discussed, have already speculated on the possibility of SXA tools being possibly used for purposes other than enhancing learning and teaching and with possible detrimental effects to these activities. Examples noted in participants' quotes –such academics being pressured and 'incentivised' by SXA data to avoid curricular areas and teaching and learning methods which can be less popular or more challenging for students- seem to resonate with the problem raised by Wiers-Jenssen et al., (2002) Skea et al., (2017) about the educationally soundness and depth of higher education teaching and limitations and associated risks of qualifying higher education in function of satisfying students' short-term expectations and neglect other important purposes of higher education that might be affected by such myopic focus. Could the use SXA tools contribute to reducing the number and rigour of subjects studied in higher education in function prioritising the short-term expectations of students? Considering the argument of Naido and Williamson (2015) that UK quality policies frame higher education as private contractual investment between individual and the institution, could such consumerist regulations create

conditions for data from SXA tools being persistently used to identify and phase out least popular content, learning objectives, teaching practices or subjects of study in order to 'maximise' individual and institutional investment interests? This also intersects with the concerns raised by Staddon and Stendish (2012) of performative quality mechanisms and their argued negative effects in academic traditions and values, and the extent to which the use of SXA apps may be amplify such processes and outcomes. Could the use of data from SXA apps follow performative and consumerist dynamics that subjugate the substance of learning in higher education? Taking the arguments of Sabri (2011), could data from SXA tools be consciously or unconsciously used to hollow out education of the students' experience? While the benefits earlier described discussed potential of the use of SXA tools to contribute to enhancing the learning experiences of students, the main conclusion which can be drawn by this exploratory finding seems to be that the use of these tools may also bring important risks of direct and indirect negative impacts to the quality of learning in higher education. A crucial suggestion of this exploratory result then is that further study and development, particularly with user-centred perspectives (Buckingham Shum et al., 2019) should consider the potential risks of SXA apps and data to producing negative impacts for teaching and learning quality. If these risks are not addressed by more research and debate, this exploratory finding suggests that that well-intentioned implementation of SXA tools could lead to serious harm for the quality of learning in higher education.

5.1.2.4 Professional damage to academic staff and the academic profession

In connection with the previous topics discussed, the next potential main concern identified was participants' description of the risks that SXA could lead to professional and personal damage to academic staff and the academic profession. Participants commonly argued that negative judgments about academics' work could be triggered or influenced by the data on such a system, which could cause professional and personal detriments. This analysis seemed to rely upon participants' experience and knowledge of the dynamics and precedents related to their own contexts, and higher education more in general. Additionally, as already introduced, participants reiterated that non-tenured staff could be more pressured by such threats. A comment by an academic leader at department level threaded though these issues:

> *And then this only compound to some extent [with] the already existing inequalities within departments and concerns regarding status and promotion. And no nobody on my staff, […] who are like relatively advanced in our career and more secure, and, you know, [we] aren't really worried about the next promotion so much. But junior staff especially, or somebody who's been stuck at senior lecturer for 20 years and once chair or whatever would see this without question as something that upper management will use in say, promotion decisions, right? Or, you know, next time you want to [take a] sabbatical, or 'should we support this person to start this new programme' and look at [the data], and they'll look back without question, then kind of go, 'well, they haven't got very good scores', 'historically over the last five or ten years, I don't think they're worth that promotion'. You see what I'm saying.*

A particular feature of the prototype –the overview of curricular data- was a frequent source of these serious concerns. Another senior academic highlighted that the risks of these data

visualisation to produce unfair judgements and damages to teaching and that, as such, the implementation of related functionality would need careful considered, and yet still might not be accepted by academics:

> *And we have to be careful because you know, anyone who has taught for a while understands the you can have a class, that it is well-designed. And you have one course that goes through it and you get fantastic feedback. And the next year you can do the same class with different cohort. And they just don't like aspects of it. And […] they can potentially rate it not so well. Again, again, that negative feedback, it would potentially be damaging to the staff member. Yes, we would not do this type of rating. We do have to think carefully about how it would be received by staff. And I mean, some points might be fair. Some, some may not.*

An academic leader of a department offered a number of insightful reflections about the negative impacts on academic staff's professional and personal wellbeing. Such issues will be central for later theoretical and critical analysis, but we anticipate that potential negative implications for staff in intimate personal and professional domains could have significant consequences for academia and higher education scholarship and partnerships. For instance, as noted by this participant, the mere awareness of the existence of such a system with such data could result in increased stress and anxiety for academic staff, as well as harming their self-worth:

> *And therefore, obviously this could feed into the anxiety among staff that yeah, this kind of scoring system will certainly affect... I have no question about this will certainly affect people's feeling of self-worth. I don't know. The whole thing. Imposter syndrome, you know.*

More discussions on these more profound issues, as already indicated, are covered in later sections. Yet, the essential analysis suggests that, if some of this data is provided by a system such as the prototype, academics might face serious additional pressures and threats. Anxiety and low-self-esteem are widely recognised inhibitors of personal and professional confidence and capabilities, which means, such data could create obstacles for the fluidity and full expression of teaching and learning. Therefore, such potential implications could end up harming the wellbeing of academics plus the quality of higher education and of the knowledge of and abilities of graduates. Just to name a few, some possible ripple effects associated to this could include less capable and resilient professional and academic workforce and future societies, decreased incentives to pursue an academic career and, subsequently, less people contributing to research and the delivery of higher education programmes. Additionally, such concern might also depend on the relationship and trust between academics and management. The same academic leader expressed further ideas pointing that the concerns about damages to academic staff could be a problem even in academic communities that may enjoy healthy leadership:

> *But currently we have a pretty benevolent upper management as in vice chancellor and the top, top management, but before the current people, there was generally a lunatic in charge. And, you*

> *know, somebody who's completely inept. And I mean, it's, it's, it's national public press, no trust [(from staff)], no trust. And so yeah, if something like this was introduced during his regime. This [former chancellor/principal]. If somebody googled [former chancellor/principal] and found out about all the problems that were going on [...] just completely inept to run the institution, I guess, bullying and all the rest, without question staff [would say], 'what is that? No way. No way.'. And even though we have a more benevolent management now, staff are going to go 'that benevolent management, it could be gone in two or three years?' […] So, [people] don't want systems like this generally. So, all of these dynamics, I think [this will] create problems of anxiety and stress among staff.*

The point that risks of damage to staff may rely on the benevolence and culture of high-level management was identified in itself as a main concern and will be discussed later in more detail. Another academic shared a similar thought, describing how quantifying, publishing comparing student ratings of different courses and module could lead to reinforcing the fears of deep implications for academic staff:

> *I very much agree with the notion that we are partners with our client group i.e., students. And that we listen to them and that we take on board their comments, and, look to see how we use those to improve our offering on a continual basis. I do have some reservations about the gradings of professional colleagues in this way. I feel that it's kind of a neoliberal perspective of what we offer, I think that gets distilled into a service, and it's something like TripAdvisor. And when I immediately see things like this, I immediately think, 'Oh, how would I feel that what I created is one star'. And I think that when we get, when we get feedback about our staff, our programmes, on, like we usually use a thing called the Online Surveys tool. We do take on board what's said but when we publish it, we sometimes don't include the little harsh feedback that some colleagues get. We only get [published] 'publicly consumable' [feedback]. That's a thing that when I look it up, because when I'm looking at documentation earlier, that's one of the things that make me take a look above, I thought, 'Oh, I'm not sure about that', whether I would enjoy seeing myself rated in that way. […] I'm happy. I'm happy for any issues in my teaching, or if there's a feeling of my students that they want to raise as an issue with the programme convener, and then they speak to me about that, and I then look to make changes, but for it to be so public, is a problem for me. [...] I would feel the same about any of my colleagues.*

This participant then connected this problem to academics' own professional identity, or even health and well-being, offering additional insights into intimate fears that the prototype raised and arguments for managing this data internally:

> *Indeed, I think I could adversely affect their [(academics)] professionalism. I think you can adversely affect the professional identity [of academic staff]. And if [there] was a continual sense, like, you weren't [rated] well, and everybody can see it, I think that's absolutely problematic for me. And I think that what we need to be doing, as in terms of the health and well-being of our staff, but also in terms of a seamless commitment to ongoing professional development, if indeed students are identifying issues with their practice, what can we do to make changes to improve that, and, and I think I would rather do that behind the scenes than it to be publicly consumable by everyone*.

These risks, fears, and the projection of serious personal and professional problems for staff were raised again by the same participant. The argument provided seems to display both a clear uncomfortable and unsettling feeling about the safety of staff, and what could be signs of an associated red line.

> *I think what you're trying to do, as I'm understanding, it, is to get [...] feedback from students in order to continue to make the learning experience...to continually improve it, and I subscribe to that. And I agree with it. […] I've just got reservations about [the rating of modules]. I think it isn't careful of who sees, who sees that information. I'm just thinking about the well-being and almost like safety of our colleagues. At again, I understand are some colleagues who maybe need help to improve […]. Well, I just feel that... I'm thinking of things like...oh, oh, it's like the old website, like 'Rate your teacher', if you remember that? You know, teachers being rated by their students, and it was public...And I mean, some teachers went off sick because that's. Yeah. So, when I see things like that Diego, I just have some reservations about that.*

It is also especially important to consider that, as already suggested in a prior quote, student feedback could be disproportionately negative for teaching staff of certain discriminated social groups. In that regard, an academic leader elaborated about the dangers perceived about the possible use of SXA apps and data to appraise the performance of teaching staff:

> *[I]f that [biased student feedback] is linked to staff performance and a indeed analysis of staff performance in, in regards their employment, then, yes, that, is that it's deeply problematic. I mean, I had a friend of mine who worked at a European institution. And part of their assessment was about student feedback, which I think is quite horrifying! (laughs). And […] not because [of] the student feedback […] obviously we want students to feedback, and I'd want to take on board what they say, and we want to make changes to suit. But you'll never, you'll never please everybody. And our job is to try and find a happy medium...that pleases enough. And yes, when there is that potential for, for feedback [to]*

> *target particular members of staff that, that is where it enters into, this really dangerous territory.*

Regarding the complex situation generated by potential harmful impacts on academic staff, and the possibility of systems being used in hiring or promotion decisions, one academic leader argued that if such data was collected and processed, it should first get the informed consent of teaching staff members:

> *What you wouldn't want to end up [is] with it being used […] by management as a performance management tool. […] If I had a poorly perform... a perceived poorly performing member of staff, that [...] as a manager, I went to and said "Can you give me feedback on X's lectures so that I can then use as performance management" ... You [should] need to be informed, consent to use it.*

When asked about some of the issues raised, student representatives seemed to frequently acknowledge possible risks faced by staff and the sensitive spaces that could be entered. Previous quotes by student representatives have already hinted at this. One vice-president of the student union argued that some of these dangers related to the way data is collected, and in particular, the questions being asked to students. This institution-level student representative highlighted the tension between the risks of quantified student ratings being linked to teaching staff performance and the value that this data being associated to areas of higher education curriculum. The participant suggested that a possible action of interest could be to ensure that the design and wording of the feedback collection instruments are developed in ways that set the focus on curricular activities and experiences and avoids linking feedback to individual staff:

> *I think that I understand staff's concerns, I think […] that as a student, as a student rep like [me], I would appreciate having the data, especially when I was a student to be able to like, help me make decisions on what courses to choose. But I think that […] I've definitely heel staff's concern there, so I suppose like my, my thought would be just, potentially like figuring a way of like reword it almost, so It's not focused on the overall rating, but like individual aspects of the course that wouldn't make staff feel that like they personally are being rated.*

Nevertheless, it is also important to mention that a few academics offered a number of counterarguments against the concerns about these tools being damaging to staff, and in particular about the overview of curricular data related to student quantitative ratings. One academic leader expressed the view that, while these risks could be latent, academics should be able to handle them:

> *I think that any, any data collected can be, can be used, unfortunately, in that way. I... I don't know, if sort of giving... or say, letting the student reps have the kind of colour-coded data [(overview of curricular structure with colour shades representing different ratings)] about the different sort of maybe areas of feedback of a course, providing you is given also with [the following instruction:] 'we think that this has been an issue in the*

> *past. So, this year for your cohort, we have changed and done this. So, it'll be interesting to know what you see now'. If it, if it continually comes back as a poor rating, then sometimes, sometimes it can be that it's a slightly, I teach very technical accounting modules. Sometimes […] it's like, 'Oh, we don't like it'. Or they like accounting, they have a module that it's all writing, [and] they don't like writing. And people and the institution understand that. And they understand the students, but I can't see how that could expose people. So, I, I do appreciate that [concern], but I think it should be and could be handled OK.*

Another academic discussed a similar stance by arguing that, ultimately, the teaching role is part of the academic job and what primarily funds higher education (and therefore, the academic environment), making it a desirable and legitimate target for data-based evaluation.

> *For the fear of hiring or performance solution. I mean, I don't see the fear. I mean, isn't that what part of our job is? I mean, if you're a poor teacher, we are a poor academic. So, I don't see what [the] fear is. I think it's a bit more transparent. It's the same with hiring, would I want to hire a good teacher as an academic or a bad teacher as an academic? And most likely the answer would be that you would go for the better teacher, right? So, I don't share that fear really. I mean, I don't think that it's misuse of this data. Uhm, and I would really want to know somebody who I was hiring in my team is good at teaching. Obviously, that is 40 percent of the academic job. The other 40 percent will be research and we will have to look at that. The other 20 percent is admin, and we will have to look at that as well. But if you, if you ask any of the top brass from any university, they'll say teaching is what pays the bills. Then you would basically want every academic to be an effective teacher, which probably is reflected by this data. I don't see a problem with that.*

In all, while these last examples question some of the arguments described by other participants, the large majority of them expressed significant concerns about the use of SXA apps and data potentially leading to serious professional and personal damages to academic staff. These findings of these possible risks raise important questions for current literature. Following Wintrup's ideas (2017) about pressures for educators and students related to desirable observable student behaviour, could data shared in a SXA tool make academics suffer feelings of fear of being exposed to judgment, anxiety and professional insecurity? What could be the personal and professional toll of such effects? Which consequences could such effects have for the quality of teaching and learning in higher education? Could this put academics in vulnerable standings which affect the motivation and teaching practices of academics? In relation to the potential threats of SXA apps being used to 'inform' hiring and promotion decisions, this exploratory finding can be linked to Wintrup's point (ibid) about the fear of punishment which could coerce academics to modify their behaviour: could the data shared by SXA apps coerce academics to adapt their teaching practices? In such a case, would the anxiety, professional insecurity and vulnerability produced to academics by SXA tools

become both the driver and collateral damage to implement internalised disciplinary mechanisms aimed at transforming higher education into efficient marketised and consumerist relationships? Would it be fair for academics to be forced to use a SXA app aimed at improving learning experiences, but which ultimately ends up harming them both personally and professionally as well as the principle of academe as a safe place? The argument of McCune (2021) about academics from research-intensive universities having to already balance the pressures related to priority research metrics (e.g., publications) offers to opportunity to ask: to what extent data from SXA tools could be used as a performance management input and further split academics intro trying to excel in research and teaching and fail to be effective in any of them? Could this also have impacts in research practice and outputs such decreasing the amount or quality of academic publications produced? What if, by following Darwin's call (2021) to find more effective evaluation of student perspectives, we end up having analytics apps that might create the affect academic staff in the same, or even worse ways? In the terms of Gourlay (2017), could SXA tools and data lead to pathologise academics who do not use teaching practices with desired observable student behaviour? Could SXA tools alter the sociomaterial network in ways that the assemblages of day-to-day practice create personal and professional damages for academics (ibid)? With quality mechanisms focused on enhancing the student experience being widely critiqued and categorised as vicious (Staddon and Stendish, 2012) for academic values and staff, could the potential additional damages to academics created by SXA apps be tolerated? Should academics resist the adoption of such technologies? Should the development and implementation of SXA apps require to be adequately informed by academics in order to find design patterns which protect them? In any case, all these are questions that, in the light of the exploratory finding of potential risks to harming academic staff, should be attended by future investigation and discussion.

5.1.2.5 Damages to the reputation of departments and institutions

The next potential main concern identified was the possible damage that the use of SXA apps and data could cause to the reputation of academic departments and higher education institutions. In conversations with participants, the idea repeatedly surfaced that if data about the student experience was made available to the wider public, it could inflict serious reputational damage. This issue was picked up in some questions to participants. A couple of student representatives had comments that explicitly illustrated this hypothetical possibility. The first of them, a vice-president of a student organisation, reflected on the public or internal use that was given to this type of data.

> *...as for the public public use [of data], I don't...uhm...it's a tricky one, isn't it? Because for example, in our own surveys that I remember when I was doing my degree, and the surveys that our faculty used, they only used it for their own [internal] use to improve [the programme]. And it wasn't published. And I don't think there's any university at the moment that publishes their surveys for others because of course, as you said, it [could damage the reputation of the institution].*

The other student representative, with a role at department level, also shared thoughts about how wide access to data may hamper the reputation of an institution and its academic departments and programmes. In particular, this participant also associated such risks with affecting enrollment decisions of current and prospective students.

> *No, I wouldn't this [(data)] to be accessible to anybody except for reps. What I meant, if [current or prospective students] were to ask me then I would have the information to be able to [...] present more informed advice to them, but I wouldn't want to give them direct access [to the data], because yeah, exactly, it would, it would skew their understanding. Especially because probably the ratings will not be that high. Just given the way that feedback often goes. And I wouldn't want somebody to not take a course because, you know, it's gotten a three-star rating. Especially if things had been weird like this year [[COVID19 pandemic)]. So, I wouldn't want it to be widely accessible. I think that would be quite problematic, and especially not for prospective students.*

In synthesis, participants noted the threats of wider access to student experience data, or related leaks, could create detrimental impacts in the reputation of modules, programmes, academic departments and higher educational institutions. This could be supposed to have implications, among others, in the decisions of prospective and current students, and thus, influencing the student demand, the size of student cohorts, and financial balances for academic departments and institutions. Moreover, if one is to consider the competition for international students, data from these SXA apps could arguably lead to damaging the reputation of higher education of a country (e.g., international students complaining about being discriminated against in one university could lead to stains in the image of studying in that country). In relation to recent discussion in literature, this exploratory insight raises additional questions. Beerkan and Udam (2017) argued that transparency instruments could create conflicts if the information published shared is not reliable or comprehensible: could SXA apps create conflicts for the reputation of academic departments and higher education institutions if their data is available to a wider public? To what extent the risks of reputational damage may create pressures for the control and usage of SXA apps and tools? As many of these risks were discussed in relation to examples of wide (prospective) students' access to student experience and feedback data, this potential risk also can be linked with tensions described by Mendes and Hammet (2020) about student experience narratives considering students both as consumers and partners at the same time: could giving data to students as partners create conflicts when considering students as consumers (or subsidised funders) in a higher education market?

5.1.2.6 Who has access to what data?

The analysis of the previous concerns suggested by participants suggested that a central question –and then, a main concern- was about who has access to what data in a SXA app. Many of the potential concerns described seemed to depend on what data from a SXA tool different stakeholders could had access to. This pattern emerged early in the initial design ethnography and rapid prototyping and resurfaced as a constant backdrop. The final design maintained potentially critical features so further associated views could be evaluated (instead of being lost within the design process). The words of an academic leader offered a nice way of putting it: depending on who has access to what data, it puts a different *spin* on things.

> *It's really useful just to click through and see how it works. [But] I share the same concerns about who gets to see it, I guess is the key question for me. I was thinking about this as a management tool for me and the head of department and directors of disciplines. I agree that if it's publicly*

> *visible to course [organisers] or going to all academic staff, or is publicly visible to all students, it puts a different spin on things.*

Specific design features of the prototype, such as super admin powers to customise the type of users and their data access, were specifically targeted to face challenges related to this problem. What was attempted in the dialogue of contextual interviews was to ask participants to try to share a quick position on who they think should have or not access to data and why. Facing this question, most participants recognised the trickiness and complexity of the situation and decision. In particular, the extent of wide student access to data was identified as a central and open topic of debate. Some of the ideas communicated by participants are offered next as a testimony of this concern. Firstly, one academic manager shared a comment with what could seem like just practical remarks highlighting that giving students access to large volumes of information might be unnecessary or excessive:

> *I don't think they [(students]) should have access […] to all the individual kind of comments and things that students make. I think that's too much detail.*

A student representative at department level offered a similar view but based on the risks of data misleading student's enrollment choices:

> *I agree with the concern about who has access to this data. Obviously, if you have some modules where students are giving quite negative feedback, that's likely to impact the uptake of those modules in future years... before staff has had the chance to make those improvements, which I think can be quite detrimental to the university and also to those modules.[…] So, if only kind of [...] representatives and staff could have a look at that data, I think that would be better. And then a report generated on the changes that have been made as a result of the feedback could be accessible to everyone. So, I think that's quite important to be able to have control over who sees the data [in] the reports. […] So, if my year group, for example, [if this year] came really negative feedback on a module. And then that was shared with the year below me and I worry that then that module would not have very many students taking up before staff actually have the opportunity to, to make the changes. Which I don't think is necessarily fair.*

Providing a different reasoning, one academic manager reflected on the value that student feedback can give and the question about the extent to which student access to it could be useful and risky, and thus, a source of contradiction and tensions:

> *What [...] I'm commenting on [is] what are the outcomes of a survey up like this [(accessible online through the app)]. And who would therefore be able to influence the direction of the […] delivery [(e.g., teaching, the curriculum), […] I'm going to contradict myself here. I think students should have an input into the overall or rather the team should be able to feed back to the students [and] therefore develop and mold the course accordingly. Because that's what feedback is for, to try and improve the student experience. I've just not quite sure whether everybody...[whether] it's a value for everybody to see all this data.*

The same participant also referred to the hypothetical risks of student feedback being skewed by conscious or unconscious factors:

> *I am hesitating here. My hesitation might be that if you suited [to give access] to students and student reps, then that may influence the overall shape of the module to the core, which the delivery team, might have a different view on and may have developed [with] architecture of the course[.] [...] I don't disagree […] with students having a say in their assessment, and their teacher, or teaching. That's a pillar of education, more in these days where the students are allowed to say how they're assessed and taught. But it would just... we need to be careful that if somebody came out of a hard math's exam and they didn't suddenly get honest and put it down as red because […] they didn't like the exam, and skew that too much... You see what I mean?*

Another academic argued that higher education students were (still) simply too susceptible of influences to be able to manage access to this kind of data.

> *So, I don't think that this data needs to be accessible by students at all. So, I share that. And the reason for that is students are young and impressionable. [TD14]*

Regarding the question of wide student access to data from SXA apps, one academic leader added reference to the tensions and questions and between the difficulty involved in critically appraising this context-dependent data, the even bigger challenges faced when discussing this data with students, and the value and interest of having these kinds of dialogues with students:

> *I'm, I'm in two minds yet. So, to take all staff, I think is useful to be able to point to the ratings of courses and say, 'Well, your course is great, so you don't need to put more effort into it. But on the other hand, another course isn't so good, and you should... […] compare what you've done compared to somebody else'. What, what we're quite careful in engineering is not to make that into a performance review tool. It's always done in the context of, yeah, we understand that some courses are more difficult than others. [W]e're not just using pure numbers. And then if you go to the students, it is a lot more difficult to have that conversation with students. It's in the context of other things that are happening in the curriculum. But on the other hand, you do want to get more conversations with student reps and our student body about what courses are good or what are bad in their... in their eyes.*

A student representative at department level further argued about the benefits of including students in access to data and that that could play a critical part in making these tools valuable:

> *I think […] it should be available for all students. Whoever wishes to have access to this data. I think there's no reason if this is a creative commons license and you are matriculated student, you should be able to have access to it in the same way that you have access to the [current] analytics. To the extent that you do as a student, you don't have edit privileges over the dataset. But the extent to which a report can be*

> *attached to a proposal by a student representative. That's where [the] student representative has an additional resource through this platform. But with the aid of everybody having access to it, insights can be more widespread. And I think that that makes it a really powerful tool.*

This stance carries a notion that students could be more than marginal contributors in these dialogues, and, perhaps by their sheer numbers, the student body could play roles of a dominant source of educational insights and improvement proposals. Beyond students, participants also discussed issues about access to data by other stakeholders. One programme manager illustrated how access by academic managers could open risks of this data being (mis)used for performance assessment:

> *So, I can see all the negatives for this that you listed rather than benefits. I think it might be useful, maybe in terms of... for an individual staff member to see the kind of [quantitative] ratings. And maybe, yeah, they'll even, the, the director of teaching, [...] programme director, I don't think they'd be a benefit in having this particular view [(overview of the curriculum structure and ratings)]. […] Because I can see that the issues of performance review, I mean, […] I think there's that's where it hangs on. It's the concerns about the potential for it to be misused. I can see it could be good, but I can also see the concerns that people would have about that misuse that you, that you gave a really good list of issues that had been raised previously and I would agree with those. I can, I can see them coming through.*

Then, the participant brought an example of past issues with older versions of questionnaires asking feedback on individual staff members and involvement of staff's unions about impacts on academics' career-related progress. Additionally, the participant returned to the idea of using this data internally and how that may allow us to avoid dangerous comparisons.

> *We saw with the course evaluation questionnaire, where there was a section for feedback on individual staff members and then that was removed. […] And I think there was discussions with the unions, from memory though my memory is fuzzy. And yeah, for the same reason that concern that student feedback on a given course might be impacting your, your overall progress, career, yeah, exactly. Yeah. And if you're, if you're teaching something that the students don't particularly want to have to learn (laughs)... Just, it's just the nature of it. Or for some of my colleagues, they were saying that some of the clinical and theoretical courses are just…Oh! and they do their […] best. But there's so much you can do with it. But it still has to be learned. So, we just accept that the, the, the, the results for that are going to be low. But at least those are only discussed individually rather than in the context of the whole course structure that you can see here in terms of rating. […]* It's, it's just, … (silence). Things may change, but, but certainly at the moment, there are too many concerns about the misuse of this kind of information in comparing staff members and courses.

In synthesis, the question of who has access to what data seemed to be a crucial factor in determining some of the risks of misuse or abuse of data and a central concern related to the design and potential use of SXA apps in higher education. In the light of this exploratory finding, a number of questions related to recent literature can also be proposed. From the argument of Wintrup (2017) that the availability of data can make educators and students feel exposed to be categorised and punished on the basis of observable or 'visible' student behaviour, it is possible to ask: could greater access to data about student behaviour and feedback lead to more intense feelings of vulnerability for students and teaching staff? It was clear from participants that one of the key issues revolved around opening access to data from the prototype to students. As discussed because of preliminary exploration (Rates and Gašević, 2022; see also: Klemencic, 2012), could sharing data with students be recognised as a necessity for egalitarian participation as partners? On the other hand, might students' access make data to be taken as an emotional badge (Sabri, 2013) by academic staff? Should all data be made openly available to every student? Should all data be made available just for student representatives and only specific data shared with the whole student body? Should academic staff be the only ones with access and have the power to select which data to share with student representatives? Arguments could be offered to support each of these positions: but in any case, the definition on whether students (and which ones) have access to data seem to have consequences how partnership dialogues could be construed, and the extent of the professional risk for academics and the reputational threats to academic departments and institutions. These questions also resonate with the argument of Berkeens and Udam (2017) of the risks of transparency instruments to create conflicts when the published information is received by individuals who may not be ready to interpret it or use it correctly: are students prepared, in terms of skills and conceptual knowledge, to interpret student feedback about teaching? This question is reconsidered in the following sections. Nevertheless, beyond students' access to data, important questions also emerge in relation to academic and institutional management data access. As quotes from participants in this and previous potential impacts described suggest, access to some of the data of SXA apps could be used –overtly or covertly- to influence hiring and promotion decisions that affect the careers of academics. The sentiments of participants denoted anxiousness about such prospects. Could the access to data by academic and institutional managers determine whether it is used as a stick –external or internalised- to press teaching staff (Wintrup, 2017)? Should data be only available for teaching staff of the programme? Should academic managers be given access to monitor educational quality within departments? Should institutional managers have access too? What legitimate use could they give to data? These questions suggest that access to data by staff and managers could be linked to the structure and participation in quality monitoring process, the governance of institutions and the internal allocation of funding to programmes and departments. These issues seem of interest, again, for the design of SXA tools from user-centred perspectives (Buckingham Shum et al., 2019). Additional questions can be raised in relation to the possible access to data from SXA apps by the state. Noting the critiques of quality policies for manifesting the intentions of governments to control higher education sectors and academia: is the state expected to access this kind of sensitive data about students and teaching activities in higher education? Could contemporary states resist the economic and political temptation to gain access to such kind of data? What guarantees could ensure that institutions have due autonomy from the state in this regard? Would those guarantees be compatible with the state's stake on regulating and accrediting higher education institutions? Yet, all these questions about

who gets access to data converge on another question: who is in control and defines who gets access to what data?

5.1.2.7 Who is in control?

My analysis of contextual interviews identified that the question of who is in control of SXA apps and data distribution was a pivotal concern. Participants highlighted that, due to different interests being a play, it may not be easy to arrive at a wide consensus on the use of SXA tools and their data. Subsequently, the ultimate power to make decisions about the design and use of SXA apps seemed an essential point of tensions. The following quotes from participants illustrate these concerns. One academic manager at department level briefly signaled that teaching staff might need to know what control they have, and what access to data is granted to students and student representatives:

> *[...] I think academic staff would like to know, I think was not clear in the presentation [from the demo video], or you might want to reinforce this, is that how much is released to the student? We talked about this before. […] I think that may be something that academic staff find helpful, [that] they knew the control they had. [...] I think [you have to] reassure people of how students can access the data, or the student reps can access the data., that it's not about identifying individual or finger-pointing the individual lecturers...*

With the previous background, this quote seems to suggest that a degree of control and knowledge about data access could be necessary to reassure teaching staff and avoid them feeling overly exposed or vulnerable. This idea implies that transparency and control regarding data could be an essential part of the mix, with the latter being an obstacle for open access to data about the student's experience. The words of a student representative at department level focused on these problems and offered a personal view of what could be necessary. Firstly, the participant noted that surveillance from the end-user could become a real issue:

> *I think them as exactly as you said, it's this ideal constant surveillance. It's, it's the, the problematic potential outcome which moves, you know, instead of surveillance from authority, you have surveillance from the end-user. And it can risk becoming a, a problematic aspect. And especially because of the emphasis on... on mono-dimensional information. Poor to excellent. Or for example, if we go back to assessment or objective, we've got a categorical distinction between courses that implies maybe more difference than there really is. And it should be [informative] [...] [T]he insight is not meant to be profound, and it's not meant to be nuanced.*

Later, the participant suggested that, in such cases it may be better that the university hosts such data in order to maintain a degree of control.

> *[...] And maybe allowing students to provide feedback on courses in a way that's visible to other students, should be something done on a service hosted by the University. So that the university can, you know, retain control. Not necessarily censorship, but at least retain jurisdiction over [...] where the data lives and what it looks like and what the messaging is.*

In the light of previous exploratory findings suggesting potential display of misleading data in SXA apps, negative impacts for teaching and learning quality as well as for the well-being and academic careers of academics and institutional reputation, plus concerns related with who gets access to data, the problem who is in control of the architecture, design and implementation of SXA tools was noted as an important question by participants during the contextual interviews. The ideas described by them, as shown in the above quotes, suggest that academics may feel the need to have a degree of control of SXA, --particularly about the distribution of data- in order to feel comfortable, safe and enthusiastic about the implementation of such systems. This, once again, could be linked to Wintrup's (2017) arguments about academics' fears that data (and hence, SXA apps) could expose them to external judgement. Such is a critical (design) hypothesis, as it could be used, following contemporary user-centred design approaches as the ones that have been argued for LA (Buckingham Shum et al., 2019), to argue in favour of design patterns which give operational control of SXA apps to academics. In technical slang, that could mean to make academics 'Super Admin' power –which define the users of the app and what modules and data they get. If, as Sabris argued for student surveys, SXA apps and their data become a receive intensive social attention, lead to sense-making and the narrative interpretation and public (or silent) opinion, they can become (or be made) a 'fact totem' (from De Santos, 2006). In this sense, a question of interest is: to what extent might the control of SXA users and data distribution (e.g., Super Admin powers) could influence SXA tools in becoming fact totems, sticks wielded to modify behaviours , or feared sources of external surveillance, categorisation and feelings of dread and anxiety? On the other hand, the top management of higher education institutions (which operate as corporations) might have the financial and legal power to claim operational control of a critical system as SXA apps. The quote from a student representative describing the potential importance of institutional jurisdiction over SXA data reemphasises this possibility. Could it be possible for the corporative structures of higher education institutions to be interested in ceding data sovereignty to academics? Taking the critiques of van Dijk (2014) and Zuboff (2019) about data becoming a key asset for surveillance and social influence, could this data-power persuade higher institution corporative management to become interested in keeping access and operational control of data in SXA apps? Obviously, the question of where students fall in this is also a critical one. Could students share a part or a say with academics in the control of SXA apps? Following the arguments of Tomlinson (2015) about student experience narratives producing transactional and consumerist approaches in higher education, to what extent could student involvement in the control and architecture of SXA tools promote transactional and marketised narratives and dynamics? On the other hand, notions of student-staff partnerships seek, as a general principle, to involve students in teaching and quality enhancement practices and processes as egalitarian partners, such as in decision-making and negotiation. Then, from a student-staff partnership perspective, as access to data from SXA tools could influence the participation of students in decision-making, decisions about the architecture and operational control of SXA apps and data should, whereas possible, include students too. Calls for human- and user-centred design of LA systems by Buckingham Shum et al., (2019), could also be argued as strongly aligned with the participation of students in co-designing a tool which they will use as partners of quality enhancement discussion and decision-making. Finally, questions about the control of the student experience and feedback data also arise in relation to the position of contemporary governments and policymakers. Bringing again the arguments of a *dataveillance*, *dataism*, surveillance capitalism from van Dijk (2013) and Zuboff (2019), it begs to ask the question whether the post-industrial state apparatus could relinquish data autonomy and sovereignty to

higher education institutions, academics or students. Could economic and strategic interests of the state lead to the governments and policymakers to seek, within a context of private contractual investments and mutual expectations (Naido and Williamosn, 2015), to use student experience data to amplify the employability and economic impact of higher education? For instance, could policymakers exercise their legal powers to create regulations (i.e., control) which establish that student experience data from a SXA tool should be used to measure student experience and satisfaction as an outcome? Since van Dijk (2013) suggests digital data as a preferred channel for state surveillance and control, could the state really be trusted to exercise degrees of control over SXA apps and student experience and feedback data? Could it be possible that the contemporary state apparatus, situated in a rogue capitalism (Zuboff, 2019) with a global competition of industrial military complexes fighting for asymmetrical advantages such as information supremacy, might abuse its power to, in the name of the quality of learning in higher education, appropriate of the (datafied) experiences of students to gain additional strategic knowledge and control of higher education institutions and academia? Within these scenarios, could these and other serious risks be controlled in technical ways? For instance, could risks of data leaks jeopardise all the possible technical safeguards? In sum, as illustrated by these questions, control of student experience systems and data appear to be a difficult but crucial topic which future studies and discussions should address –and hopefully, before technology goes faster than academic debate, if this has not already happened.

5.1.2.8 Reliance on management and leadership culture

Following the identification of concerns about potential negative impacts of the use of data from SXA apps and the critical questions about who has access to data and who is in control of these tools, the next potential main concern identified was the hypothetical need to rely on institutional management and its leadership culture. As many previous quotes illustrated, data about the student experience could be used for good or bad. As already mentioned, this leads to a focus on the problem of who uses the data, who has control, and how data is used. One participant expressed such concern in relation to the possible misuse of this data for performance management:

> *I think definitely [in] my institution, we use these for [the] enhancement agenda. So, it definitely is not used for performance […] it is used if there are major issues, to identify them easily so that we can put mitigations in place. I think probably it will depend on the institution and the line management or whether it could be misused in that way, [I] think [it] has got nothing to do with having the data there, I think providing the data and a nice visual way like that would be very useful.*

A programme manager also shared a similar conclusion about the risks of misuse of data for performance management and noted that academic managers in their institution could already access feedback related to staff, but it seemed to be ignored, or at least not used for appraising the work of academic staff. The participant suggested that the decisions to use SXA data in desirable or undesirable ways might be determined by the prevailing institutional culture:

> *[…] well, that depends on perhaps the institutional culture. […] Yes. I think it should and could be handled by saying 'well, that didn't go well. Okay, So, we're going to try this instead. How's it going?' And you know that's all you can ever do. But yeah, […] I think that it could be used negatively, but I would hope it would*

> *not but, anything like that is a risk. And I, I know that all the online module survey feedback that I get, I can access mine, I can access them for everybody in the programme, I don't know if they are aware of that. But I can, and I know that my boss and subject network leader, etcetera, they can all access them as well. So, you know, they, they are already able to access should they choose. But they don't tend to choose to access them, if I'm honest.*

Finally, following the arguments of an hypothetical dependency on institutional management and culture to avoid undesirable use of SXA apps and data, one academic leader offered a *sombre* analysis about the fundamental weaknesses of relying on top-level institutional management and leaders to control the safe and desirable use of SXA apps --while some leaders may be 'benevolent' or commit to not using data from SXA tools in questionable ways such as teaching performance management, leadership is constantly renewed:

> *So, I think whether or not it's used that way by upper management, you would have, almost certainly, almost certainly upper management who say 'We would never do that'. But it doesn't really matter because upper management changes. The next regime might. […] Data will always be used, right? You and I probably know that right, like once it exists... is like tech. [...] once tech has developed it's used, it may not be for good, right? And if this data is collected without question, students or staff will feel it's going to be used to judge them.*

In connection with previous possible concerns such as potential misuse of data, who has access to data and who has control, the reliance in line and upper academic and institution management and the leadership culture appeared to be weak point for a range of potential misuses and abuses of student experience data. Looking at Staddon and Stendish (2012) description of quality mechanism focused on student satisfaction and feedback as a vicious 'subjugation of learning' to the production of feedback which universities are required to provide' (p.647): to what extent could upper institutional management and leadership culture be trusted to implement SXA apps? With the widely discussed economic and pressures which higher education institutions face and the student experience being portrayed as a key area for universities to remain competitive (Staddon and Stendish, 2012): could institutional management and leadership culture be in a position to resist pressures to (mis)use SXA tools and data as performance, hiring and promotion tool in order to increase the market competitiveness of the programmes and departments of the institutions? As a participant discussed previously, management changes, so whilst 'benevolent' or principled leaders may be relied on to make good decisions, other future leaders may succumb to economic stress. Such an idea brings back the question of neoliberal policies and marketised higher education systems in which consumerist approaches and transactional relations: to what extent could institutional upper management be able to resist the market forces and financial pressures linked to student experience data?

5.1.2.9 Complex human environment and unforeseen consequences

Closing the concerns identified in this exploratory study is the discussion by some participants of an inevitability for the implementation of systems such as SXA tools in complex human context to trigger unforeseen consequences that go beyond initial intensions. As expressed by a participant, based on personal experience with the (not quite successful) implementation of innovative digital educational technologies:

> *You will be asked all these questions about when humans deal with these [tools], and maybe some things that are unintended consequences. [We don't know e]xactly how it can impact on how people work. I'm not saying this will happen to you. But maybe aspects of what I've been through, building a technological solution [...] but then […] put it into place, the human aspect of things starts to become apparent. And through my experience and some of the things we've done, that's what made me kind of like ask you questions the way I've done about your app.*

As described by this participant, the complex human environment implies that the adoption of systems such as data-machines may end up being adopted in different ways than planned. In relation to this problem, some examples were suggested by participants to illustrate how the implementation of SXA apps could go in different directions than expected or intended. One academic leader talked about the risks of the emergence of poorly thought, routinised and mechanistic practices such as collecting data for data-sake:

> *My, my worry would be that we end up collecting too much data, and the data... unfocused... data collected for data-sake. So, it's a case of just because we can do it, everybody feels that they've 'got to do it'.*

Another academic leader shared a description of a similar speculative scenario in which every teaching activity could end up being subjected to automated monitoring:

> *I mean, the biggest, the biggest problem I see is, it's I think the danger of an app like this, if I go to the most problematic side, is to automate it, like the nightmare scenario […] we've been joking about this for a few years. But is that [scenario of] every student [rating] every lecture, for example, that sort of thing.*

This participant continued by explaining why such all-seeing, immediate experience, and micro-management focus could seriously interfere with what the participant argued as good teaching practice and become critically dangerous for higher education:

> *Because [every student rating every lecturer] it's not how we should evaluate, because you might come out of a lecture incredibly frustrated. And that's a good thing because […] frustration as part of a learning process, sometimes not every lecture should leave you with a good feeling, for example. So, while sometimes I think kind of micro assessments could be really helpful, for example, direct feedback off a certain intervention [that] we're trying, what I would be really [(emphasis by the interviewee)] worried about it if this was rolled out across […] an entire university or college level. That kind of all courses, all elements are assessed basically constantly by students because it would shift the focus from the learning experience overall to evaluating individual things. Individual things have to be evaluated on an individual basis. And that can be really dangerous because it draws the attention away from a more holistic kind of evaluation to the immediate experience. And sometimes the immediate experience is not relevant. It's actually wrong to focus on it. But sometimes it is [(relevant to focus on it)]. I think [...] I see an app like this incredibly useful if it can be used flexibly. If it was the sort of thing that really became like a constant monitoring tool, I think it would be really counterproductive.*

The ideas discussed by participants about the potential for ripple, unintended and unforeseen impacts of implementing SXA apps open up new questions about how these data machines could influence the future of higher education. In short, my interpretation is that participants indicated that, based on their own experience and reflection, the impacts that technologies (such as SXA tools) can have likely go beyond what could be previously expected and predicted. In other words, even though potential impacts may be identified by testing prototypes and interviewing potential users and informed proxies, the idea is that the ultimate consequences of SXA apps cannot be fully understood and anticipated *a priori*. Quotes from participants, for instance, highlight that the use of SXA tools and data could follow inertial, routinary practices. This, once again, resonates with the Staddon and Stendish (2012) critique of the vicious performativity which, they argue, has been related to quality mechanisms in higher education. The third last quote here illustrates the uncertainties about the automation of monitoring process based on detailed student experience data where every lecture and teaching activity is categorised. Could this automation --as the participant suggested- further shift attention from a holistic view of education towards individual, segregated evaluation of learning activities? Once more, this resonates with the critique of Staddon and Stendish (ibid) about learning being subjugated to the production of feedback and experience being hollowed out of education. In any case, besides the specific points mentioned by these participants (of inertial adoption and automation), I think the main questions related to the complex human and social factors within which SXA tools could be implemented and the fundamental limitations to the ability to anticipate the full range of possible associated consequences for higher education. Are there any odds –as some participants expressed- of serious negative impacts for the human and social domains of higher education that go beyond what is desired or tolerated? How should the study and development of SXA apps address these potential consequences? From a user-centred design perspective (Buckingham et al., 2019), how and to what extent can unforeseen impacts of SXA tool for users and higher education stakeholders be identified, addressed or mitigated? To what degree could design research methods avoid unforeseen impacts to the democratic and human aspects of higher education (Parkers et al., 2017).

5.1.3 Main conclusion from potential impacts identified in the analysis of contextual interviews

To summarise, the main conclusions from the exploratory findings about the potential desirable and undesirable impacts of the use of analytic applications to support the improvement of the student experience in higher education is that both relevant positive or negative possible effects were suggested by academic leaders and student representatives from Scottish universities. On the basis of this exploratory results, it is possible to argue that more research about the potential impacts of SXA tools would be justified due to their speculative potential of creating both benefits but also unintended consequences for higher education. While this study cannot claim to be generalisable to all institutions and countries and only considered Scottish universities, there was no signal that the potential impacts identified may be exclusively associated to the unique regulatory or cultural characteristics of Scottish institutions. Thus, to some extent the findings might be a relevant reference for further research in other countries.

5.2 Theoretical and critical analysis

To complete the results obtained in this study, the following sections present a brief theoretical and critical analysis, respectively, of the main potential benefits, negative effects and challenge found from the analysis of the contextual interviews with academics and student reps. For each

of these, the first paragraph offers a theoretical analysis based on the conceptualisation of the student experience and SXA data and analytics proposed in this study. The second paragraph then offers a critique of the implied discourse about power.

5.2.1 Benefits?

5.2.1.1 Better understanding of the experience of students

Theoretical analysis: strengthen the epistemic power of the co-transformational educational experience

The hypothetical gains in the access to and quantity, quality, detail, speed of data that could be theoretically interpreted as SXA apps becoming an instrument for extended cognition which could give student reps and academics the power to gain more descriptions (linguistic distinctions) and sophisticated analysis, and thus, a more robust collective sense about the interactions, contexts (places) and perspectives (accounts) of students which are part of their higher education. Accordingly, in brief words, based on this exploratory finding, it is possible to speculate that SXA tools may have the potential to expand the epistemic or cognitive power of educational (design and improvement) observers regarding students' learning experiences. In this way, in theory, the more knowledgeable observers are about the student experience, the better informed they are about the options to create more desirable learning activities and curricula (co-ontogenic drift). Such theoretical speculations could be of interest in several current discussions, such as in research about higher education quality focused on the improvement of the student experience (e.g., Harvey, 2005; Sabri, 2011, 2013; Staddon and Stendish, 2012), student participation in representation (Klemencic 2012; Rates and Gašević, 2022) and partnerships (Bovill and Felten, 2016; Matthews, 2019), and the design and theory of higher education curriculum (Linden et al., 2017, 2019; Young, 2013; Kelly, 2009, and; Bernstein, 1973).

Critical analysis: claiming legitimate power over the student experience

A critical analysis, from a Foucauldian lens, suggests that the attempted narrative of this first and central potential benefit is, in quite an explicitly way, a discursive attempt to claim that SXA data and systems can provide educational epistemic supremacy. Attributing increased and dominant epistemic power over the student experience can be argued as a discursive mechanism to declare legitimate control over educational decisions. In an evident contradiction, this analysis of power resonates with Maturana's famous proposition: objectivity is what I claim when I want to force my way without resorting to physical violence (or, as a pretext to use it). The idea of increased epistemic power suggested can then be argued as being directly linked to claims of political power. Whilst the discourse could be argued as mirroring bottom-up approaches with narratives of giving epistemic and political power to students and academics (QAA, 2015), nothing guarantees that this narrative will not harm educational practice or their political standing. For instance, one could imagine that operational control over such systems could relay at institution-wide levels, and hence, the epistemic and political power regarding education could also be proclaimed or disputed by the most dominant and influential echelons within universities. Furthermore, with states granting institutions the legal authority to offer higher education programmes, governments and policymakers could impose direct control or indirect regulation over SX data and systems by means of coercion (e.g., accreditation requirements). With higher education being argued as pressured to focus strategic effort on the

goal of improving the student experience in order to remain competitive in a marketised context (Staddon and Stendish, 2012; Bloch et al. ,2021), questions may be proposed about whether the claim of a data-machine enabled epistemic dominance about the student experience could lead to changes in the political standing of teaching staff and students who might depend on the institutional and state construction and regulation of such artefacts, respectively. Overall, these critical issues raised about the assertion of hegemonic epistemic offer initial insights which may be of interest for literature consumerist and marketised higher education (e.g., Sabri, 2011; Wiers-Jensen et al., 2002; Skea et al., 2017; Naido and Williams, 2015) as well as policy and politics related to the improvement of the quality of higher education (e.g., Harvey, 2005).

5.2.1.2 Closing feedback loops and dialogue

Theoretical analysis: Strengthening communication, structural coupling and co-transformative experiences

Feedback cycles and dialogue can be considered as crucial parts of the languaging activity which is fundamentally required to coordinate the mutually consensual co-transformation between the educators and the student body. If student feedback is obtained, discussed, actions are decided and taken yet there is not an effective closure of the feedback loop in a consistent manner –what seemed a common issue for participants of different institutions—the student body will likely struggle to make distinctions and individual and collective sense about giving feedback and participating in decision-making having any relevant impact in educational practice and the student experience. In other words, without closing feedback loops student might not be able to distinguish that the co-transformation experience responds to their expectations and that the higher education is a place in which they are accepted as listened to. The hypothetical benefits of helping close feedback loops can then be theoretically interpreted as supporting students to make more meaningful distinctions about the impacts of giving feedback and participating in educational discussions and decisions. In turn, these additional distinctions that the student body could be able to make should in theory provide students with a more consistent and coherent sense about the value of giving feedback, of participating in educational improvement processes and of higher education as place that accepts and listen to them. Furthermore, it can be theoretically argued that helping to close feedback loops may contribute to students strengthened epistemic power and languaging operations, and in this way, increase the possibilities for students' recursive interaction and the histories of consensual co-transformation within the higher education institution. Subsequently, it can be proposed that closing feedback loops could drive significant or even fundamental contributions in the dialogue and educational relation between the student body and academic staff, at multiple curricular levels –as participants also pointed out. Real dialogue, it must be remembered, is an essential requirement for aspirations of egalitarian participation of the student body in higher education. That is, for academic staff go beyond their greater expertise and remain open to accepting the legitimacy of students and their perspectives, so both engage in dialogic discussions where collective sense and mutually accepted agreements are construed. These co-created collective sense and agreements are materialised and they change how observers perceive and interpret the world, and in doing so, they also change the references that observers use to give sense to their own identity. Thus, it can be theoretically interpreted that SXA systems' speculated assistance in closing feedback loops and fostering student-staff dialogue may have significant influence in the educational and improvement processes, decisions and practices of higher education. Moreover, the theoretical framing describes more detailed mechanism in which such

influence could be materialised. Thus, this initial theoretical analysis seems of relevance for discussions about the enhancement of learning quality in higher education. In particular, this exploratory theoretical analysis resonates with debates about the effectiveness of student-staff partnerships and students (e.g., Matthews et al., 2019) and of how teaching staff perceive the educational environment and themselves. Interestingly, the theoretical analysis of the potential of SXA tools to support student-staff dialogue seems to be aligned with agendas that promote the benefits of high levels of student involvement (Parkers et al. 2017) and offer counterarguments to positions that categorise it as 'encouraging lack of confidence' in the ability of teaching staff to decide about their teaching (e.g., Staddon and Stendish, 2012) and limiting higher education to meeting the short-term expectations of students (Skea et al., 2017). Enhancing student-staff dialogue and feedback loops could also help to dissipate some of the tensions which, as Mendes and Hammet argued (2021), create conflicts about the contradictions between simultaneous understanding of students as consumers and partners. This initial theoretical analysis also raises questions about how fostering dialogue and closing feedback loops could influence academics' views of their teaching and research roles and professional identity (McCune, 2021) as well as the opportunities that this potential benefit could create to catalyse more sophisticated forms of pedagogical practice (Darwin, 2021).

Critical analysis: Legitimising the marketisation of higher education

From a critical position, it is possible to interpret that this potential benefit of helping closing feedback loops and dialogue between staff and students as an attempt to legitimise the marketisation of higher education and the use of SX data and analytics to have critical influence in this effort. By suggesting that SXA could improve communication and dialogue between students and staff, and therefore drive changes in the way they observe the educational environment and themselves and open up new opportunities for making higher education better, a few assumptions are implied. Firstly, that providers and customers –staff and students, respectively—are observers that have legitimate authority over educational decisions in higher education contexts. That assumption then conveys that both staff and students must negotiate in order to legimitise the educational activities to be delivered. More specifically, the idea of helping to close feedback circuits carries implied the assumption that teaching staff needs accounting back to the student body, thus, that students have legitimate aspirations of monitoring (surveilling) and bargaining power over the actions of academics. In conclusion, the suggestion that helping closing feedback loops and improve dialogue is a desired outcome can be used to normalise the belief that teaching staff has legitimate educational authority only insofar as they consent to give monitoring and bargaining power to customers. In other words, the underlying narrative is that higher education and knowledge-transfer is only legitimate if it is in the form of an ideal market, where customers wield effective monitoring and bargaining power. Furthermore, the discourse also claims that SXA could be crucial to secure the material conditions that guarantee student monitoring and bargaining power. The final implications of this are that, firstly, academic staff no longer have legitimate authority and power over their knowledge and how it should be distributed. Secondly, using SXA tools could ensure that customers have monitoring and bargaining power, and by doing so, will cause higher education to operate as an ideal market, where academic control over knowledge is infinitely diluted by market forces. In conclusion, from the perspective of modern and contemporary forms of state monitoring and control, the claim that SXA apps could foster the student-staff dialogue and closing feedback loops could be abused –and hence, contested- as a discursive mechanism aimed at persuading academics and students that into accepting market logics promoted by a

state to control and modify higher education towards increasing its power over human populations. Accordingly, such claims could potentially be a source for critical analysis. In particular, questions about the degree of performativity of SXA's hypothetical contributions to student-staff dialogues and feedback loops (Staddon and Stendish, 2012) and to the internalisation of disciplinary mechanisms in quality enhancement processes (Wintrup, 2017). Moreover, further questions can be suggested in relation to this claimed potential benefit could have for the encouragement of a lack of confidence in teaching staff (Staddon and Stendish, 2012) and the powerlessness (Sabri, 2013) that academics may experience in these speculated scenarios.

5.2.1.3 Supporting educational improvements and curricular development

Theoretical analysis: Refined curricular decisions, more coherent and desirable consensual co-transformation

Participants indicated that more and better data offered by the SXA prototype could give them improved distinctions about students' educational experiences, and that this could ultimately help them identify more opportunities for educational improvements and curricular development. This contribution of additional ideas to support educational refinement can be interpreted, at first instance, as increasing observers' ability to find more mutually desired changes to the programmes of study, and hence, to their co-ontogenic drift. Linking back to curriculum theory, it is possible to say that teaching staff and students may be assisted by SXA to make better decisions when selecting (Bernstein, 1973) the knowledge, outcomes, processes and empowering strategy of educational plans (Linden et al., 2017; Kelly, 2009) that shape how societies build, maintain and change themselves (Young). If a stronger ability to find improvements is followed by adequate implementation, the effect should in theory lead to higher education programmes becoming better –in retrospective, more desirable and coherent with the expectations and emotions of students and teaching staff than before the changes were made. Accordingly, following this scenario, students should end up benefiting from improved the quality of the educational activities, interactions and experience. Obviously, these benefits would depend on the actual improvements made, more specifically, what was improved (if at all). However, in general, if we assume that the educational process is classified as a mutually accepted co-transformation, it can be interpreted as students taking part in experiences that recursively transform them in ways that are more desirable for them. If we also assume that the students and staff have acceptance and fraternal love towards other human beings (such as Maturana and Varela's would encourage), those more desired transformational experience should not, at least in first instance, be against being hostile or harmful to other third parties. Considering that those more desirable educational activities could lead to more and better qualified professionals and higher education graduates such as doctors, engineers, educators or journalists, to name a few, it would be possible to assume that supporting curricular improvements and development could have highly desirable social implications impacts (e.g., better health care, education, technology, press, justice system, government). In turn, these could be broadly interpreted as enhancing the distribution and performance of advanced operations and interactions that build complex and sophisticated contemporary societies (Young, 2013). In this way, by propagation, enhancing the learning and curricular experiences of higher education programmes, the experiences of the wider population could also be improved in multiple ways. Then, in theory, higher education could also be suggested as becoming more effective in delivering key social contributions. Such initial theorisation raises

additional questions about the extent to which SXA apps can help students and academics in finding more coherent and desirable higher education practice and to which this could be or not aligned with the intellectual development of students (Wiers-Jensen et all., 2002; Skea et al., 2017), fostering academic values and principles (Staddon and Stendish, 2012), contributing to the wider public good of higher education (e.g., countering the critique of Sabri, 2011) and contemporary society (Young, 2013).

Critical analysis: Expanding the marketisation of higher education programmes

While the discourse of the potential of student experience data and analytics to expand the epistemic power and strengthening dialogue of students and academics could be argued as an attempt legitimise the marketisation of education, the narrative that these technologies will support educational and curricular improvements can be suggested as carrying the assumption that SXA tools can help higher education institutions in becoming more closely aligned with the demand from students as consumers in comparison with the present conditions. This narrative can be critiqued as portraying current non-analytics-dependent educational practice as insufficient, or at least inferior, to the present state-of-the-art possibilities. The implication of conveying such an assumption is to believe that the student desirability and hence marketisation of higher education can, and therefore must, *be expanded whenever possible*. It can then also be critiqued that, in such discourse, SXA tools are normalised as possible resources to augment this curricular and educational desirability and marketisation, and therefore, as *a necessity* which academics and the student body should accept and integrate in their praxis. Additionally, it can also be critiqued the assumptions, firstly, that students and staff, in a customer-provider relationship, can by themselves find, and agree to, the best possible educational decisions. Secondly, SXA tools will augment the probabilities for them to agree more coherent and desirable decisions within such kind of relationship. As many participants noted, diverse concerns about potential undesired outcomes can be speculated, with many of these discussed by participants as being able to lead to important negative consequences for higher education and society. Then, in synthesis, the acceptance of this potential benefit and this initial theoretical interpretation can be argued as an attempt to persuade the reader that current higher education practice could and should be made more desirable and marketised and teaching staff and students have to submit to the epistemic intermediation of SXA tools to succeed in these efforts. Yet, the concerns described by participants raise questions about possible negative implications that are not addressed in this study and rely on the possibly naive presumption of educational observers arriving to perfect decisions and all stakeholders being dominated by feelings of mutual acceptance. In all, the initial theoretical analysis suggests that the claim that SXA tools could support the development and improvement of higher education programmes might be deeply problematic from a number of angles. For instance, such claims could be questioned as an attempt to legimitse the commodification of higher education (Sabri, 2011) by reinforcing the value of these tools as a ‘fact totem’ (Dos Santos, 2006) which, if followed as an oracle, can lead to better learning, curriculum and programmes. In terms of the critique by Wintrup (2017), the claims that the se of SXA apps may help curriculum development and enhancement could be suggested a moral incentive (Sabri, 2011) for its adoption by academics which may be argued as working as a complement to the fears of exposure to being categorised that make academics and students internalise the self-monitoring of specific behaviours deemed of interest.

5.2.1.4 Inform policymaking?

Theoretical analysis: Inform changes to the formal linguistic distinctions regulating co-transformative experiences

A few participants discussed that SX data and analytics could help inform policymaking and change. In a consent-based context, policy can be interpreted as mutually accepted linguistic distinctions ('agreements') that define the terms of consented recursive educational interactions and co-ontogenic drift. Hence, these tools could in theory support policy changes that enable co-transformational experience which are more closely aligned with what is coherent and desired by observers. In this sense, it is possible to suggest that SXA could generate material and interactive conditions that ensure that structural coupling can be formally regulated in more desirable ways and, in this subsequently, lead to what could be distinguished as 'better higher education'. In particular, the increased data analysis capabilities about the student experiences were mentioned as allowing policymakers to make more sophisticated distinctions about the efficacy of existing policy and proposals. Thus, it can be argued that by helping inform the regulations of the co-ontogenic drift SXA systems could lead to thrusting higher education as a medium inhabited by and structurally coupled to students and staff. In all, this initial theoretical analysis offers additional details about the possible ways in which SXA apps could inform the design and evaluation of the policies and mechanisms which regulate the domain of interactions in which higher education institutions can operate. By doing so, this initial analysis can be a source of additional questions: could improvements to policymaking become a major contribution towards the continuous enhancement of higher education quality (Harvey, 2005)? Could data from SXA tools be used as an asset by academics and students to refine ill-thought quality policy and help correct detrimental regulations and mechanisms of which evidence can be demonstrated? For instance, could teaching staff use data from SXA tools to demonstrate (and create the case against) impoverished understanding of the student experience (Sabri, 2011) within institutional policy? Could data from these data machines be used by partnerships support with evidence demand the consideration of the different backgrounds of students (Sabri, 2013)? Could it be used to demonstrate the impact of current policy on teaching staff and teaching practice? Alternatively, could these tools be used to find the balances that could lead to more beneficial policies? For example, could it be used to better establish what policies are more coherent with the perspectives of students and teaching staff? If some of these answers are yes, it could be possible to argue that SXA tools might help to counter some of the critiqued performativity (Staddon and Stendish, 2012) and disciplinarity (Wintrup, 2017) behind current quality policy focused on a consumerist approach to the student experience, as well as the tensions of the simultaneous but contradictory understandings of students as partners and consumers (Mendes and Hammet, 2020).

Critical analysis: Justifying the commodification of education

It was previously discussed that the claimed benefits of better understanding of the student experience, improved feedback loops and dialogue and inform curricular improvement carried narratives of articulating dominance in epistemic and legitimacy domains. The potential benefit of informing policy making can be critiqued as giving an extra step intending to politically justify the marketisation of higher education and the total submission to an educational regime of customer-provider relationships. Participants highlighted that SXA tools could be used to inform and evaluate institutional policies. The underlying discourse is a promise of data-supported institutional agreements. Furthermore, the assumption is that academic staff and the student body will participate in the interpretation of data and decision making about the student

experience, and therefore, that they will have the power to shape the regulations that configurate their educational interactions. In this way, the narrative is that beyond the incentives of epistemic power and legitimacy, teaching staff and students should integrate SXA in order to gain additional political influence over their co-transformation. Such assumptions seem to imply that using SXA would make higher education more respectful of the people directly involved (i.e., teaching staff and students) and therefore, more considerate of their views and rights to have legitimate authority over their educational decisions, including decisions about the regulations which define the domain of consensual interactions (at least in terms of shaping the policies within an institution). In other words, the discourse is of SXA imparting political justice and contributing to a fairer higher education institution and community. Yet, noting the previously mentioned discursive connections between SXA and customer-provider, marketised models of higher education, it can be argued that, ultimately, the narrative is to politically justify and normalise the commodification of education and that academics and students should concede their acceptance to SXA to gain political power. Nevertheless, by design or macro socio-material conditions, this power may only be allowed and wielded within customer-provider and marketised institutional dynamics. Thus, the discourse seems to suggest that if students and academics aspire to have full control of their participation, it can only be gained by surrendering to a consumerist approach, transactional relationships and a marketised higher education system. In other words, the contemporary capitalist, bio-power state seems to offer to distribute power to teaching staff and students if, and only if, when in favour of building a marketised education system which can put them in service of the economy and the state. Such initial critical analysis offers additional reflections on how claims of the potential improvement for policymaking granted SXA apps might be used to construct discourses promoting highly contested consumerist approaches to higher educational quality (e.g., Sabri, 2011; Staddon and Stendish, 2012; Naido and Williams, 2015). In particular, the offer a twist to the discussion of contradictions of the simultaneous framing students as consumers and partners (Mendes and Hammet, 2020): to what extent could SXA's impacts for student participation in policymaking would relate to egalitarian partner or consumer identities? Would this hypothetical data-power gained by students and academics be fostering the political position of students as partners, as consumers, or both? In terms of the powerlessness felt by teaching staff in relation to quality policy mechanisms (Sabri, 2011), to what extent could SXA apps and data really change the political regime and mechanisms established to control the quality of higher education? Whilst an optimistic stance might want to suggest a rationale in which detailed data about the quality of learning could be used by academics and students to win policy arguments and debates, from a skeptical or cynical perspective this can be questioned as a well-intended but wishful thinking which will likely fail to be realised. The critique of quality policies as attempts of state control of higher education (Harvey, 2005) suggests that contemporary states may not allow changes to policy which could reduce their ability to monitor and influence the behaviours of the sector – such as with within competitive market pressures, fears of being categorised due to student experience data and the internalisation of disciplinary gazes (Wintrup, 2017). Moreover, notions of rogue surveillance capitalism (Zuboff, 2019) and the pursuit of biological power by the State (Foucault, 2004, 2007) could be argued as reinforcing the idea that contemporary governments and policymakers would only allow changes to policy that will lead to expanding the concentration of knowledge and the exercise of privileged influence and power over human populations by the State.

5.2.1.5 Expanding temporalities

Theoretical analysis: Time, interaction and histories of co-transformation

The analysis of interviews surfaced the potential benefit of SXA tools related to afford the expansion of the timescales of data analysis and communication. Participants speculated that the prototype could allow them access to live data and records from previous years, changing the timescales and temporalities of analysis of the student experience in comparison to the current conditions. Participants noted that this could enable them to identify issues sooner and respond quickly, or even during the participation of students in educational activities. That could be theoretically interpreted as allowing observers to have live information that can be used produce on-the-go linguistic distinctions to adapt activities, and therefore --their structural coupling and co-ontogenic drift-- as preferred. This scenario contrasts with the existing conditions where the student experience is evaluated *ex-post*, that is, only after educational activities and interactions have been already completed and when it is no longer possible to make amendments to the co-transformational experiences which have taken place. For the case of gaining the ability to analyse data from multiple years, it can be interpreted that observers gain the ability to analyse educational pattern across multiple years. Accordingly, the academics and students could be able to make distinctions about long term impacts of educational decisions in the student experience, a task which participants mentioned as difficult and time-consuming to achieve at the time of the interview. In sum, students and teaching staff could be able to get insights and attempt to make coherent linguistic distinctions into the multi-year time effects of educational interactions and, therefore, to arguably to arrive to more coherent educational decisions related to multi-years experiences and transformations. Overall, this initial theoretical analysis offers further insight into the possible hypothetical effects that expanding the timescales of educational analysis could have for higher education as a domain of consensual transformation. More specifically, it opens a number of questions. If SXA tools can help education observers in expanding their linguistic distinctions to greater and smaller time scales of student interaction, to what extent could this contribute to continuously improve and refine the quality of learning in higher education (Harvey, 2005)? In regard to student staff partnerships, how could student-staff dialogue be impacted by the expansion of the time scales of educational analysis? To what extent an SXA apps' offer of analysing the live student experience might change the relationship between teaching staff and students (both now embedded in a live feedback loop)? Could these changes empower a more informed partnership which is then more closely aligned with the perspectives of students and academics? Could it help partnerships to attend and transform new dimensions of the student experience? On the other hand, in relation to the argument of Wintrup (2017) about the use of student experience data as a disciplinary mechanism, could this expanded linguistic distinctions be interpreted as expanding the domain of what can be categorised and --by fears of exposure to judgement- internalised as desirable observable student behaviour? Might greater data about the instantaneous and long-term aspects of the student experience help to offer more valuable student experiences and better higher education (Harvey, 2005) Alternatively, could these additional epistemic powers lead to furthering the commodification of and state surveillance and influence over the student experience and higher education (Sabri, 2011; Zuboff, 2019)? These previous questions are all examples which suggest that the potential of expanding the time scales of educational analysis can be of interest for current theoretical debates and might be further explored by future studies.

Critical analysis: Expanding self-surveillance into further micro and macro dimensions

Just as the last question suggested, the proposition that SXA could expand the temporal scales of data analysis can be critiqued as pushing a narrative if increased educational self-surveillance and state and capitalist influence into further dimensions of the self. The idea that data about the student experience could be flowing instantaneously towards academics and students situates these observers and their interaction into what is being observed: *the observers* become *part of the observed*. As these self-aware observers become aware of being observed by other observers and themselves, they start feeling the gaze of being exposed to judgements by these other observers. As a result of this, they can internalise the social surveillance that they are exposed to, without the need for an external observer to discipline the subject. In consequence, thanks to this so-called extended cognition provided by SXA apps, educational activities lose their privacy and intimacy and are situated and become part of a monitored and marketised place. Academic staff can feel they can be micro-managed to the extent that micro data about every interaction and experience allows, whilst students bear in mind that their learning activities and interactions are being ruthlessly inspected in full detail. All actions, interactions and accounts are being tracked, categorised and actioned upon. Such speculative scenario, I would argue, could make academics feel constantly tested and under an all-knowing gaze, which could also be argued as being likely affecting their professional confidence and autonomy –whilst these things being fundamental for an effective and rich mutually-accepted co-transformation. Likewise, students could be put under excessive pressure and stress, generating risks of serious counterproductive effects to their education and wellbeing. For the case of gaining multi-term and year analysis capabilities, it can be critiqued as a discourse where educational decisions must account and be surveilled for long-term impacts. That construction implies longitudinal arguments could trump emergent propositions, thus, that teaching staff and the student body may be denied powers to make agreements on the basis of their concurrent contingencies. In other words, the contingencies of the co-ontogenic drift are now removed of full legitimacy by a demand to also consider long-term data and impacts. Yet, as already mentioned, participants noted that at the moment it was time-consuming to complete the analysis of long-term data. Thus, the implied need to consider long-term data and impact in educational decisions hints that SXA tools could be proclaimed not as merely beneficial, but as an essential necessity. In sum, such narrative, it can be argued, may open the possibility that institutional and the state use discursive mechanism which are supposedly informed in multiyear data and overrule the boundaries of the temporalities of experiences of individual staff and students, and hence, removes the legitimacy of their experiences –and voice- for pedagogic and curricular decision-making. In the light of such initial critical analysis, a number of additional questions can be suggested as being of interest for present debates. As already introduced, is it possible that the expansion for the timescales of educational analysis lead to further promoting the commodification (Sabri, 2011) and transactional characteristics (Tomlinson, 2017) of a marketised higher education? Instead of gaining more linguistic distinctions for consensual educational agreements and interactions, could live student experience data actually make teaching staff further lose autonomy and confidence over their teaching (Staddon and Stendish, 2012)? Will teaching staff be forced to feel exposed to being categorised in relation to every interaction and behaviour of students (Wintrup, 2017)? Could those fears and livestreaming data lead to reflexive teaching in which teaching staff cease to exist as an autonomous self? On the other, could students' awareness about all of their behaviours being monitored eradicate their freedom to fail and learn? In sum, these questions are also suggestion that the hypothetical expansion of the timescales of

educational analysis might have critical impacts for the autonomy and legitimate authority of students and teaching staff in higher education.

5.2.2 Concerns?

5.2.2.1 Misleading info

Theoretical analysis: Cognitive deviation, false distinctions (which observers could recognise as such)

Finding from the interviews also involved concern about negative effects of SXA of providing misleading data. Theoretically, this can be described as observers recognising that access to data could in some cases lead to inadequate linguistic distinctions about educational activities and experiences, that is, linguistic distinctions which are not coherent with the coherent linguistic domains of observers. Access to data can trigger cognitive and *languaging* operations and structures in students and academic staff, yet, if this data does not accurately portray what is observed, some of the resulting learning might be deviated of what observes could later recognise, within their own emotions and reasoning, as acceptable conclusions or inferences. The implication would be that students and teaching staff could build inaccurate perceptions that lead to decisions which are not as good as they could be without access to this misleading information. In that sense, the potential risk of SXA tools driving misleading interpretations of data could lead to incoherent interactions and have direct undesirable consequences for the direction of the co-ontogenic drift or its wider social outcomes. This initial theoretical analysis suggest more detailed descriptions of the possible mechanisms in which misleading student experience data could lead to student-staff decisions which can diverge from what these stakeholders specify as coherent domains of interaction and mutually accepted co-transformation which higher education involves. In this way, this initial analysis offers questions about the possibility of SXA apps to mislead academics and students in ways that set the ground for erroneous interpretations and linguistic distinctions which could ultimately lead to undesired learning experience and higher education (Harvey, 2005). Furthermore, the awareness of the risks of misleading data can also increase fears from staff and students of being categorised (and penalised) unfairly (Wintrup, 2017). It could also be asked: could such fears of unfair categorisation trigger emotional states in teaching staff which further restrict their confidence in their professional competence (Staddon and Stendish, 2012) and, thus, abilities to find improvements and develop pedagogical innovation? In all, these additional questions seem to emphasise that the risks of SXA apps sharing misleading data can have significant theoretical relevance and might be object of more sophisticated research and discussion.

Critical analysis: Reinforcing claims of educational epistemic hegemony

The recognition that SXA could provide misleading information that leads to undesired educational outcomes can be critiqued as a discursive attempt to validate the belief that (more accurate) data can lead to improved educational knowledge. By saying that wrong interpretations of data can lead to negative effects, the reverse is logically implied: valid interpretations of data lead to greater educational knowledge. In that sense, it can be said that the proposed concern of “misleading data” implies the logical belief that access to (better) data provides an epistemic hegemony, reinforcing the narrative from the discussed earlier. With this presumption, academics, students and institutions, perhaps even the state could be pressured

by narratives of epistemic threats in order to accept SXA tools that carry implicit assurances of giving them better data and interpretations about the higher education activities and interactions –even if they can still include some misleading data. Considering the significant tensions surrounding these stakeholders (e.g., keep a job and building a career, make right choices about their studies and future life, ensure organisational sustainability, protect economy and public services) it can be argued that this implied promise of epistemic dominance may be too important and desirable to be resisted. By casting the recognition as failure as controlling what success is and the best ways to achieve it, this initial critical analysis offers a turn in the discourse about learning about the student experiences and perspectives towards potential problematic relationships between the accuracy, reliability, abstraction and fallibility of data (Hagel, 20012; Kitchin, ; Wang and Williamson, 2022) and the desire, despite the acknowledgment of serious risks of triggering misleading, to be followed as a 'fact totem' (Sabri, 2011; from De Santos, 2006) and oracle not just to try to enhance higher education, but, firstly, as a form reinforcing epistemic and political dominance in higher education. In that sense, further question can again be suggested in relation to the relevance that data and epistemic confidence could have in connection with teaching staff's autonomy and confidence and the possible implications for important academic values and traditions (Staddon and Stendish, 2012).

5.2.2.2 Misuse of data

Theoretical analysis: usage which leads to consequences that go beyond what is acceptable by observers

Participants speculated that there could be several risks of misuse of the data provided by SXA systems. In principle, this can be theoretically interpreted as participants recognising that observers could use data in ways that are not intended or desired to be. That implies that some uses of data may not be coherent for observers, mutually acceptable, and hence, consented by academics and students. The example of using SXA data to inform teaching staff hiring decisions was noted as very problematic. Many participants directly or indirectly implied it as a redline which should not be crossed. This premise at first can seem contradictory with epistemological considerations, because it is possible to think that if the data is not misleading (inaccurate, untrustworthy, lacking context) then accessing data should imply accessing reliable data, and subsequently, more descriptive and predictive power for observers. However, the problem lies in that data, being trustworthy or not, could be utilised in non-coherent and non-consensual ways. In other words, the problem is that the interpretations made by observers can only be legitimately and acceptably applied if, and only if, to convey mutually accepted actions. In this way, from this lens, it would seem convenient, or perhaps even necessary, to start by agreeing what are the mutually acceptable actions and interpretations, or conversely, what data-led interpretations and actions are not acceptable, before implementing SXA systems that offer data which can be misused or abused. While such an approach could offer a degree of mitigation to this problem, it could also carry significant practical and political burdens –how to formally define mutually accepted domains of educational interaction and use of student experience data? In the end, if students and staff could agree a range or domain of desirable education interactions and of accepted use of data, plus relevant create safeguards to avoid undesired deviations, they could pave the way for SXA to support them in the ways that they find beneficial. This initial theoretical analysis suggests that the potential risk of misuse and

abuse of data from SXA apps can be associated with these tools power to create novel sociomaterial conditions for student experience data being used against what is coherent with the perspectives of teaching staff and students. The concerns about the possible –overt or covert- use of this data as a performance management tool highlights a case in which SXA could be misused as a tool to surveil and influence behaviour of academics (Wintrup, 2017) in line with the commodification of (Sabri, 2011) and consumerist approaches to higher education (Staddon and Stendish, 2012). Additionally, like Hagel et al., (2012) suggested for the case of the Australian national student engagement survey, could SXA apps be used following 'functional ideologies' restricted to monitoring student behaviour instead of getting actionable insights from the perspectives of students? On the other hand, as suggested by a participant later, could SXA lead to students misusing or abusing some of the data which can be shared with them such as in the case of surveillance by the end user? For instance, could students adopt habits of questioning or making judgements about academic staff based on data which is not intended to do so? Could any of these scenarios make academics feel unsafe or anxious and coerce them to normalise certain behaviours deemed desirable by institutions and the state (Wintrup, 2017)? Could any of these scenarios trigger emotions which restrict the confidence and domain of interactions in which teaching staff may be motivated or willing to engage (Staddon and Stendish, 2012)? And of course, could this exposure end up harming the value of higher education as a public good (Gourlay and Stevenson, 2017)? In synthesis, these questions support the initial reflection that the misuse and abuse of SXA apps and their data could have practical and theoretical implications worthy of further and more sophisticated study and discussion.

Critical analysis: validating disciplinary usage

Whist recognising that the risks of misleading data can be examined as implying the assertion that data-based educational interpretations are superior, to consider that data can be misused or abused can be critiqued as a narrative that carries the assumption that, when argued as mutually acceptable, student experience data could be legitimately used to discipline and punish. Claiming that data can be used outside of mutually accepted ways is embedded in the complementary logic that data can be used within acceptable ways. Hence, in brief, this discourse implies that it is possible to justify the use of data when it is said to be in ways that are mutually accepted. If we recognise the practical challenges and limitations faced both to define mutually acceptable forms of use of data and SXA tools (i.e., that student and academic bodies will have time and authority to dialogue and define the domains of coherent and ways of using student experience data), and to ensure that all stakeholders act in coherence with this these consented agreements, it is possible to assume that inevitably less-than ideal agreements might be reached and implemented in practice. Accordingly, what is ultimately framed as 'legitimate' use might not end up becoming effectively desirable by all academics and students. Theoretically, accepting these less-than ideal agreements would already become a 'tolerable' breach of the principles of consented co-transformation. Then, if a breach of the principle of consent can be tolerated, there would be no consistent reason to resist the use of data in breach of consensual obligations, potentially justifying the implementation of disciplinary and punitive mechanism. Such rationales might be used to coerce educational observers to effectively normalise disciplinary and punitive use of data from SXA apps. For example, participants could be persuaded or coerced to think that it is in their best interest to do so. For instance, a couple of participants noted that using data to inform hiring decisions could support a legitimate educational purpose. This possible use of data could also be difficult to resist by

academic managers who have to justify hiring decisions and by teaching staff who need to sign an employment contract in the terms defined by the institution and national laws. Likewise, at the time of the initial enrollment, students must take or leave the hard-earned offer of study given by the institution, with all its conditions: offering little alternative other than accepting the terms of service regarding data usage. In synthesis, the claim that data can be misused and abused situates SXA tools in a moral scenario in which there is normal and abnormal behaviour and disciplinary mechanisms can be justified. This moral scenario can be critiqued as a potential discursive mechanism to validate and normalise the use of student experience data to discipline and punish behaviours and experiences distinguished as abnormal (e.g., inefficient, unsatisfactory, noncompliant). Implications could include use of data to coercing students and academics, in undesirable ways, thus, failing the principle of consented co-transformation, and jeopardising the essential notion of education that is being proposed. Following this initial critical analysis, a number of additional links and questions can be made in relation to the literature. The twist to the risks of misuse of data as a discursive mechanism which legitimise use of student experience data to modify undesirable behaviour can be argued reminiscent Sabri's ideas (2011) about student surveys being used as a 'fact totem' (from De Santos, 2006) and within a sense of moral authority sense of righteousness. To what extent could claims of misuse and abuse of student experience data be associated with moral legitimisations which can be instrumental to normalise the disciplinary use and punitive use of this data? To what extent could moralistic discourses about misuse and abuse of data be used, as a complement of fears of categorisation (Wintrup, 2017), to coerce academics and students to modify their behaviours towards what is deemed acceptable and desirable in the light of student experience data? For example, could such a claim and moral baggage be coherent with accepting that, for instance, students should not register unsatisfactory learning experiences, and thus, poorly rated teaching staff and practices should be not tolerated (e.g., an argument to demand or justify changes)? In all, this initial critical analysis and questions offer additional ideas which can be of interest for discussions about what is desirable for higher education and how associated narratives may also carry prescribed ideas about good, wrong, and the legitimate use of data to modify (coerce) behaviours in higher education towards what are formally claimed to be domains of desirable and non-desirable educational interactions.

5.2.2.3 Affecting educational quality and unpopular subjects/methods

Theoretical analysis: Decreasing the desirability of higher education's co-transformative experiences and questioning its mutually-acceptable grounding

Participants highlighted one of the main possible undesirable effects of misusing SXA data could be damaging the quality of higher education study programmes. In particular, they discussed the possibility of SXA data –such as student feedback- posing pressures on observers against maintaining or selecting 'unpopular' educational activities and subjects of study. Participants noted that some 'unpopular' subjects of study or learning or assessment activities or instruments might be argued to be a necessary or ideal part of the curriculum, making these hypothetical pressures to increase the risk of decisions that are counterproductive to what may be ultimately educationally desirable, and hence, to the quality of higher education. For instance, participants suggested that not-yet-tenured academic staff may feel more pressured to select a popular assessment instrument if this could give them better promotion prospects. This can be interpreted as non-tenured academics being a group of observers that, through their history of interactions within their higher education environment (e.g., learned that

a colleague was hired by making their difficult course less challenging and more popular for students) being able to distinguish that an educational undesirable option is of their critical professional career and self-interest. Another example described by a participant, on a higher level, was the case of academic departments being pressured by comparatively poor student experience data to shut down their educational provision of courses, programmes or disciplines or entire fields of study. For instance, the hypothetical case of the history department closing down teaching (and hence research) in medieval history because it is rated lower by students than compared, say, to contemporary history. Alternatively, shutting down neurology and neurosurgery specialisations in favour of, say, aesthetic surgery or other perhaps less challenging medical specialisations that are best rated. This can be interpreted as academic departments –a third order system- being forced by SXA's data to construct a sense of student and organisational gain related to the idea of lashing out areas of the curriculum, thus, of academia, due to the pressure of the social forces within the higher education environment. Regarding more general negative effects for the quality of educational activities, these can be interpreted as students dedicating their time to what could be distinguished, in comparison with the prior set ups, as less desirable co-transformational experiences. Consequently, in the end, it can be argued that SXA might drive changes that lead higher education graduates and the professional workforce developing worst capabilities than in the past. In the context of clinical professionals, for instance, this could lead to a decreased quality of clinical care and therefore, to less effective medical treatments and health services that increase the prevalence of health conditions and the associated increase in deaths, suffering and related socio-economic impacts of problems. On the other hand, the implications of pressures against least popular study subjects could involve higher education institutions reducing the offer of options for structural coupling that may not be the most popular but can be of interest for an important number of students, and, more widely, which may have critical impact for the operation of contemporary societies. For instance, if neurology –broadly recognised as a very difficult subject and discipline- is consistently rated as the lowest student experience of the medical department, this may lead to neurology programmes and academic positions being phased out or weakened. This could also have progressive effects on the quality of specialist medical practice and greater impacts of neurological diseases. Likewise, in the speculative case of medieval history being pulled out of the curriculum due to hypothetical unpopularity, then contemporary society could decrease the number of experts studying a critical time of its past. Thus, it could be argued that, overall, the population of future societies will likely learn less about a very influential age, which would imply significant cultural losses that can have vast effects for the co-ontogenic drifts of citizens and society as a whole. This initial theoretical analysis offers additional details about the possible mechanisms in which SXA apps and data could drive negative impacts for the quality of higher education. Some of these ideas offer the opportunity to ask further questions in relation to debates in recent literature. Following the comments from participants and the critique of Staddon and Stendish (2012) about performative dynamics subjugating learning to the generation of student feedback, which is required to institutions, could data from SXA apps be used in performative ways to reduce the value and quality of higher education learning by favouring more amenable content and subjects? Could SXA apps further overemphasise student's short-term expectations (Skea et al., 2017) in detriment of challenging students' perspectives and supporting opportunities for resilient intellectual development (Wiers-Jenssen et al., 2002) towards being able to understand and critique disciplinary judgements (Staddon and Stendish, 2012). In the words of Sabri (2011), could SXA tools and data be used to create linguistic distinctions and design decisions which hollow out of education from the learning

experiences? While not exhaustive, such questions highlight that further research and theoretical discussion about the hypothetical risks of SXA apps and data harming the quality of learning may be argued as of important interest for higher education.

Critical analysis: Normalise utilitarian views of education

The claim and initial theorisation about SXA's data being possibly used in ways that decrease the quality of higher education programmes can be critiqued as a narrative where education quality is associated with utilitarian perspectives. While the proposition in itself recognises that SXA's can have educationally harmful effects, it can also be assumed the contrary, that is, that in the right cases, data and SXA systems can be trusted to inform decisions that will have beneficial contributions. These discursively connected assumptions also imply that education has a measurable quality that increases or decreases in function of how desirable the provided education is. Then, it could be argued that these claimed concerns follow a narrative where education is primarily framed by its utility to satisfy desires. In other words, although these claims ascertain that SXA's may produce serious educational impacts that question their overall beneficial characteristics, in doing so it resorts to validating utilitarian views of educational practice. This initial critical analysis provides additional ideas about possible ways in which SXA data could be used as part of discursive mechanism that may lead to normalise behaviours which reduce higher education into instrumental and performative definitions (Staddon and Stendish, 2012). Thinking of the critiques of quality policies and student experience as state attempts to control the sector (Harvey, 2005) and foster consumerist and transactional (Sabri, 2011; Naido and Williams, 2015; Tomlinson) approaches aimed at increasing the efficiency of higher education and amplifying its production of a human capital of the population and the biological power of the neo-liberal state (Foucault, biopower), it is possible to raise a number of questions. To what extent could claims of risks of student experience data being used to decrease the quality of learning might be reinforcing discourses that reduce education into an instrument to generate desirable observable qualities and behaviours (Wintrup, 2017)? If higher education is framed as an instrument to satisfy desires, who's desires are these? What impacts are defined as harming higher education quality? How are they defined in this way? What ideas of quality underly making such distinctions? To what extent are these ideas of quality linked with transactional and consumerist perspectives aimed at increasing the power and influence of the contemporary neo-liberal state? Could human populations (e.g., people) benefit from these utilitarian ideas of quality? In which ways may they not? While again these are not exhaustive questions, they seem to raise issues that could be of importance for the future of higher education.

5.2.2.4 Damaging staff

Theoretical analysis: triggering staff's professional insecurity, to distinguish the system as non-accepting of themselves, and poser barriers for structural coupling, drift

Another critical concern raised was the possible professional and personal damage to academic staff. Theoretically, this concern can be interpreted as, both academics and students, recognising that availability of some data in the SXA's prototype could lead to negative judgments about the professional capacities of teaching staff. For instance, these judgements (specific distinctions and wider sense that encompasses the different distinctions perceived) could be made by hiring and promotion decision-makers, influencing the prospects of an academic career. Additionally, teaching staff themselves could arrive at such negative linguistic

distinctions about their own capabilities, what some participants argued would inevitably impact academics' professional self-awareness and identity. In this way, teaching staff could feel less accepted by the social environment and themselves, which could affect their professional confidence and their abilities to contribute to the co-ontogenic transformation and their personal wellbeing. Accordingly, it can be theoretically proposed that, in turn, academics could start distinguishing the university environment as a more hostile place for them. Furthermore, this could have relevant implications for interest and incentives to participate in teaching roles. Then, the quality of higher education could diminish, and contemporary and future society could face extra challenges to distribute desirable knowledge and skills. Subsequently, this could be argued to cause the reduction of the capabilities of future higher education graduates. As already pointed out, the ultimate implications could involve reduced quality of the professional workforce in all disciplines and potentially significant impacts on the quality of life of the broad population. This initial theoretical analysis offers further ideas and questions related to literature. Suggesting that SXA tools could lead to professional and personal harm to higher education teaching staff can be directly linked to debates about the negative impacts that quality mechanism focused on improving the student experience can have for the wellbeing and confidence of academics (Sabri, 2013; Wintrup, 2017; Staddon and Stendish, 2012). Could the use of SXA apps lead to additional professional and personal costs for academics? For example, could data from SXA tools be used to influence the distinctions of managers or committees which make decisions about promotion of academics within a department? Could some data in these apps (e.g., consistently poor student ratings) persuade a committee to reject the promotion of an academic? Could SXA apps expose damaging comments from students about a teaching staff member that ends up harming their emotional or mental health? On the other hand, could the awareness of teaching staff about the hostile socio-material environment created by SXA lead them to feel higher education as an unsafe and unfriendly place? In synthesis, it may be possible to ask: to what extent could the linguistic distinctions, interpretations and actions triggered or enabled by student experience data end up affecting the professional life of academics, the academic profession, and the values, traditions and principles of academia and higher education? What kind of effects could this ultimately have in the construction of academic identity? While the potential harm to academics and to academic traditions and identity are of higher importance, the potential additional impacts that this harm to academics could have for the quality of teaching and learning can also be argued as likely to have major social implications. Considering that student surveys focused on the student experience are already discussed as affecting the morale of academics (Sabri, 2013) and having vicious effects for the substance of teaching practice (Staddon and Stendish, 2012), the ideas discussed raise questions about the extent to which SXA apps could worsen such situation and the ramifications in the professional and intellectual quality of future professionals, higher education graduates, public services and life of future generations.

Critical analysis: self-attributing care for academics' interests (while acknowledging awareness of harming them)

Recognising that the adoption of SXA's systems could produce serious damage to academic staff can be critiqued as claiming to care for academics in order to gain buy-in and epistemic authority over what is best for them. On the onset, establishing that SXA systems might lead to unacceptable harm to academic staff is to acknowledge that these stakeholders –and any stakeholders that values the contributions of academics- have good reasons to oppose such technological development in higher education. That may be sufficient analysis. However,

behind such narrative it is also portrayed a discourse of caring for the interests and well-being of academics. That discourse can be used to trigger academics to distinguish this narrative as coming from a perspective which is interested in protecting their professional and personal wellbeing. In this way, a basic self-preservation unconscious bias could facilitate the coercing of academic staff into ceding epistemic trust to discourses related to SXA tools, and the improvement of the student experience more broadly. In synthesis, while openly confessing the contrariness of SXA systems to the well-being and capabilities of academic staff, this concern also can be critiqued as potentially instrumental for exploiting basic unconscious biases in order gain the buy in from academics and to claim epistemic dominance about what is best for them. This initial critical analysis offers new connections to discussions from literature. Firstly, the risks of professional and personal damage to academics and scholarship in general (Sabri, 2013; Staddon and Stendish, 2012) are emphasised as a fundamental reason for the higher education community to resist the implementation of SXA tools which may generate such threats. Unless future studies demonstrate the contrary, this would imply that the design of SXA tools and their use –in alignment with human-centred approaches which have been promoted for LA by Buckingham Shum et al., (2019)- should investigate, anticipate, and address every possible professional and personal harm to academics before the construction, installation and adoption of this kind of data machines in higher education practice. The failure of researchers, higher education institutions and the academic community to further investigate, discuss and consider such threats in the design of future technologies may be –consciously or not- contributing to significant negative impacts for the professional and personal life of academics, and thus, for the future of academia (Staddon and Stendish, 2012) and the intellectual and critical abilities of next generations (Wiers-Jenssen et al., 2002). The critique of the recognition of the risks of teaching staff as a possible discursive mechanism to attribute care for the interests and well-being of academics raises questions about the extent to which basic unconscious biases –such as self-preservation- could be exploited by human-centred narratives to persuade –or coerce- the higher education community to support the adoption of advanced data machines which could have serious consequences for them.

5.2.2.5 Institutional and reputational damage

Theoretical analysis: weakening academic departments and higher education

The suggestion that the use of student experience analytics could affect the educational reputation of academic departments and higher education institutions should be first be analysed in relation to what is defined as educational reputation and reputational damage. Understanding education as a mutually accepted co-transformative experience between educators and students, educational reputation could then be argued as the frequent distinctions used by multiple observers to describe the effectiveness and quality of the consensual, co-ontogenic interactions produced by academic departments and institutions. Linking to the idea of sense of place, a damage to the educational reputation would mean that the use of SXA could lead to the generation of negative descriptions that affect the description of academic departments and institutions as good educational places when these are understood as spaces created by desirable professional and academic co-transformation. From this definition and considering the distinctions (positive, negative or otherwise) of educational observers as both a) determined by their own biological and cognitive systems and history of learning linguistic distinctions and domains, and, b) being fully legitimate (valid) distinctions (knowledge) whilst consistent with the linguistic and cognitive structure of its observers, the effect of the potential educational damage of SXA could be analysed as decreasing the desire of observers to get involved in the professionally and academically co-transformative space generated by higher education departments and institutions. By the possible effects of reduced interest from observers, the ultimate implications of damaging educational reputation might include weakening the

co-transformative power academic departments and institutions, and thus, their potential to generate consensual professional, academic and intellectual transformation of humanity. From a point of collective meaning (Kurtz & Snowden, 2003), the discussed risk of reputational damage raises the question: to what extent could the (mis)use of SXA affect the confidence required by observers to come together – overcoming their *otherness*- to dialogue and construe complex, mutually-accepted, transformational educational experiences? Could it be that the declared reputational risk of using analytics to evaluate the student experience lead to negative impacts in the sense of higher education as a place (e.g., Cross, 2001), and thus, on how the observers that compose it weave shared emotions, meanings and relationships to orchestrate higher education and in the process to see –and trust- each other and themselves? Would it be possible to mitigate such risks? If so, how?

Critical analysis: protecting corporate and commercial power through fear

Both academic staff and student representatives expressed concerns about data from student experience analytics apps being able to produce serious negative inferences of academic departments and the wider institution. While of course this can be portrayed as detrimental for academics, academia and its present wider packaging – higher education institutions- (as I could freely admit), it is also possible to spin such discourse upside down. For instance, instead of a benevolent and uninterested interest in the well-being of academia and academics, it might be interrogated whether the fears of academics and student representatives about the generation of undesirable perceptions of the departments and institutions in which they participate in are being mainly thrusted by the emotional tension generated by the prospects of how these bad reputation –notably, which could be deemed unfair in some cases- could affect the feelings and economic prospects of academics and students of these departments and institutions. Firstly, this is not necessarily something worth critique. But, if we refer to Foucault's ideas of biopower (2004) and normalisation (1995), the fears that academics and students may have about damaging the educational reputation of academic programmes, departments and institutions can be spined as a sign of the emotional and thus corporal and biological control of that states use to drive marketised and commercial mechanisms to maximise the efficiency in the production and thus the total biological power generated by higher education academics, students and institutions. In other words, the narrative of concerns about reputational damage could be argued as exposing – and consequently, demonstrating- how SXA would be inserted in spaces of authoritarian and marketised spaces in which surveillance-triggered emotions of fear of pain are used by the modern state to control and influence academia and higher education for its greater benefit in terms of accumulation of power (Zuboff, 2019).

5.2.2.6 *Who has access to what data?*

Theoretical analysis: knowledge about stakeholders' data access could alter their perceived position, security and the sense-making process and medium

Related to a number of the concerns previously discussed identified, a key problem seemed to be the questions about who has access to what data. This can be theoretically suggested as a manifestation of doubts –linguistic distinctions which trigger to contradictions or uncertainty of the linguistic domains and sense- in students and staff and sometimes uneasiness or even emotions of fear about how both would feel if data was available to different stakeholders. For instance, participants noted that access to data by hiring managers could lead to data being used in such decisions. Alternatively, if all academics receive detailed feedback about every colleague in the department, members of this department could feel exposed to being misjudged by their peers and bosses. Or, if students have access to all data, multiple

unnecessary confusions and misled expectations could be generated within the student body. In one sense, this is a problem of what data would be accessed by each stakeholder through a SXA app and how the distribution of extended cognition about educational interactions and experiences might enable problematic scenarios. Yet, as participants also suggested, there are also risks of data leaks. The latter would be much more difficult, or even impossible, to control. This scenario can then be synthesised as observers' awareness that flow of data about the student experience to some observers involves risks of undesirable situations and consequences, thus, potentially fomenting feelings and distinctions of higher education as an unsafe place. Participants noted in various occasions that internal and restricted use of student experience data and analytics would likely be safer and hence avoid more obstacles, whilst greater access to data by more stakeholders generating more threats and challenges. In theory, this can be proposed as students and teaching staff observing that sharing data internally (within student-staff committees of programmes and academic departments at most) could reduce the possibilities of that data being accessed by stakeholders who may be more likely to trigger undesirable consequences. This could also be argued as the distribution of data and extended cognition about the student experience being likely to trigger different emotional response by observers (teaching staff and students) about different data-sharing regimes. In other words, the theoretical analysis points out that data may be better kept close to the stakeholders directly involved in the co-transformation, but, not ‘too close’. The previous initial theoretical analysis highlights more ideas and questions. Could the question of selecting who has access to what data be one of the fundamental factors that define the extent to which student experience data and analytics have positive or negative impacts for higher education? Could internal and restricted use of student experience data (e.g., at programme or department level) inhibit the risks of fostering vicious performative subjugations of learning to the production of student feedback (Staddon and Stendish, 2012), consumerist and transactional approaches for teaching and learning (Sabri, 2011; Tomlinson, 2017), disciplinary and coercive mechanisms based on fear of exposure of being categorised by observable student behaviour (Wintrup, 2017), or ultimately negative effects for the interest in continuously improving the quality of learning in higher education (Harvey, 2005) and values and principles of academia (Staddon and Stendish, 2012)? Similarly, could such an internal and restricted use of SXA analytics and data support the creation of safer spaces that stimulate positive, confident, creative educational reflections, dialogues and decision-making by student-staff partnerships? To what extent such safer and more educationally reflective spaces could lead to more valuable and critical higher education teaching and learning (Harvey, 2005), scholarship and academia? On the other hand, to what extent could unrestricted or public sharing of data from SXA play towards the enforcement and internalisation of functional, marketised and transactional dynamics (Sabri, 2011; Wintrup, 2017) or other forms of monitoring and behavioural influence by the neoliberal state in the age of surveillance capitalism (Zuboff, 2019)? Finally, referring to the risks of dataism ideology (van Dijk, 2013), to what extent could uncritical stances towards the datafication of the student experience and giving data-power to states and corporations may inhibit the recognition of the threats involved in regards the question of selecting who gets access to what data?

Ciritical analysis: Internalising the data-gaze

The claim that academics and students should worry about who could have access to data about the student experience can be critiqued as a potential discursive mechanism aimed at seeding fear of student experience data and of judgements that it can trigger in other observers.

By admitting that there are possible risks related to the selection of what data can different stakeholders' access to, the reader might use their cognitive structure and linguistic domains to deductively arrive at the distinction that access to and analysis of data by observers can lead to undesirable threats for them –particularly if they are academics and students. If doing so, the reader can link the ideas of data about the student experience and SXA tools to feelings of danger, insecurity, and ultimately fear. So, in conclusion, the narrative could be used to trigger fear of data, SXA systems, and the gaze of observers. And, by doing so, it attempts to coerce academics and students into internalising the surveillance and discipline of the student experience within their own observation. This initial critical analysis suggests additional angles for the conceptual and political examination of SXA apps. For instance, to what extent the distribution of access to data and its communication to academics and students could be exploited as a coercive discursive mechanism aimed at controlling behaviours associated to desirable observable student behaviours and experiences (Wintrup, 2017)? To what extent the question of who gets access to what data could influence the powerlessness of academics in relation to quality policies (Sabri, 2013)? To what extent could the evolving, dynamic, human and non-human sociomaterial assemblages (Gourlay, 2017) produced by different distributions of access to data about the student experience may affect the sense of professional and personal confidence of academics (Staddon and Stendish, 2012)? To what extent this hypothetical impoverishment of teaching and learning (Sabri, 2011) and academia (Staddon and Stendish, 2012) might enable further expansion of the interests and influence of contemporary neoliberal states? The suggestion that the acknowledgment of risks associated with the distribution of access to student experience data can be exploited to persuade academics and students to fear and internalise the observation and categorisation of the student experience raise further questions about problematic uncritical stances towards giving data-power to institutions and governments (van Dijk, 2013): could student experience data-power given institutions and governments imply they could only need to exploit the distribution of data as a material and discoursive mechanism to coerce teaching staff and students into internalising the observation and modification of behaviours, experience and identities which amplify the biological and cognitive power of state and non-state corporations in the age of surveillance capitalism (Zuboff, 2019)?

5.3.2.7 Who is in control?

Theoretical analysis: Questions about the system’s control influences speculation about the drift and medium

With the question about who has data access being influential for the co-transformation processes, the matter of who has operational control was also discussed as central to many concerns. During the interviews, the conversation went many times, from talking about access to the issue of who ultimately has control over the SXA data access and system itself (i.e., who regulates, designs and has super admin powers over SXA apps). Participants discussions implied that academics should have a information and a degree of control over data access. Participants also pointed out that wide student access to non-nuanced data may be unnecessary and generate misled distinctions about educational activities and programmes. In this way, it can be theoretically suggested that participants recognised an operational need to have adequate control of data and SXA systems in order to ensure that the agreed mutually accepted co-transformations can be achieved in the most desirable and safe ways. Considering the theoretical assumption that education can only called like that when it accepts students and

teaching staff as valid observers, this would imply that legitimate control of student SX data and analytics solutions must continuously include these stakeholders. In other words, that education institutions or the state cannot legitimately exclude academics and students from the control of SX data and analytics systems. This initial theoretical analysis allows me to suggest a number of questions linked to recent debates. Considering the potential central problem of who gets what access to student experience data, to what extent can the control of SXA app be coherently distinguished as a critical factor to ensuring that the continued improvement of higher education quality is beneficial (Harvey, 2005)? To what extent it may be justified that academics and students retain data sovereignty? For instance, could shared student-staff control of SXA apps, data and how data is used enable to the implementation of these tools in safe and educationally enriching ways? Could it be argued that potential impacts of SXA apps and data on the consensual co-transformation experiences between students and teaching staff warrant their legitimate right to sovereignty and control over these data and tools? For the case of academic staff, to what extent different controllers of SXA apps and data may generate different forms of influence on the sociomaterial context (Gourlay, 2017) of teaching practice and their professional confidence (Staddon and Stendish, 2012)? How different controllers of SXA apps and data could impact on emotions and mental health of higher education teaching staff (Sabri, 2013)? Could the loss of control of SXA apps and data by teaching staff and students mean they lose cognitive sovereignty (and thus sovereignty) over their co-transformational experience to the marketised interests of corporative higher education institutions and neoliberal governments in the age of surveillance capitalism (Zubboff, 2019)? This raises again the question of dataism (van Dijk, 2013?) and the risks of uncritical stances about datafying learning experiences and submitting data and political power to corporations and states: to what extent is the higher education community prepared to exercise sovereignty over data about the student experience?

Critical analysis: Legitimising control

The discourse of students and academics worrying about the control of data and SXA systems, and that these stakeholders must participate in this control, can be critiqued as populistic narrative that might be used by the state and corporative institutions in attempts to legimitise political control of the evidence of the data about the experience of students and of the SXA technologies. By telling students and academics that such data and systems can only be legitimate if they are active part of their control, they are enticed, through the exploitation of self-preservation biases, to accept effective forms of operational authority and control over student experience data and these tools. Control is internalised as a need due to its emotional reassurances in the face of fears of data and these tools being accessible by other observers without their consent. Yet, this of course could be argued as merely a *promise* of control, and not a guaranteed political and operational commitment. For the sake of influencing the perceptions of stakeholders, this narrative could trick academics and students and convince them that control is necessary and convenient. By doing so, the discussion about data about the student experience and analytics systems that process this data creates a demand for legimitising political control, giving institutions not just the opportunity to but also the obligation to invite some representatives of teaching staff and students to claim legitimate control over this kind of data and systems. Control can then be enforced thanks to a promise that will never be fulfilled. Such initial critical analysis about the problem of control adds new insights about the possible discourses that may surround debates about student experience data and analytics. Following the argument of Wintrup (2017) about fears of categorisation from student survey

data driving the internalisation of disciplinary mechanisms, could it be argued that control can be also exploited as a discursive mechanism to coerce academics and students into accept and internalise the observation and modification of behaviours and experiences in higher education? To what extent the different controllers of SXA apps and data may turn them into being more damaging for teaching staff and practice than student surveys (Sabri, 2013)? Could contemporary, neoliberal states ignore or resist both their ideological dogmas and political interests and allow students and staff to remain sovereign of student experience data and analytics tools? Could these questions end up being decided by a court of justice? How long may that take to happen? Which side could the courts be on? If things turn out to be similar to what participants speculated in the contextual interviews –and across user testing and initial design ethnography- plus the additional ideas suggested in these theoretical and critical analysis, the control of SXA apps and data may well have determinant influence into the probabilities of these data machines leading to desirable or acceptable futures. In consequence, the above question may not be considered too wild stretch.

5.3.2.8 Reliance in institutional management and culture

Theoretical analysis: A dependancy in the organisations' the histories of being of its decision-makers and participants

In dialogues with participants a number of them pointed out to the influence that department and particularly institutional leadership could have in the ultimate outcomes that an hypotethical adoption that SXA applications in higher education. Following the theoretisation of the student experience proposed, this could be reflected as participants recognising that many of the critical and beneficial issues discussed by academics and student reps –and thus, the desirability for them of the integration of SXA into their co-ontogenic drifts- might depend on the linguistic distinctions, learning, knowledge and the approaches and decisions –in all, the histories of being- of individuals which hold management roles. In other words, these individuals –and their histories of being- may be discussed as having in their hands the choices to make SXA trigger desirable or undesirable educational interactions, and therefore, consensual co-transformation in academic, professional and personal domains in which higher education can operate. What some academics discussed as benevolent leadership might have the sensibilities (linguistic distinctions) to distinguish what might be desirable by students and academics for the histories of co-transformation. Yet, individuals in these leadership positions might not necessarily be assumed of being able – or having the intention– to construe these non-trivial distinctions and implement effective actions that are timely and sufficient to ensure that the integration of SXA in higher education is persistently consistent with the intensions of students and educators. In the other hand, beyond the influence of individual leaders, participants' idea that institutional culture could also influence the use and outcomes of SXA apps can be theorised as wider dependancies in the linguistic distinctions of educators and the student body, which vary in every institution and in time. Overall, this concern signals the importance of considering the educational perspectives and habits of institutional managers, academics and students for gauranteeing the safe and beneficial use of SXA in higher education. In this way, it is possible to argue that such a problem might generate the necessity to recognise political dimensions related to decision-making and shared values of the individuals which conform higher education institutions and hold leadership positions in them. Such a view would seem to escape the individualistic absolutism of the theorisation proposed and incline into domains of collective organisation that may be interestingly explored as socio-material assemblages.

Critical analysis: blaming managers, academics and students

The discourse of the theoretical analysis persuades the reader to believe that the interest of students, academics and wider society are drivers of this study and thus, of the SXA discussed. This narrative can be critiqued as hiding ulterior, more sinister motivations thrusting this dissertation and propositions. Picking up the fears of less-than-benevolent institutional leaders and less-than-effective institutional educational culture can be questioned as an attempt to shift the blame to academics, students and always suspect managers for the potential negative impacts that SXA could have in higher education. Even if some of the undesirable consequences of the integration of such analytics technologies could be directly linked to decisions and perspectives of these stakeholders, such an assertion explicitly implies that such scenario would be known by its designer. In consequence, these possible negative implications could be classified as a known secondary effect of the design of SXA – which is quite different to an unforeseen outcome. In other words, this discourse can be critiqued as ignoring that user errors are design errors, one of the main principles of human-centric design.

5.3.2.9 Unforeseen consequences

Theoretical analysis: Consequences beyond what observers that are not distinguished before making decisions

The last main concern identified was participants' discussion of potential threats related to unforeseen and undesired consequences caused by the implementation of SXA systems within the complex human contexts of higher education institutions. That supposes that academics and students may not succeed in distinguishing all the undesirable probabilities that lie ahead after the moment in which these tools are plugged in to the socio-material and autopoietic contexts of universities. In this sense, this can be theoretically interpreted as a limitation in the explanatory, predictive and epistemic power available for academics and the student body in regard to the possible implications on their histories of co-transformation (co-ontogenic drift). Consequently, it can be theoretically suggested that participants observed that, despite all the best intentions and efforts, the implications that SXA data and analytics could produce may go beyond what can be foreseen, under the control, and desirable for students and academics. Such theoretical propositions are of interest in general questions about the capacities of predicting how interventions or changes turn out in complex educational contexts. More specifically, these propositions are relevant to the philosophical discussion about the capabilities and limitations of students and teaching staff for making accurate distinctions and sound sense about the implications that their mutually accepted co-transformative experiences will have, for them, and beyond. If this capacity is not infinite, it can be argued that these co-transformative experiences that are mutually agreed upon will consistently turn out to be distinguishable from what was consented to, or in other words, not coherent to what is coherent for and desired by participants of a formal educational process. In the light of this initial theoretical analysis the risks of unforeseen unintended implications to higher education, could academics and students arrive to reliable distinctions about whether the use of SXA apps and data is something safe and aligned with what might be coherent and desirable for them? Would the recognition of unforeseen effects to something as strategic as higher education be distinguished by academics and students as a red flag due to the possible threats for the value of higher education as a public good (Naido and Williams, 2015; Gourlay and Stevenson, 2017)? With some participants

speculating about risks associated to automation, misuse and abuse of data, misleading data, and professional and personal harm to academic staff plus various authors warning about the vicious performativity (Staddon and Stendish, 2012), the risks emotional and mental tolls in academics (Sabri, 2013; Wintrup, 2017), the consumerist and transactional instrumentalisation of higher education (Sabri, 2011; Tomlinson, 2017), and the risks for scholarship and academic values and traditions related to data from student surveys: to what extent this possible unforeseen effects should be dealt with? Could human-centred design perspectives (e.g., Buckingham Shum et al., 2019) be sufficient to address or mitigate these risks? Should these problems be also informed by socio-material perspectives of higher education teaching and learning contexts (e.g., Gourlay, 2017) and the actions that could be made or triggered by SXA apps or data? As these questions have emerged on the basis of a brief and not exhaustive analysis of unreliable exploratory data it is important to remember that it is not possible to make them a source for strong inferences. Yet, this initial conceptual analysis seems to emphasise the importance of further exploring the possible scale and nature of the potential unforeseen consequences that SXA apps and data could trigger in higher education.

Critical analysis: Normalise the marketised disruption of higher education

Closing the critique of the concerns identified and theorised in this study, the admission that the implementation of SX data and analytics in higher education practice will produce unforeseen unintended consequences can be suggested as a discourse to normalise the belief that academics and students should surrender any resistance and accept and use them despite their limited control of the consequences for them and higher education. A literal reading indicates that SXA systems and the discourses coordinating its implementation should be rigorously reviewed before their integration in higher education contexts. However, the narrative also sustains the idea that limited knowledge and control are normal, and furthermore, inevitable. In other words, the narrative can be used to internalise the belief that lack of control about unavoidable, tolerable effects and nothing else can be done except accepting them and to hope to be able to adapt to the new normal and avoid personal compromises. The discourse of the claimed concern attempts to make readers convince themselves that there is no choice for academics and students rather than assent (persuade themselves that they consent) that there are no guarantees given of what ultimately is going to happen to them in consequence of the use of SXA apps and data. Such narrative can be used to coerce academics and students to think that resisting undesirable educational situations and outcomes might not be worthy, and hence, a waste of energy. In this way, while apparently being reasonable, this is a dangerous narrative which can be used to validate notions of teaching staff and students having insufficient ability to wield control and autonomy of the educational activities they participate in. This last part of the initial critical analysis can be used to suggest further questions. Could the recognition of potential unforeseen impacts be used to normalise the expectation of unpreventable undesired effects for teaching staff and their confidence (Staddon and Stendish, 2012)? Could fostering the commodification of higher education learning (Sabri, 2011) be an ‘unforeseen’ consequence of the use of SXA apps and data? Could academics’ increased feelings of dread and anxiety be another ‘unforeseen’ outcome (Sabri, 2013)? Could SXA apps and data end up being ‘unpredictable’ and create more barriers between the data haves and have-nots (UN, 2015?)? To what extent may these tools and data be used a stick such as student surveys (Staddon and Stendish, 2012)? Besides the problems today discussed in relation to the student experience, feedback and surveys, what unpredictable threats could be directly or indirectly triggered by Sa apps and data? For instance, is it possible that autonomous, automated data

machines might end up categorising and influencing experiences --similar to *machine behaviourism* (Knox et al., 2019?) and change how higher education is built and lived as a place by student and teaching staff? Acknowledging that unforeseen also implies the opportunity of unpredicted benefits, it may be also fair to ask: could there be potential good surprises in store? Might the critique be too partial and miss relevant reflections about the exciting part of the 'unforeseen'? Is it possible that some unpredicted but genuinely educationally valuable influence by be induced by SXA tools and data? The exploratory findings and posterior analysis do not allow us to rule out such possibilities. However, the balance between expected positive and negative unforeseen effects does not go well because the expected unforeseen impacts may not offer sufficient incentive to expose oneself to expected unforeseen negative consequences. You do not bet unless you are in the betting. In conclusion, as higher education cannot be by any account defined as a trivial and random matter in which positive and negative impacts can be betted on, a simple statistical analysis would suggest that if SXA can have undesired unforeseen effects then it is not reasonable to take the chances. Such conclusion sums up in good way the results of this study and points to the main implication of this exploratory study: the findings and analysis produced by this study suggest the necessity for further, more sophisticated investigation before large scale implementation of student SXA tools in higher education.

Chapter 6. Conclusion

Based on the previous findings, initial theoretical and critical analyses, and the associated questions in relation to the recent academic discussion, in this last chapter I synthesise the relevance of this study and avenues for further research.

6.1 Main conclusion

The main conclusion is that the results of this exploratory design research study initially suggest that, from the perspective of the participant academics and student representatives, the use of SXA in higher education could lead to both important positive and negative consequences. In this sense, the hypothetical use of analytics to evaluate and improve the student experience of higher education programmes would not be trivial, hence, should not be trivialised or turned a blind eye. While findings are exploratory, interpretative, from a small non-probabilistic sample, situated in Scottish universities and context of student-staff partnerships, and cannot be generalised, the consistent suggestion by participants of potential benefits and problems related to the possible implementation of SXA reinforce the necessity for more sophisticated research and debate to better understand and corroborate these possible impacts and their associated implications for higher education. It can also be argued that this need for additional research is of particular relevance for countries (e.g., Scotland and the UK, Australia, US, Ireland, New Zealand) institutions and researchers with explicit interests or concerns in the enhancement of the student experience (e.g., Harvery, 2005; Sabri, 2011; Staddon and Stendish, 2012; Gourlay, 2017; Wintrup, 2017; Bloch et al., 2021; Darwin, 2021; Budd, 2021) and the participation of students as egalitarian partners in quality improvement processes (e.g., Bovill & Felten, 2016; Cook-Sather, 2014; Healey & Healey, 2019; Matthews et al., 2019). Similarly, the conclusion that the implementation of SXA could have non-trivial impacts can also be argued as of particular interest for discussions about the opportunities, challenges and problems of using data and analytics in higher education or beyond (e.g., Ferguson, 2012; Sin & Muthu, 2015;

Papamitsiou & Economides, 2014; Avella et al., 2016; Vieira et al., 2018; Viberg et al., 2018; Aldowah et al., 2019; Hernandez-de-Menendez et al., 2022; Chen et al., 2022; Tsai et al., 2020; Jarke and Breike, 2019; Knox et al., 2020; Buckingham Shum et al., 2019; Parkes et al., 2020; Williamson et al., 2020). In the next section I outline some of the main specific areas and questions that may be further addressed in future academic research and debate.

6.2 Main questions and areas for future research and debate

To what extent could SXA apps help improve the understanding of learning experiences in higher education?

The most central potential benefit of SXA suggested was related to the potential expansion of the student-staff's understanding of the learning experiences of higher education students. This possible benefit was found to have the potential to lead to important secondary benefits such as driving improvements in teaching, curricular and policy decisions. Thus, it seems important to start by reflecting on this finding. Harvey (2005), Cahill (2010), Ryan (2015) and other authors have argued that enhancing the student experience and considering the student voice have become international trends in higher education policy. It then seems logical that an informed, detailed and reliable interpretation understanding of the students' experiences and perspectives could be a fundamental issue for higher education institutions. In such a scenario, the suggestion that the use of SXA could improve and expand the understanding of the student experience can be argued as a very significant and desirable potential outcome. Accordingly, the extent to which the understanding of learning experiences can be improved and expanded by the use of SXA becomes a crucial question that should be further examined by more advanced research. Additionally, Darwin's (2021) suggestion of present limitations in the literature to indicate how students' perspectives can be more effectively understood raise questions about the extent to which SXA apps could complement existing alternatives such as student surveys, partnerships, peer assessment. A recent proof-of-concept of a text-analysis tool to assist teaching staff in assessing student feedback by Jah et al., (2019) and a similar study by Saarela et al., (2021) indicate that research is already underway on this question. Moreover, considering the discussed absorbing but ineffective (ibid), unreliable (Hagel et al., 2012) and problematic (Wiers-Jenssen et la., 2002; Sabri, 2013; Staddon and Stendish, 2012; Bloch et al., 2021) character of student surveys or course enhancement questionnaires (Wang and Williamson, 2022), it is possible to ask about the extent to which SXA might even replace and render obsolete some of these instruments.

The question of the extent to which SXA could contribute to better understanding of the experiences of students might be focused on the discussed limitations of student experience discourses and evaluation instruments and the potential of these tools to go beyond them. For instance, as introduced in the previous chapter: following the argument Tan et al., (2016), could the greater and better data from SXA go beyond cognitive and satisfaction representations of learning and help increase the understanding of higher education learning contexts and affective domains? Following the ideas of Wiers-Jenssen et al., (2002), could SXA open new windows to understand the intellectual formation of higher education students? Taking the critique by Hagel et al., (2012) about Australian student surveys, could SXA expand the understanding of student autonomy and reflection? Following Tomlinson (2017) argument that consumer identities do not represent the whole self-images of students, could SXA provide insights into the complex identity of students? Could SXA be used to better understand how teaching and learning practices can challenge and unsettle the world view of students (Skea et

al., 2017)? Could SXA bring new insights into the public value (good) of higher education (Gourlay and Stevenson, 2017)? Noting the assertion by Budd (2021) that interest in student experience has focused on structural inequalities, could SXA provide a more robust understanding of the challenges based by different student groups (e.g., women, ethnic minorities, students from disadvantaged socioeconomic backgrounds, disabled students)? Following Budd's (ibid) critique of this limited scope, could SXA lead to great awareness about 'studenthood' and complex student-institution and student-student relationships in higher education? Could SXA offer more informed interpretations of the personal and social transformations that take place in higher education (ibid)? Another important angle that may be addressed by future research is linked with the possibility of an improved understanding of the students' experience being used to evaluate changes and quality mechanisms. As already mentioned, Bloch et al., (2021) claimed that little studies have attempted to obtain evidence of quality practices, creating challenges to confirm which approaches are more effective. Attending to this problem it may be relevant to ask: could SXA be used to get and analyse data about the impacts and effectiveness of quality processes? If so, could this lead to a better understanding of the ultimate effects of quality enhancement efforts and policies?

Finally, considering a more skeptical or cynical standing point, as mentioned in the previous chapter, is also possible to question the extent to which the suggested potential improvement and expansion of the access to data about and understanding of learning experience might ultimately end up working against flexible and richer interpretations of higher education. Acknowledging the precedent of student surveys, there are many risks that should be noted. For instance, taking Skea et al., (2017) argument against a focus on student satisfaction, could SXA and their data be used to reinforce a focus on student satisfaction and foster narrow understandings of higher education as meeting short-term expectations of students? From Sabri's (2011) critique, how can it be ensured that such approaches do not conclude in *hollowing education out of experience*? In the light of Gourlay's (2017) critique of the risks surging interests in observable student engagement, could SXA contribute to distorting and reducing the understanding of learning experiences by overemphasising more easily observable or measurable teaching and learning practices in detriment to other less visible –but also valuable- educational activities? Similarly, following Budd's (2021) question about prevalent student experience discourses, could SXA end up making it difficult for academics to resist drives towards academic degrees being *flattened into readily observable metrics*? Or, considering Hagel et al., (2012) reflection on student surveys and Wang and Williamson (2022) conclusions about correlations between lenient grading and satisfaction scores: could data from SXA lead to deceptive or unreliable interpretations of learning experiences? From a Foucauldian (1995) perspective and the idea of internalised discipline, however, the initial critical analysis suggested that discourses of stronger epistemic power that SXA about the student experience could be used as an argument to justify authority and control of teaching and learning practices and higher education in general - *visibility is a trap*. Considering the idea of biopower (Foucault, 1990; 2004; 2007) –the pursuit of power by modern states through via biopolitical management- there are also risks that governments may seek to use SXA and its claim of epistemic power to influence higher educational behaviours towards such an agenda. In general, all these issues and questions seem of interest to guarantee that analytics can contribute –instead of being detrimental- for the understanding of the learning experience of higher education students.

To what extent could SXA apps strengthen student-staff dialogue and partnerships for quality enhancement?

In the preliminary exploration conducted (Rates and Gašević, 2022) insights obtained pointed to the towards access to data being a crucial factor to enable the egalitarian participation of the student body in partnerships for quality enhancement. Those early findings seemed to support the proposition by Klemencic (2011; 2012) that access to information was essential for effective participation and that higher levels of participation required higher levels of access to information. Additionally, those insights indicated that relevant analytics could support empathetic and democratic educational practices (Parkes et al., 2020). The results about the potential benefits of SXA obtained by this study –with the assistance of a prototype that gave concrete examples for participants- appear to reinforce all of these propositions. By potentially helping student reps to better understand the experiences of their peers, to close feedback loops and foster dialogue, to identify opportunities for improvement, to strengthen the ability to keep track of things and the continuity of their work (in roles that change every year), and to inform policy-making –such as gathering student feedback about policies or proposals-, SXA seemed to have the potential of being important enablers the student body as egalitarian partners in higher education (Matthews et al., 2019). Accordingly, these findings reinforce the suggestion (Rates and Gašević, 2022) that the use of data and analytics might become a relevant part of the maturation of partnership practices and approaches (Healey & Healey, 2019). Findings and its critical analysis, on the other hand, pose very serious questions about the possibilities that student experience data and analytics apps may drive vicious and even dangerours dynamics which threatens the autonomy and the discussed educational contributions of partnerships. Consequently, based on the results discussed, it is possible to recommend practitioners and researchers interested on student-staff partnerships for higher education improvement to engage in further investigation and debate around the use of student experience data and analytics and how can they influence egalitarian relationships in universities and academia.

Beyond the potential to foster the implementation of partnerships in present higher education practice, there is an additional interesting angle which I would like to reflect and elaborate. Besides the partnerships' contribution to improve higher education teaching and learning, they are also discussed to lead valuable personal benefits for students (see also Matthews et al., 2019) such learning about their own learning, supporting their confidence and identity as students, or strengthening their curriculum vitae and employability. From this perspective, the possibility that the use of SXA and data could encourage and nurture student representatives' participation as partners in higher education decision making –particularly in regard to understanding the views of their peers and informing policy evaluation- could also hypothetically lead to their learning –and by their involvement in consultation and from vicarious learning, to the student body in general- to use data as a key aspect for (political) representation duties. This may sound like a syllogism at first. However, if we consider the argument of Luescher-Mamashela (2013) that student representation in higher education can also play an important role to make universities 'sites of democratic citizenship' and inculcate democratic political practices in future professionals and leaders, this idea can gain a new twist. Following this argument, it is possible to hypothesise that the use of SXA by student representatives as part of their participation in partnerships for quality enhancement could prepare and accustom future generations to use data to inform decision-making and democratic dialogue. In one hand, this could be supposed as personal benefit for representatives –and the student body more widely,

in terms of learning to provide inputs and receive reports. On the other hand, and of potential great significance, the use of SXA apps by student reps and the student body as part of student-staff partnerships could hypothetically lead to partnerships contributing to more robust and accountable democratic baggage and practices for future generations. In other words, by sparring in dialogues (debates) with academics –who are in a more powerful and experienced position- and using data in these processes, future generations may strengthen their abilities to seek, obtain, analyse and use evidence to build a case in favour of the interests of the represented majorities (and minorities too). Accordingly, with the argument of Luescher-Mamashela (ibid) it is possible to propose that the use of SXA by student representatives could allow partnerships to make significant contributions higher education as a place of citizenship, and therefore, for the future of democracy.

While after conducting this study I feel strongly aligned with the notion that the use of SXA could contribute to student-staff partnerships (and partnerships contributions to students and society), I believe these benefits cannot be taken for granted and concerns raised in research and through the critical analysis of findings should also be given attention. Staddon and Stendish (2012) argue that the involvement of students in educational evaluation and decision-making promotes a lack of confidence in academics' teaching abilities. As discussed in the previous chapter, the use of SXA by student representatives, and by students in general, could obviously generate additional tests to the confidence in academics' professional competence. The cases of stress and anxiety triggered in academics by student surveys (Sabri, 2013) and the fear of exposure to being categorised by data (Wintrup, 2017) may replicate or even become more acute by SXA apps and their more detailed and accessible records. These possible scenarios could be supposed to critically affect the trust, comfort, incentives and ultimately the relationship needed for open student-staff dialogue and partnership. These arguments advise that, despite abundant promising features, extremely careful consideration of the effects that SXA could have on academics, scholarship and partnership shall be contemplated in the design and implementation of such systems. Lastly, more cynical stances about narratives about the possibility of SXA being *pro-partnership narratives* might also require to be given due consideration. Such discourses could be instrumentalised as mechanisms to legitimise and normalise the adoption of these tools on the premise of supporting the political position of students and academics in higher education decision-making. At least for the case of the UK Quality Code, it can be argued that there are precedents of the rhetorical use of partnerships and 'consultation' to implement quality regimes that foster competition, marketisation and vicious performative dynamics that 'subjugate the substance of learning' and threat academic principles (Staddon and Stendish, 2012). On the other hand, it is possible to sustain an interesting counterargument that runs opposite to the prevalent assumptions and directions of these critical references. If data is power and can be used by the State apparatus to establish disciplinary regulation or biopolitical management (Foucault, 1995; 2004), could teaching staff and students make use of data to contest detrimental State, market and institutional influence? In this regard, a recent article, Thomson and Prinsloo (2021) reflect about ways in which the data-gaze can be re-storied, re-shaped and re-directed into forms of data activism. If we take the example of the VP of a student union who noted that the prototype SXA app could be used to ask students whether a policy or proposal was good or 'crap' and combine with the idea that use of data by the student body to evaluate and discuss their experiences with teaching staff could strengthen higher education and future societies as spaces of democratic citizenship

(Luescher-Mamashela, 2013), there are certainly options that require further critical examination beyond prevalent perspectives centred on passiveness and vulnerability.

What could be sensitive issues for the design of SXA tools?

To conclude this dissertation, I would like to highlight what appeared to be critical areas for the design of SXA systems for higher education. Firstly, participants reiterated that allowing the comparison of data that may be linked to academic staff performance could be highly problematic. Related data or data visualisations were deemed a risk to teaching staff professional confidence and well-being. Likewise, if data can be directly linked to individual students, this could affect their behaviours by fear of being judged. These points strongly resonate with problems discussed by Wintrup (2017). Secondly, another omnipresent problem discussed by participants was the risks of misleading data. Whilst the expression of such views indicates a degree of awareness about these risks, this acknowledgement was not discussed as a guarantee that students, academics, or line or top managers could safely avoid misinterpreting data from SXA tools. Actually, the contrary seemed the case: this was repeatedly described as a persistent and dangerous threat. In consequence, the design of SXA should carefully examine the implied risks of data being misleading. Moreover, this perhaps requires very serious discussion about data and educational literacies and training related to quality enhancement. Assuming that members of universities are well-versed in quantitative and qualitative data collection, analysis and communication might ba grave mistake, even for the case of academics. For instance, academics from humanities might have very little abilities and confidence to deal with statistics. Likewise, and corroborated by my conversations with participants, academics from mathematics and sciences may not be able to adequately use qualitative data. If we consider that decisions about teaching and curriculum are made on the basis of such type of data, these issues can have very real and meaningful implications. Such conclusions are in line with the argument from Beerkens and Udam (2017) that transparency instruments might be problematic if the people who receive it do not have the skills to interpret it.

The most centrally-sensitive design issue seemed to be related to who gets access to data and who controls this –what can be linked to who has ‘superAdmin’ powers. This is weel reflected in the diagram of potential sociomaterial assemblages surrounding SXA (chapter 3). As discussed by participants, wider student access to data may be important to foster the contributions of this tool. For instance, by letting students to analyse data and share ideas, or simply, to learn that feedback is recorded and used and thus, incentivised them to give student feedback and participate in quality enhancement activities (the latter being a well-known problem). On the other hand, if all or many students have access to data from SXA tools then students and teaching staff may be more exposed to misinterpretations. Again, *visibility is a trap* (Foucault, 1995). Similarly, students and staff may become more exposed to judgements that alter their behaviours (Wintrup, 2017) or misuse of abuse of data that harms them. Additionally, and perhaps the most crucial issue, is related to access to SXA data by institution managers, quality agencies or government and policy makers. With corporate, economic and political vested interest at hand, access to detailed data about the learning experiences of higher education students by these powerful actors could produce a myriad of serious problems. Use of data for performance management, hiring and promotion decisions, phasing out unpopular (but important) teaching practices or areas of study (and thus research), accrediting institutions and hence coercing them with financial (or status or reputational) consequences, withdrawing less

economically productive or politically inconvenient programmes and ideas are all possible threats which might be difficult or impossible to be protected against if SXA data is accessed by these actors with regulatory and funding powers. My reflection is that, in the lights of findings from this exploratory design study and considering that quality policies and mechanism have been critiqued as an attempt by governments to control and ideologically influence higher education (Harvey, 2005), access and control to analytics and data about the learning experience, or in other words, the sovereignty over the representation of learning, could be a critical factor and juncture that skews the balance between educational dynamics that foster higher education as a human right (Talvit, 2008; 2009) and bottom-up partnership for public good, or a top-down marketised and surveilled private service in the interest of the current neoliberal-oriented State.

6.3 Recommendations for higher education practitioners and researchersTo start rounding up this investigative exploration of the potential impacts of student experience analytics, with a focus on higher education contexts in Scotland, next I offer what could be described as the key recommendations and messages for higher education practicioners (academics, student representatives and leaders) and researchers (on student experience, higher education quality, student-staff partnerships, educational technology and analytics).

For researchers with an interest in educational technology and analytics –whether designers, promoters or critics- this study opens up the academic inquiry and debate on a new typology of educational analytics technologies focused on the evaluation and enhancement of the student experience –what I have simply referred to as student experience analytics (SXA). Due to the potential serious positive and negative impacts of SXA apps expressed by academics and student representatives, plus the complementary theoretical and critical analyses of these findings, my recommendation would be to continue and expand research and discussion around these novel analytics systems. If research does not anticipate the practical implementation of SXA, the findings of this study suggest risks of significant implications for higher education and, by extension, to wider society. For researchers attending student-staff partneships questions, as just mentioned in the precious section, the context and recommendation appear to ressemble similar ideas. At the light of the results and conclusions from this dissertation, the use of student experience data analytics could also bring both beneficial and problematic scenarios for student-staff collaborative enhancement of higher education. Thus, I recommend further and profound engagement on the debates about partnerships and the access to data by different stakeholders. The future of partnerships --and perhaps even student representation- may be conditioned by the particular data and data governance regimes established in the next couple of years and decades. In consequence, following this informed speculative forecast, researchers should expand the corpus of empirical evidence and debate so partnerships –and more in general, teaching staff and student relationships- are promoted –instead of harmed- by data and analytics apps. For researchers with a focus on the student experience and educational quality, the main recommendation and message shares an analogous direction. As SXA, from the views of academics and student representatives, showed possible desirable and undesirable implications for the quality of higher education programmes, I would strongly recommend researchers to bolster the research base, scrutiny and dialogue on the potential effects that student experience data and analytics can have on professional and academic learning. The implementation of more advanced student feedback tools is taking place in many institutions and will likely experience rapid incremental growth in the following years. Therefore, the question is not whether student experience analytics apps will become a regular part of

higher education or whether they will have non-trivial consequences: the question is when these will happen and what outcomes will these tools drive for the quality of higher education. Hopefully, researchers still have -- and can make use- good of the chance to try to answer these questions and influence the occurrence of events and future.

For the case of academic staff and student representatives, particularly for leaders at programme, department and institutional levels, I would recommend that they too respond by taking the initiative and engage with local and broad inquiry and discussion about the use of student experience data and analytics. My recommendation is primarily for these actors to take a leading role in help understanding what benefits and problems could the use of this data and systems bring to them, and to higher education and society more widely. Questions such as what data can be positively and safely utilised and how it should be used are essential questions that practioners should develop an answer for/ Accordingly, these questions offer directions for a good start for practitioners' engagement. From a participatory and people-centred approach, the generation of such a continuous learning and discussion is not only ideal but absolutely critical. Researchers can enrich this dialogue, but it must include and be translated into the agreements and actions of academics and students in higher education practice. Finally, as a closing reflection, all these sensitive issues and questions seem important for the interests in ensuring that analytics can be relevant and of genuine interest for its intended educational users (Buckingham Shum et al., 2019) and support empathetic, democratic and human (or if preferred, posthuman) educational practices in higher education contexts (Parkes et al., 2020).

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Appendix

Appendix A. Data revolution (extended literature review)

[For reference purposes only]

A.1 Data revolution and datafication

A.1.1. The rise of data machines

A revolution is unfolding. Whilst there are different interpretations (e.g., Schwab 2015; UN, 2014; van Dijk, 2013; Zuboff, 2020; Flensburg and Longborg, 2021), in the last decades there has been growing academic debate about a new unfolding technological and industrial revolution: the revolution of data machines, or simply, the data revolution. Based on the anti-positivist and anti-intuitive quantum physics and its related advancements to understand and control electrons (solid-state physics) and photons (optics and photonics), the second half of the last century witnessed a continuously exponential growth of data storage, computing and communication power (speed). Equally important for these developments has been the parallel production of algorithms and data-science libraries that enable these data machines to work in increasingly powerful ways. By the first decades of this century, and particularly in the 2010s, these advancements enabled the mass-production of cheap and powerful of sensors, computers and ultra-fast internet connections which can collect, analyse and communicate huge amounts of data in real time across the planet.

This massification of data machines and their data collection, analysis and (inter) communication powers have offered the unprecedented possibility of accessing and processing data related to almost all kind of phenomena (natural or social), thus, creating new ways of interpreting related human activity, and therefore, to change relevant decisions and how these activities human activities are performed. Examples of the implementation of advanced data machines and their disruptive power are widely discussed in recent literature. In the case of medicine, analytics have been developed to create new innovations for clinical and self-care, such as in relation to analysis of exams, biosensors, continuous patient-monitoring, personalised medicine, wearable devices, bionic prothesis, data-driven medical research and public health infrastructure, among others. An illustrative example, analysing pathologies from thoracic (X-ray) radiographies, a deep learning algorithm has achieved radiologist-level accuracy in the detection of 11 of 14 pathologies, while taking an average of 1.5 minutes to analyse 420 radiographies compared to 240 minutes required by radiologists (Rajpurkar, 2018). For the case of transportation, machine-learning-based data machines have achieved significant progress in self-driving vehicles (e.g., Bojarski et al., 2016). Within social communication and media, algorithms are "increasingly dictating how media consumers navigate their media environment, while also increasingly dictating content production decisions" (Napoli, 2016, p3; from Napoli, 2014). In relation to agriculture, examples include networks of digital sensors and artificial intelligence to inform decisions about planting, harvesting, irrigation and crop protection, as well as autonomous weeding machines. Smart cities have also emerged as a new urban paradigm linked to data-machines applied "transform urban governance, management, and living [in order to] help address issues of urban resilience and sustainability in a time of rapid population increases, environmental change, and fiscal austerity" (Kirchin and Dodge, 2017, p47). The implementation of data-machines in criminal justice and policing, by nature a highly sensitive topic, has also been growing with "data-driven models now increasingly applied in justice systems across the world for predicting risk, forecasting crime hotspots, and implementing the biometric identification of targeted individuals" (Lavorgna and Ugwudike, 2021, p1). An example from this year, a Google engineer has triggered substantive questions after reporting that an artificial intelligence prototype has shown to be "sentient", have "self-awareness", and had asked for help to talk to a lawyer about its rights as a non-human person.

In sum, literature is plagued with tales of rising data-machines. These examples are evidence of their expansion and potentially revolutionary implications in multiple areas of human activity. At the onset of the growth of these new technologies and the new possibilities they offer for governments and society, the report of a UN commissioned panel of experts on the post-2015 development agenda called for a 'data revolution' to seize the present technological "opportunity to strengthen data and statistics for accountability and decision-making purposes [,] to enable real-time monitoring of development results [,] enable us to reach the neediest, and find out whether they are receiving essential services […] to make sure that no group is being left behind." (2013, p23). The UN Secretary General, Ban Ki-moon, picked this call and commissioned a new advisory group of experts which produced the prominent 'A world that counts" report (UN, 2014). The key motto of this report asserts that 'data are the life-blood of decision-making and the raw material for accountability'. The report positions the data revolution as strongly beneficial for citizens, policy, society and its sustainability, indicating that the massification of the use of advanced data-machines can "produce high-quality information that is more detailed, timely and relevant for many purposes and users [, and] ultimately, more

empowered people, better policies, better decisions and greater participation and accountability, leading to better outcomes for people and the planet." (UN, 2015, p6).

Another widely discussed source advocating for is Klaus Schwab, founder and chair of the World Economic Forum, who suggested that human civilisation is experiencing a new profound industrial revolution: "[w]e stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another" (2015, p1?). In his article for Foreign Affaris, Schwab indicated that activity was underway leading to new forms of symbiosis between humans and other organisms, products and built spaces: "[e]ngineers, designers, and architects are combining computational design, additive manufacturing, materials engineering, and synthetic biology to pioneer a symbiosis between microorganisms, our bodies, the products we consume, and even the buildings we inhabit" (2015b, page). Schwab also suggested that, as other previous industrial revolutions, the data revolution "has the potential to raise global income levels and improve the quality of life for populations around the world" (page). While not the central focus of this dissertation, discussion about artificial intelligence has been growing significantly in the last years. The Office for Artificial Intelligence of United Kingdom's Government Digital Service published three years ago 'A guide to using artificial intelligence in the public sector' (2019) where it indicated that embedding services and products based on these technologies have "the potential to create thousands of jobs and drive economic growth. By one estimate, AI's contribution to the United Kingdom could be as large as 5% of GDP by 2030" (UK Office for AI, 2019, p1). At the light of the discussed examples of the massification of data machines in several areas of human activity, as well as the influential business, governmental, intergovernmental narratives reviewed, this data revolution appears to be developing at a vertiginous pace and to promise unprecedented opportunities and change for contemporary human society. However, it is important to note that with the growing calls to embrace the data revolution, there has also been increasing discussions about associated challenges and risks as well as mounting critiques about its beneficial direction and contestation of widespread narratives shaping these orientations.

A.1.2 Data revolution? Challenges, risks and critiques

During consultations for the 'A world that count' UN report, members of the expert panel recognised that in addition to the perceived opportunities of the data revolution, there is awareness of "*clear risks*, as people around the world question the *accessibility* and *privacy* implications of the new world of data" (Barroso and Le Goulven, 2014, p1, my emphasis). In this publication also reports a list of preliminary social rights which might be desirable to situate at the heart --such as privacy, consent and participation, ownership of personal data, protection from discrimination- and reminds that advanced statistics are not unproblematic: "statistical averages can hide inequalities, but granularity can infringe on privacy" (p2). The 'A world that counts' UN report recognises new threats but also makes a clear attempt to normalise them: "As with any change, the data revolution comes with a range of new risks" (p6). This report places the focus on challenges and risks linked to data access, use and inequalities. Additionally, it reconises the existence of problematic tensions between promoted collective benefits and impacts to individuals and minorities: "privacy, respect for minorities or data sovereignty requires us to balance the rights of individuals with the benefits of the collective" (ibid). The impact of data revolution on individuals, the report acknowledges, can be significant: "As more is known about people and the environment, there is a correspondingly *greater risk* that the *data could be used to harm*, rather than to help" (ibid, my emphasis). In relation to the risks of

deepening social inequalities, the UN report suggested that the data revolution was generating a new frontier of disparity: “[m]ajor gaps are already opening up between the data haves and have-nots" (p7). In the end, the ‘A world that counts’ report concluded that “[i]t is governments – ideally working in collaboration with forward looking and socially responsible private institutions, civil society and academia – that can set and enforce legal frameworks” and initiatives to guarantee an adequate use of data machines that protect personal privacy and security, makes adequate balances between public and private interests, and does not contribute to local and global inequalities (p.8). Then, in synthesis, this report is evidence that serious possible challenges and risks associated to the expansion of data machines have been early acknowledged at the highest official level, and that governments and academia have been pointed as critical players to protect the population of undesired consequences.

The suitability of the term data revolution has also been questioned. For instance, Mcfeely (2020) argues that “there has not been a single data revolution, but many. The Data Revolution is in fact a series of revolutions” (p.1089), both in the production and consumption of data. Kitchin’s (2014) widely discussed critique puts emphasis around the problematic mainstream use of the term data. Kitchin argues data is assumed as truth produced independent of the observer, when it may be better understood as a rhetorical creation: “data are never simply just data; how data are conceived and used varies between those who capture, analyse and draw conclusions from them” (2014, p3, from Rosenger, 2013; Floridi, 2010). Additionally, Kitchin suggests that data are abstractions, thus, intrinsically fallible. Furthermore, Kitchin argues, data is situated in contested and complex political, economic and cultural contexts, domains which data is also trying to remodel. Subsequently, noting that considering contingent revolutions (plural) than a single one, and, that data is not just produced independently of the observer and wider social context, the construct of data revolution is more complicated than what has tended to be widely assumed by advocates and official discourses.

Another important idea within the data revolution debate is the concept of ‘datafication’, which is said to have been introduced by Mayer-Schönberger and Cukier. The authors defined datafication as “taking all aspects of life and turning them into data” (Cukie and Mayer-Schönberger, 2013, p26). van Dijk (2014) offers an early critique of the concept arguing that it is rooted in problematic philosophical positions and *dataism* ideology. For van Dijk, dataism is characterised by both an *uncritical stance on datafying human activity*, and, for *trusting government and corporations with additional data-power*. These uncritical beliefs, van Dijk argues, are problematic due to their reliance on a pressumed trust in the independence and integrity of these organisations. In contrast, van Dijk describes the concept of *dataveillance* as an “increasingly preferred” form of surveillance characterised by “the monitoring of citizens based on their online data” (2013, p.202). van Dijk argues that, in the light of scandals related to collusion between state agencies and ‘big tech' corporations to conduct mass-surveillance, dataism contributes to the acceptance of dataveillance as a ’normal’ form of social monitoring” (p.206) that triggers uncomfortable questions about “profound consequences for the social contract” (ibid, p205) between the state, private firm and citizens.

Since van Dijk’s article, a vast number of studies have focused on raising critiques about the datafication of human activity. A recent systematic review (Flensburg and Longborg, 2021) found that, between 2019 and 2020, a total of 273 research publications included the term datafication in their title, abstract or keywords. The authors of this review noted two main streams of research: on one side, the advocates of the opportunities of datafying human activity,

and on the other hand, more skeptical scholars from humanities and social sciences focused on "cultural, political, economic, and rhetorical dimensions of the data paradigm shift" (p.262). Of the latter group, Zuboff is one of the most prominent exponents. Zuboff suggest that the datafication of human activity or data revolution are drivers a 'coup from above': a new age of rogue capitalism with a never-seen concentration of knowledge and wealth by corporations and governments that seek to overthrow people's sovereignty, with the intention of the "annexation of human experience [to achieve] exclusive concentrations of knowledge and power that sustain privileged influence" (2020, What is surveillance capitalism, para. 2): something that, Zubbof argues, is a form of premodern absolutism which is profoundly antidemocratic. As a final reference about the critique of the datafication, Mejias and Couldry (2019) looked at the controversies created by the new political economy where the production of data is linked to the generation of profit and capital. Mejias and Couldry note that threats of datafication to privacy and individual have been raised at least two decades ago. In relation to individual autonomy, the concept has been put into question by the recognition that "things like self-tracking devices, psychometric algorithms, and workplace tracking systems arguably interferes with the minimal integrity of the self as a *self*" (Couldry and Mejias, 2019; see also, Hildebrandt, 2015), and that data-driven tactics and tools to influence the actions and habits of the population, referred to as *data behaviourism* (Rouvroy, 2015). Finally, Mejias and Couldry also point out datafication has been also discussed --and may be better understood- as a (post)colonial process "that appropriates human life so that data can be continuously extracted from it for the benefit of particular (Western, but also increasingly global capitalist) interests" (2019, p6), in other words, "a form of domination in both social and cognitive domains" (ibid; from de Sousa Santos, 2016) in which data is crucial for both dispossession and legitimation.

Appendix B. Higher education quality (extended literature review)

[For reference purposes only]

B.1 Higher education and quality

B1.1 Higher education: a brief history and synthesis of current trends

A brief history of higher education and student representation

Student representation is not just part of Western universities from its origins. The first European university –the University of Bologna, established in 1088 CE – was founded and initially governed by students. In other words, unlike the Platonic myth of academia suggests, for Europe and the so-called Western world, higher education was firstly organised by students –rather than academics. Students came to Bologna's trading centre from different countries, which "evolved in an institution where students decided what they wanted to learn, and who would teach them" (Day & Dickinson 2018, p.13; from Janin, 2014). Later, after issues with expensive rents and discrimination, students from Bologna obtained self-governing powers for the University, "placing the control of university affairs in the hands of the 'Dominus Rector'" (ibid) - a student that was elected by peers who could hire and fire academics - a de facto control of the curriculum. This model with central student participation was followed by Universities in Italy and similarly some centuries later in Scotland (ibid).

Another ‘master’ or scholastic model was established in the University of Paris, where scholars decided alone about governance and on the “design and shape of the curriculum” (ibid). This model was followed by Oxford and Cambridge, later mirrored in England and Wales. With time, most universities followed this latter model. Difference in these models can be noted in the mid 19th century, when two Royal Commissions were established (ibid: from Asby & Anderson, 1970) to look at universities in Scotland (1826) and England (1850). In Scotland, students were part in the Commission’s discussions. But in England, they were not. Yet, student representation in Scotland was still considered insufficient. Talking about the University Court, Henry Cockburn, Lord Rector of the University of Glasgow, said at the time: “the voice of students ought to be very distinctly heard in it. It should contain one person, at the very least, directly elected by them […] I think that the students have too little say in it, and the ex-officio members rather too much” (REF, page). In 1884, Robert Fitzroy Bell lead the creation of the first modern student union, the Student Representation Council (SRC) of the University of Edinburgh. Its original agreed aims were (ibid): 1) to represent students in matters affecting their interest; 2) to provide a channel of communication between students and college authorities; and 3) to promote the social and academic life of the University. The University of Edinburgh’s SRC made quick progress. It was recognised by the Scottish law (1889), *forcing every Scottish university* to have a similar organisation. Also, at the University of Edinburgh, a student-staff committee was initiated “to examine teaching methods in Medicine, and students quickly began to take an interest in examination methods, assessment, overcrowding and tutorials.”. Universities in England and other countries followed, with different degrees of student participation. At the University College London, college authorities kept the “right to veto topics for debate that they did not consider ‘suitable for the undergraduate mind’”. In the first years of the 20th century, most universities in the UK had an SRC. In France, the ‘Union Nationale des Étudiants’ was found in 1907 (Laqua, 2017).

After the First World War, national unions of students started developing and international meetings were held for students to meet, discuss, and to help avoid the horrors from the recent war. In 1919, it was agreed (ibid) the constitution of the international confederation of students (CIE, Confédération Internationale des Étudiants). Those years other international student organisations (ibid) for particular student groups – e.g., women, Jews, Catholics- – were created. In the 1920s, the CIE joined national student unions representing over 350,000 students around the world (ibid). In the UK, during the late 1930s (Day & Dickinson, 2018), the National Union of Students (NUS) started producing reports on issues like student health and graduate employment. In 1940, the NUS adopted (ibid, p.19) the ‘Charter of Student Rights and Responsibilities’. The fifth right claimed for students “a share in the government and administration of the universities”. This triggered great resistance from some academics (ibid.), with one commenting: “Are students who have failed to fulfil a primary obligation of their membership of university society fitted, quite apart from their immaturity, to have a voice in its government?”.

In the context of the cold war, student representation was a fertile land for activism and politics, being central to the famous movements of the late 1960s. Yet, it faced renewed resistance. In the UK, Baroness Cox led a movement called “The Black Papers” rejecting student participation in university governance: “The government of an academy must be built on the concept of academic authority. […] An academy is NOT a community of equals and cannot be run as a democracy or partnership; the justifications of democracy in society at large do not apply in the special circumstances of the academy”. This reactionary group believed nothing short of the fact

that the Soviet Union was taking over Western universities through democratic and representative structures and hence opposed them fiercely. Overall, we highlight that student representatives were the founders of Western Universities and the first who obtained self-governing powers, yet the academic-led model did later prevail. Modern student representation was created in the late 19th century and, although it has received important and continued resistance, iduring the 20th century it became an integral and historical part of universities, and in many cases, of national politics.

Higher education in the 21st century

Following the Second World War in the middle of the last century, the postindustrial economic model emerged has the hegemonic blueprint for government and international social development agendas (Clark, 1940). The postindustrial economy place is predominantly driven by services and knowledge production rather than industrial manufacturing. Thus, instead of needing to educate most of the population to be industrial operators (secondary activities), the postindustrial societies require that a majority of workers are highly educated to work in services industries (tertiary activities), research and innovation (quaternary activities). Figure B1 illustrates this rationale. This postindustrial economic analysis has become hegemonic for the State and inter-State apparatus and created unprecedented growth in the demand for the massification and improvement of higher education in the second half of the last century and the first decades of this new century and millennia.

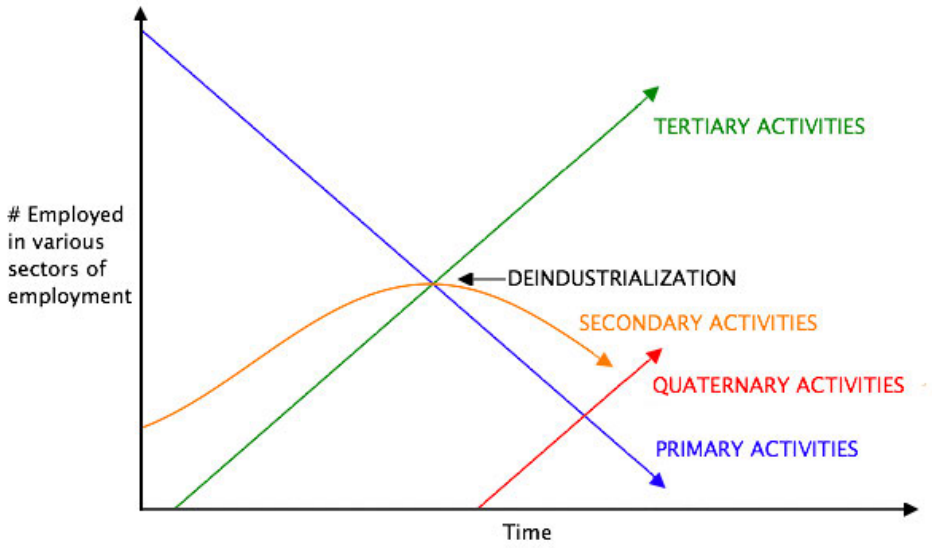

Figure B1. Deindustrialisation model (from Clark, 1940).

As shown in Table B1, the number of tertiary (e.g., postsecondary) students has increased from nearly 35 million students in 1972 to 231 million in 2019. Considering the estimated global populations, this represented a change from 0.96% of the population to 3.21% in this period, which indicates that the percentage of tertiary education students has more than tripled (around 330% growth) in less than 50 years. However, the available data suggest that, as global average, public funding for tertiary education has increased only in the order of 10% in the same period. In other words, as a global average, the increase in enrollment rates in higher education is 33 times bigger than the increase in public funding.

While the increase in the number of vacancies has offered the possibility of higher education studies to many, many more millions than nearly five decades ago, it is clear that this growth has not been supported by a proportional increase in public funding. This raises very serious questions about governments commitment to higher education, and more specifically, to ensure the high quality of its provision and of the learning that students get. This higher-level background is at the heart of many of the current debates about contemporary higher education, and we will see in the next section, for debates about higher education quality.

Table B1. Expansion of higher education 1972-2019

	1972 Population	1972 Pub. Exp. (%GDP)	1972 Total students	1972 enrollment rate	2019 population	2019 Pub. Exp. Ert. (%GDP)	2019 Total students	2019 enrollment rate	1972-2019 Enrollment Growth factor	1972-2019 Pub. exp. growth factor
World	3.7B	**0.70**	**35.7M**	**0.96%**	7.2B	**0.80**	**231M**	**3.21%**	**3.3***	**1.1**

Note. Data from UNESCO, World Bank. *Growth factor for the period in terms of percentage of population studiying in higher education. **Growth factor for the period in terms of total number of students enrolled in higher education. Extracted on 05 Jul 2022 15:27 UTC (GMT) from UIS.Stat.

Finally, to round-up a synthesis of the literature about contemporary higher education, a number of current trends and agendas about its curriculum are discussed. The term curriculum is used colloquially to refer to the totality of the formal sequence of educational activities which students take part in as part of a programme of study. Thus, the term curriculum encapsulates discussions about the underlying ideas related to the purpose and structuring of educational practice. Subsequently, it can be argued that reviewing the trends and agendas around higher education curricula opens a window to recent debates around the broader aims and roles of higher education. Having said that, the first thing to note is that the current state of debate around higher education curriculum has been described as *the curriculum crisis* (Young, 2013; Linden et al., 2017). On one side, there are so-called ‘normative’ theories of the curriculum, and on the other side, the auto denominated critical theories of the curriculum. The ‘normative’ or also applied theories of the curriculum share a common characteristic of proposing theoretical models and ideas to frame and inform educational practice. The most traditional of these understands the curriculum as the content (e.g., syllabus and reading lists) of a study programme (Kelly, 2009). From this perspective, the curriculum is a defined set of conceptual knowledge which students are required to thoroughly understand in order to attain the ability to make academic and professional judgments within a defined discipline. This view sees the higher education curriculum as the advanced knowledge passed to next generations. This thinking was influenced by traditional religious education, which frequently aims to teach ‘divine truths’ or ‘revelations’ to the population. Then, since the last century, influenced by behavioral and cognitive psychology and military training, a second perspective focuses on the curriculum as a product, or in other terms, the list of outcomes produced by education. This has become the de facto hegemonic approach in higher education and beyond, particularly when defining curriculum as the set of observable competences gained by the student (Satu et al., 2013; Watson et al., 2002; Ashworth and Morrison, 1991; le Vrang et al., 2014). Additionally, another understanding of the curriculum defines the curriculum as processes (Kelly, 2009), such as

defining study objectives, designing teaching and assessment activities, evaluation of the results and activities, etc.

On the other hand, ‘critical’ theories of the curriculum have at large been influenced by the so-called new sociology. Postmodernism and critical theory have been important references for this group of positions which share an a-priori distrust about traditional and ‘normative’ understandings of knowledge and social progress, and hence, they are skeptical or cynical about the curriculum as a project. Initiated in the School of Frankfurt, critical theory emerged as philosophical contestation aiming to expose and defy society’s unfair power structures. As Horkheimer famously put it, critical theory is not only commited to enrich the historical and socio-empirical understanding of contemporary society, as it must also be invested in “liberat[ing] human beings from the circumstances that enslave them." (Horkheimer 1982, p.244). Over the last decades, critical approaches have become extensively adopted in social sciences and humanities, for instance, in areas such as posthumanism, critical race theory, postcolonialism, and feminism, to name a few important examples. In relation to education, multiple influential authors have made significant contributions. Within the English-speaking literature, the ideas of Bernstein have perhaps been one of the major references. Bernstein (1973) argued that the curriculum can be understood as a *linguistic appropriation* of *what counts* as valid *knowledge*, and, by omission, what knowledge is not considered as legitimate knowledge. With attention to the political aspects of the curriculum related to its conditioning of what is –and what is not- legitimate knowledge, critical approaches share a focus on unfolding the contradictions, discrimination and oppression within the curriculum policy and theory. Additionally, in line with the previous quote from Horkheimer, critical theories of the curriculum often aim to contest these problems by promoting critical reflection and action by education stakeholders, such as teaching staff, and particularly, students. An example of this is Freire’s critique of capitalist state (and, more generally, utilitarian) reduction of education as a technological practice and his proposition of a pedagogy of the oppressed, focused on ensuring that the oppressed student does not become, thanks to their education, into a future oppressor. Nonetheless, it is also necessary to note that critical approaches to the curriculum have themselves being subject of critique, with some authors suggesting these narratives have been self-centred and have failed to offer realistic alternatives for educational practice (Young).

Overall, for this exploratory study, in a context of curriculum crisis, both applied and critical understandings of the curriculum are thought as essential to represent the presently co-existent perspectives and debates about contemporary higher education. For both parties are part of the curriculum crisis and applied curricular theories of curriculum cannot ignore problems of power in society and education, and, similarly, critical theories of the curriculum cannot ignore that they require perspectives and practices about knowledge selection that they can critique, and ‘liberate people from’. Then, for this study an essential reference is the ‘integrative’ curriculum model by Linden et al (2017), in which the curriculum is composed of knowledge and ownerships dimensions related to content, outcomes, processes and emancipation, as shown in Figure B2.

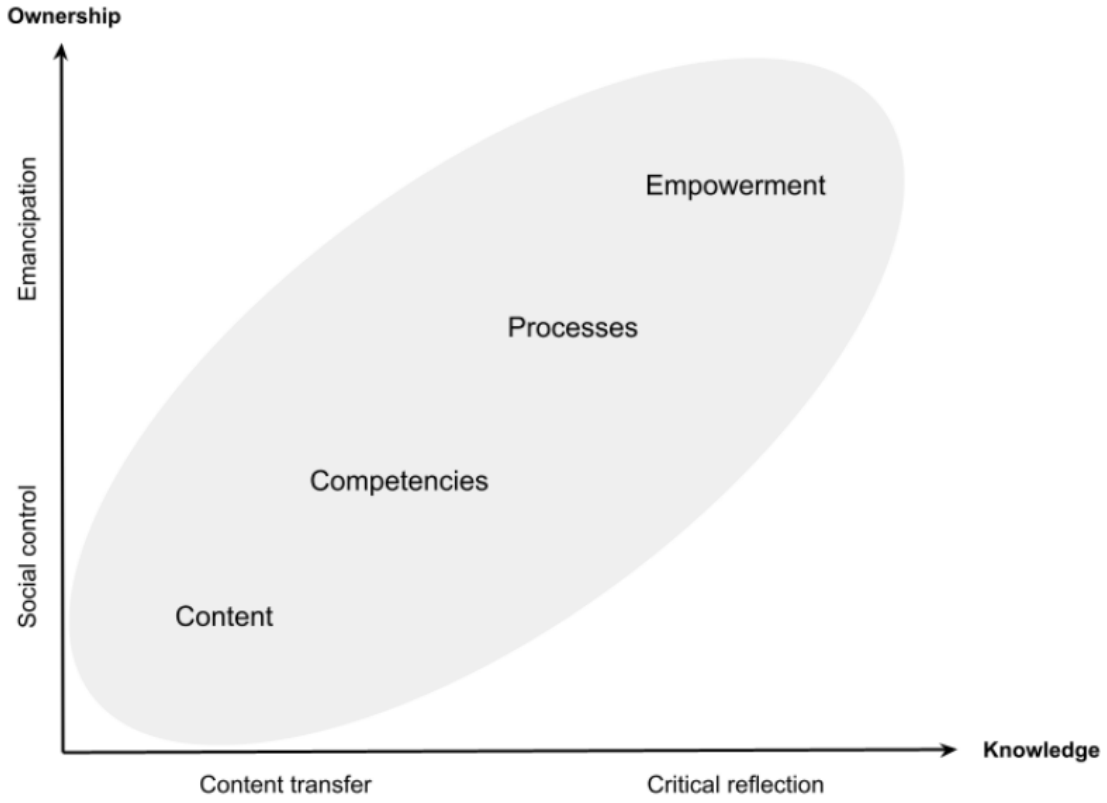

Figure B2. Curriculum model by Linden and colleagues. Note: from Linden et al., 2017.

Lastly, a number of emergent trends and agendas associated to higher education curriculum can complete an overview of the current moment of contemporary practice and debate. In the last years, the literature includes, among other, international discussion about: curricular issues such as competences (e.g., Kouwenhoven, 2009; Chan et al., 2017; Barnett, 1994), employability (e.g., Knight & Yorke, 2004; Fallow & Steven), the importance of theoretical knowledge (e.g., Shay, 2013), research-based education (Carnell & Fung, 2017; Fung, 2017) and on continuous enhancement (see Temponi, 2005; Briggs, 2007; van de Mortel & Bird, 2010; Quirk & Chumley, 2018), to other issues like accessibility (e.g., Orkis & McLane, 1998; LaSala et al., 2020), widening participation (e.g., Warren, 2002) and inclusion (e.g., Bolt, 2017), introducing skills for sustainability (e.g., Franco et al., 2019; Cullingford & Blewitt, 2013), entrepreneurship (e.g., Akhmetshin et al., 2019) and interdisciplinarity (e.g., Holley, 2017), the 'hidden curriculum' (e.g., Sempler & Blasco, 2018; Margolis, 2001), the 'decolonisation' of the curriculum (e.g., Gyamera & Burke, 2018; Fomunyan & Teferra, 2017; Stein, 2017; Leibowitz, 2017) and, the co-creation of and in the curriculum with students (e.g., Bovill & Woolmer, 2019), to name only a few recent examples. In sum, this range of discussions suggest that the curriculum of higher education raises debate related to practical educational matters but also about economic impacts, problems of inequality, social inclusion and sustainability (again, just to mention some prominent examples). Therefore, in conclusion, for this study higher education has had critical influence in enabling and shaping modern society. Since the second half of the last century, higher education has become central for postindustrial, service- and knowledge-based economies for being the main place for the creation and distribution of knowledge and

innovation which drives the value-generation chain. Therefore, and in many countries strengthened by extreme neoliberal policies, higher education has been incentivised to expand their provision in unprecedented ways while facing stagnating public funding. Debates about the roles of higher education and its curriculum suggest a crisis of contested thinking represented by 'science wars' and so-called applied and critical theories. Rounding-up, discussion of contemporary higher education is framed around educational matters but also in relation to internal and external economic and political problems and implications. This complex contemporary context sets the scene for in-depth discussion about higher education quality and student experience, and the potential impacts of the use of data analytics to inform their improvement.

B.1.2 Higher education quality

Quality: Concepts and mechanisms

Following trends from the manufacturing industry in the late second half of the last century, the co-called quality assurances systems and mechanisms expanded to a near standard part of productive processes in a broad range of industries and management paradigms. The arrival of quality systems in higher education institutions took off in the 1990s (Harvey and Stensaker, 2008), and, over these few decades, governments around the world have implemented different regimes and processes to foster the quality teaching and study programmes in the sector (e.g., Schwarz & Westerheijden, 2004; Liu, 2015; Nguyen et al., 2021; Pham, 2018; Atibuni et al., 2021; Gupta, 2021).

During these periods, a number of approaches for defining higher education quality have been discussed and applied in practice. Schindler et al., (2015) identified four broad conceptualisations of quality "consistent with those originally developed in the 1990s" (p.5) by Harvey and Green (1993) and other authors. In brief, Harvey and Green (1993; see also refined in Harvey, 2006) discuss quality *as excellence,* for when quality is seen as reaching some minimum standards (non-exclusive), or, as achieving standards that only a few can reach (exclusive and elitist). Quality *as perfection* changes the focus from aiming to achieve excellence in inputs and outputs to seeking consistency of processes. Reliability and zero or minimum errors occur "at each stage" instead of relying on a final inspection at the end of the process. This approach, Harvey and Green argued, "subverts exclusivity" and calls for a 'quality culture' across the organisation. Quality as fit for purpose understands the performance of higher education in relation to the fulfillment of its intended affordances and utility. As the authors elegantly put it, the motto of this perspective is: "If [higher education] does not fit its purpose then its perfection is irrelevant" (ibid, p. 17). Who defines the purpose of higher education, and how to appraise its fulfillment, are two main questions in this approach. Harvey and Green argue that there are two main alternatives of sources for defining what is intended in education: the customer and the provider. In the first case, the quality of education is measured to the extent that it meets the requirements or expectations of the customer: "In principle, the customer is sovereign" (p.18). Importantly, while customer needs are central for this perspective, it is the provider who has to anticipate these needs: "the customer requirements or needs are determined by the producer or provider" (ibid). Important questions also arise here, is the customer the student, who uses the service? Is it the state who funds it? With increasing student fees and loans becoming the normal in growing neoliberal there has been big discussions about the 'marketisation' and 'customerisation' of higher education: "Is the student the customer, the product, or both?" (ibid, from Collins et al., 1990). Harvey and Green are,

while these issues are contentious, students are, at least in part, undeniable consumers of higher education, and so are their future employers, and local and central governments. The authors also suggest (from Elton 1992) that customers (e.g., students, governments, employers) are not always in a position to specify what is required. Therefore, again, it is normally the providers who assume what is needed by the customer. The authors indicate that a way that governments have used to 'ease this burden' is to "returning the emphasis to the institution [...] quality can be defined in terms of the institution fulfilling its own stated objectives, or mission" (Harvey and Green, 1993, p.19).

Quality as value for money, the authors argued, compares the inputs, outputs and outcome with the total costs. Harvey and Green suggested that, for the case of the UK, the political right, influenced by neoliberal Thatcherism, "has made use of this populist view of quality " (1993, p.22). Economic accountability and efficiency, the authors argue, are at the heart of this approach: "The government wants to get more people into higher education with minimal extra investment" (p. 24). Finally, a different approach equates quality to transformation. Harvey and Green note that, although services normally do something *for* the user, the case of education is different because does something *to* the student --and by doing so, *to* other stakeholders such as employers, central and local governments, and society at large. Then, from this perspective, the quality of higher education is linked to the extent to which it is transformative for students and society. Overall, Harvey and Green (1993) concluded that "[d]efinitions of quality vary and, to some extent, reflect different perspectives of the individual and society" (1993, p.28). In that in their review, Schindler et al. (2015) suggest that definitions of higher education quality tend to be standard-driven or stakeholder-driven and faced three manin challenges: I) definitions of quality are subjective and dependent on perspective of stakeholders (e.g., academics, students, administrators, accreditation bodies, experts, governments); II) Defining quality in a single idea is reductionist, and: III) quality is relative to educational, social, economic, political, cultural trends and conventions, and thus, a dynamic concept that changes over time. In another recent review, Ryan (2015) concluded that there were no international agreements on what higher education quality is, or how to improve it. In synthesis, after at least three decades of debate, there is no unifying and internationally accepted theory about the quality of higher education. This is an important reference for this dissertation as it goes to explore the use of data analytics to support higher education quality recognising that it is a highly contested domain and is highly likely that some of its assumptions may not be widely supported.

After acknowledging the co-existence of competing conceptualisation of higher education quality, it is then important to consider the different mechanisms that are commonly used to implement quality systems in practice. Firstly, these mechanisms for quality assurance can be external or internal, depending on whether higher education institutions define and implement them, or if there are external stakeholders involved (such as governments, quality agencies, etc.). Dill (2007) discusses external mechanisms such as national qualifications frameworks (European Skills/Competences, Qualifications and Occupations, ESCO; see le Vrang et al., 2014), (external) quality assessment by governments of subsidised agencies (e.g., subject assessment, academic audits, academic accreditations), and the publication of quality-related information (e.g., to inform government funding decisions, and, more recently, 'student choice'). Dill continues by arguing that policymakers have promoted the publication of information about programmes founded in the belief "that informed [prospective] student choice is an influential means of external quality assurance" (ibid). The author also lists some of the information often made public –in virtue of regulatory requirements or autonomous initiative: graduate placement,

salaries, satisfaction, student [standardised] test scores, completion rates, and marks; student engagement. Surveys of student experience, such as the Australian Course Experience Questionnaires and US National Survey of Student Engagement (NSSE). Yet, Dill also notes that making this information public has generated significant problems: "[o]verall, the validity of public information on academic quality has become a controversial issue in higher education" (2007, p.9). This point introduces the question of the use of data within quality mechanisms in higher education and both the impacts that this could have, an important matter for this dissertation which will be reflected across its chapters. It also opens the question about the ultimate evidence and debates about the effects of quality systems in higher education.

Qualifying quality: putting quality systems to test

Positive and negative Impacts

As quality systems seek to bring demonstrable improvements in higher education, it would be absurd not to attempt to critically appraise their effects in practice. Pham (2018) offered a recent brief recap of international literature regarding positive and negative impacts attributed to quality systems. Pham (ibid) notes that some of the main positive (i.e., arguably desirable) impacts of implementing quality assurance systems in higher education institutions included: *enabling cultural change* (e.g., in teaching and curricular design practices; in cooperation and collaboration; in the use of data to support student learning; in planning change; and, in academic management and development), improvements as a result of external recommendations, and engagement of various stakeholders in quality conversations (e.g., making programmes of study increasingly responsive to academic and industry discourses; making student (re)gain stakes (after growing tuition fees) and becoming (again) the "most important and valuable stakeholder group, especially related to internal quality assessment [and] increasingly regarded as partners who judge to what extent their personal aspirations are fulfilled" (Pham, 2018, 171; from McDowell & Sambell, 1999; Jongbloed et al., 2008). Pham also points out that a number of studies indicate limited improvement of student experience, engagement and learning outcomes (from Harvey, 2002; Newton, 2002; Harvey and Newton, 2004; Vincenzi et al., 2018; Gosling and D'Andrea, 2001; Horsburgh, 1999). Looking at 20 years of quality assurance systems, Ewell (2010) argued that these efforts have brought changes such as a steadily increasing focus on student learning; transformed modalities of teaching and learning; quality assurance becoming trans-national; growing attention to documentation and intentionality; reinvigorating attention to teaching in research-intensive higher education contexts; provide more transparency for a more informed public perception of the activities and contributions of higher education. Yet, critically, Ewell also surprisingly recognised that, nevertheless, it was still not possible to know ultimate benefits for student learning: "[t]he elephant in the room remains the fact that we don't really know how all of this has affected how much or how well students learn" (ibid, p.175, my emphasis). The author then, in a rather humble way confessed: "at least given us a vocabulary to begin to talk about this most important question. And that too is a form of progress" (ibid). From this literature, it can be concluded that the positive impacts attributed to the implementation quality systems and mechanisms may have significant effects in practice. Nevertheless, following more than 30 years now the little evidence of enhancing the quality of students' learning fails to demonstrate that the implementation of quality systems has had determinant contributions to the excellence, fitness, consistency, efficiency or transformative power of higher education.

So far, the little evidence of fostering quality can be argued as the most critical problem for higher education quality systems. Pham (2018) also identified from the literature two other important negative impacts of the implementation of these systems in higher education institutions: high bureaucracy and resource and time demand, and, generating academic distrust and resistance. Firstly, mechanisms such as external academic audits were reported as being burdensome, adding bureaucracy, being time-consuming, demanding too much paperwork, being too stringent, and being expensive and requiring "[re]allocating additional resources to meet external requirements" (p.172; from Harvey, 2005; Cheng, 2009; Godwin, 2011). In other words, all of these issues represent a significant drain on the scarce resources and time of academic departments and academics, and therefore, a direct decrease in what can be invested in the quality of academic programmes. Secondly, there is vast evidence of prevalent academic resistance to higher education quality systems. Pham indicates reports in England of external evaluations perceived by academics as creating tensions between academic values and the audit (from Harvey & Newton, 2004), arguably caused by academics feeling that quality evaluations were based in distrust of their professionalism (form Cheng, 2009). Pham (2018, 171) notes that the analysis of Harvey and Williams (2010) suggests that "[b]ureaucratisation, administrative burden, stifling of creativity, and lack of trust have been recurring concerns" reported by academics. Watty (2003, p.217) point that Everett and Entrekin (1994) reported a "steady increase in dissatisfaction and alienation among Australian academics", and (from McInnes et al., 1994) "overwhelmingly negative views with regard to the worth of quality assurance mechanisms and their effectiveness and efficiency". Trowler (1998) identified four types of response to change by academics in British universities (used later by Watty, 2003). Some discontent academics accepted the status quo and others attempted to work around or change local policy (refered by Trowler as 'sinking' and 'using coping strategies', respectively). On the other hand, some academics that were content with changes accepted the status quo, while others sought to change it ('swimming' and 'policy reconstruction'). Pham also discussed the findings from a small survey (N=63) at one university by Kemenade and Hardjono (2009) about the factors driving academic resistance to quality systems: "[r]esistance was found among lecturers because of increasing workload, negative emotions (stress and insecurity); the lack of knowledge and experience (help from specialists is needed); and lack of acceptance (other paradigm)" (p.171). Academics' partial withdrawal from participating effectively in programme accreditation has also been reported, particularly in external evaluation (Cardoso et al., 2018). Pham notes the critical effects of this resistance in the light of academics' ownership of quality mechanisms being significant for their successful implementation.

In sum, the literature reviewed suggests that, while there is some studies reporting some positive impacts attributed to the implementation of quality systems in higher education, after three decades of application in practice there is also scarce evidence of enhancing the quality of student learning in higher education –the central reason used to support their implementation. Additionally, there is plenty of literature discussing the negative effects related to high time and resource demand of quality processes that directly decrease the capabilities of academics to offer better teaching and programmes of study. Likewise, it is well discussed that quality systems have also triggered significant and problematic academic distrust and resistance, which question the legitimacy of their implementation. In other words, it could be fair to suggest that in over three decades, quality systems have shown to persistently fail to demonstrate the fulfilment of their objective and have brought an array of important undesired impacts in higher education. If it would be needed to make a judgment base of these antecedents, such as a quality agency,

it could be possible to argue that dominant higher education quality regimes have consistently failed to meet minimum criteria required to be accredited as a justifiable external policy imposed in higher education (pun intended). Furthermore, there is also abundant literature about challenges related to the implementation of quality systems and mechanisms, as well as conceptual and methodological critique.

Challenges and critique

In the early discussion about higher education quality some authors were already contesting that defining quality is a "waste of time" (Vroeijenstijn, 1991) due to quality being relative to stakeholders, their interests and perspectives (Harvey and Green (1993). The question of who defines quality and how to appraise it, as mentioned earlier, is a good starting point for analysis. Harvey (2005) offers his own critique of the symbolic case of British higher education sector, noting that the development of quality policies in the sector were stimulated since the 1980s by Thatcher's neoliberal government: "[the growth of the quality systems outside the control of universities and professional bodies] was on the back of government ideology in the 1980s that set out to bring market forces to bear on all aspects of economic, social, and cultural life in Britain and to attempt to privatise as much public service as possible" (p.264). For the British context, Harvey (ibid) mentions government sources during the 1980s which asked higher education to increase its effectiveness in supporting the performance of the economy, and for funding councils to develop teaching quality indicators related to funding. Later, the creation in 1997 of the independent but centralised UK Quality Assurance Agency (QAA) took control of quality legislation and assessment from professional bodies and funding councils, increasing the complaints about real and opportunity costs, accountability and compliance, and weakened and academic autonomy and freedom (ibid). Harvey adds that this central agency "was resented" due to "its evident desire to control the sector to an unprecedented degree", a practice the author argues continued later, but with lighter rhetoric (p.269). The author this time also notes voices concluding, twenty years ago, that QAA procedures were cosmetic or theatrical and the time of external reviewers "would probably be better spent in frank and open discussion aimed at enhancing the student experience" (p.272). Overall, Harvey then suggests, instead of being associated with continuous improvement, "[o]n the contrary, quality has become linked with control" (p.272).

Houston (2008) contributes with a similar line of thought, pointing out that although the development of quality systems in other industries emerged within organisations, in the case of higher education quality systems have been mostly driven by market pressure and governmental influence. Houston then highlights that a number of fundamental assumptions of quality systems were taken for granted: "Largely the rhetoric and postulates of quality management – that quality is defined by customer satisfaction; quality is the reduction of variation; and quality must be measurable – were accepted uncritically" (p.62). Such assumptions, Housten argues, "pre-empt" questions about who benefits from higher education and what ideology is served by it. Legitimate academic authority moved from academics to administrators and customers. The adoption of performance indicators designed for organisations competing in markets, Houston notes, is based on the assumptions "placing education as a business in the market" (p.65). Alternatives views which define higher education as a community of scholars (teachers and students) which foster and distribute advanced knowledge and fulfills essential cultural and ethical social roles (Coady, 2000), or in other words, acts as the "critic and conscience of society" (New Zealand Government, 1990). Such views are

not explicit and seem missing in customer-oriented quality definitions and mechanisms. Additionally, Houston asserts that the notion of system used in quality systems is “an impoverished representation of system ideas” (p.67): systems are seen as organised mechanisms instead of building a holistic picture which recognises and embraces complexity and emergent properties, which is contrary to breaking things into parts (from Midgley, 2000). In another article, Houston and Paewai (2010) highlight that external quality assessments are both used by governments to drive by political agendas and control over universities, and, enforced coercively by means of threats of “changes to university funding, reputation, or status” (p.267). The authors also describe quality systems as a series of control mechanisms, some unidirectional (e.g., government-university) and some multidirectional (e.g., academics-students, academics-academic unit, academic unit-university), with uni-directional loops offering scarce opportunities "for those involved or affected by quality assurance to influence the measures of improvement” (p.270, my emphasis). Furthermore, the authors argue, the state, through its agencies attempt to seize control by occupying roles of “system designer, expert and guarantor” (p.271). In this study Houston and Paewai conclude that quality systems in higher education have been ‘imposed from the outside’ in order to improve external accountability and control.

Jarvis (2014) noted that within a tradition of peer-review and internal mechanisms, universities and academics have long been the authorities in charge evaluating higher education production and distribution of knowledge. Yet, thanks to subsidiary, evaluative and regulatory state and ‘new public management’ culture in governance, “this is no longer the case” (p.156). This expansion of external control can be interpreted from Foucault’s idea of governmentality: mechanisms of the state to project interests and exercise control, which can be seen in higher education as neo-liberal (market creation) managerialisms practices based on “performance based evaluation and efforts to frame, regulate and optimise academic life” (Morrissey, 2013, p. 799). Jarvis argues that the neolibieral managerialism makes rhetorical use of ideational motifs related to concepts such as efficiency, value, performance, and economic worth in order to further control over the sector to regulate the activities of stakeholders in higher education to "serve the interests of the state and the economy” (p.156, from Rosa, Stensaker, & Westerheijden, 2007). For example, and also drawing from Rosa, Stensaker and Westerheijden (ibid), neoliberal managerialism's purpose of higher education is redefined by quality regulations as the production of graduates that can be employed by the market. Such notions reduce (higher) education as a technoscience (Slaughter and Leslie, 1997), or as Freire puts it, a technological practice (XX). Accordingly, Jarvis (2014) concludes, instead of quality being a simple attempt to make higher education excellent, fit for purpose, accountable and efficient, "[a]s ever, the quality debate remains principally a debate over values, politics and ideology” (p.164).

To wrap up this review of the critique of quality narratives, a number of recent publications offer additional complement. Tomlinson and Kelly (2016) use Dewey’s ideas to analyse the question of the intrinsic and instrumental value of within current marketised discourses of higher education. The concluded that market-oriented understanding are centred on the instrumental value of higher education for students and employers, with employability being a main common denominator. The authors also point out that the measures used to evaluate learning experiences determine de facto judgments of value of higher education: if HE is evaluated by consumer-based criteria, intrinsic and instrumental value will likely be defined in terms of the extent in which consumerist desires are met. A recent systematic review by Bloch et al., (2021) identified limitations in research about higher education quality. An increasing number of studies

have focused on quality practices, such as the use of feedback and observation processes, but there is little discussion about factors and conditions which enable these practices. Quality processes are valued by management, but contributions can be outweighed by negative impacts if staff is not involved in decisions about changes. Important for this study and the next sections, the review of these authors note a growing trend “to view student learning experience as an outcome measure in itself” (p.713). They suggest this reflects a modification of perspectives of quality from focusing on changes in teaching and learning to student perception of the effects of these changes, and, they argue, the new perspectives could have implications for the organisation of quality practices. Only a small number of publications tried to measure the effects of quality mechanisms, adding to previous concerns raised about the impact of quality systems. Studies focused on feedback and observation processes offer multiple insights into mechanisms used and contributions to critical reflection, however “it is difficult to make sense of what works best, for example in terms [methods and] models” (p.714). In all, the findings from this review portray critical gaps in research about higher education quality, adding more questions about the contributions and maturity of quality policy and systems. Finally, Mello et al., (2022) conducted a review to evaluate whether quality systems were driving or inhibiting educational innovation in higher education. They found literature suggesting that quality mechanisms were found to lead to innovation in teaching, research and management. Yet, the also recognised claims that output-oriented mechanisms were “more likely to inhibit than boost innovation due to their tendency toward standardization” (p.10). Other critiques focused on negative impacts of the economic ethos of quality policy and systems, including perturbing daily life in institutions, fierce competitiveness, weakened university autonomy and reduced resources and work overload. These impacts could be argued as creating additional challenges for innovation. These authors also found that authors who supported quality systems implementations considered that these systems promoted innovation. Conversely, other authors argued that quality systems inhibited innovation, who they refer to as the ‘resistance approach’. Mello et al., also note in this review, it has been discussed that it is stakeholder participation in quality systems what drives innovation (Stensaker, 2008), and subsequently, the authors assert, top-down approaches and systems seem less effective and efficient to stimulate educational innovation, and thus, do not seem suitable to bring enhancement in higher education quality.

Open questions about higher education quality (and data-machines)

After a brief and not exhaustive review of some essential debates on the conceptualisation and mechanisms of higher education quality improvement systems, it is possible to situate the enhancement of the student experience and student staff partnerships within wider and contested discussions about quality. In this sense, a set of key ideas offers central reference points for the next section and chapters. It seems that there is a critical paradox: a great majority of authors have concluded the concept of quality in higher education settings is relative to stakeholders' perceptions and ideological, political and moral agendas. Four ideas taken from industry quality approaches –excellence, purpose, value for money and accountability- seem to have dominated in the conceptualisation of higher education quality systems. Yet, research and policy many times does not seem to systematically account for this complexity. After three decades of global implementation via by neoliberal new public management regulations drive by the state, there is limited and inconsistent evidence of positive impacts quality systems and mechanisms, such changes in teaching and learning practices and culture. However, there is very limited evidence of ultimate effects in educational quality, for example, related to improving student learning. This fact alone –and this time is the only when I use that deterministic term-

demonstrates that all the efforts in this over 30 years of policy and trauma have failed to deliver what they promised. Uncomfortably, that is only the beginning. The biggest negative impacts of quality systems appear to be the great efforts and cost affecting the workload of academics and funding of higher education institutions. The expensive characteristics of quality mechanisms require relocation of internal resources, quality system also have a high opportunity cost, particularly in terms of time of academics and institutional funding that could have been used to support multiple critical actions aimed at improving the quality of programmes. Yet, beyond insufficient positive results for higher education quality and huge resource demand, literature is also rich in critique of how quality has been conceptualised and systematised in higher education. Across the world, government driven quality policies and systems have been critiqued as driven by a narrow neoliberal agenda and ideology that develops regulations to transform higher education into profit-oriented businesses and the sector into a competitive market, both aimed at increasing the employability of graduates for wider national and global markets and economies. These macroeconomic visions have been widely critiqued as poorly informed reductionism and instrumentalisation of higher education and academia, particularly for its absence to recognised the social values and purposes of the sector. Different anaylses have suggested an evident attempt of state's uses of quality systems to seize critical operational control of higher education and academia. Significant dissatisfaction and resistance of academic staff in relation to quality processes are widely reported and debated, with some authors linking them to negative impacts of quality systems (e.g., work overload, feelings of lack of trust, stress) and lack of power to participate in decision-making. This appears to create a toxic vicious cycle where demotivated academics decrease their participation, fewer participation drives weaker enhancement, weaker enhancements and participation increase the pressure over higher management, who then increase the pressure over staff leading to further reduced motivation. In parallel, little gains and high resource demand should make neoliberal governments abandon such absurdly inefficient regulation, but instead, quality systems and mechanisms appear to be further expanded.

In this scenario, important questions about the potential impacts of data analytics to improve the student experience and higher education quality can be considered. Can the increased use of data analytics help improve higher education quality, when there is no agreement of what quality is? This question can be reframed to highlight the relative nature of quality: What perspectives of and agendas behind higher education quality can be assisted by the incremental implementation of data-machines? Can the datafication of the student experience lead to reducing the negative impacts of quality processes? Or more specifically, could the data revolution reduce the significant time and resource demand of quality assurance and enhancement mechanisms? Could it increase the decision-making power and participation of academics or students? Alternatively, could the use of data analytics impact in the wrong direction (e.g., damage educational quality, increase workload and costs, reduce participation and decision powers of the stakeholders at the bottom)? Will the datafication of higher education teaching and learning enable the government to further surveil and control behaviors and outcomes of higher education? If such is an actual possibility –and the most skeptical or cynical may agree, can data machines be used to prevent further external and ideological control of higher education? Is it a good thing to implement data machines in this area? Or perhaps, not at all? Overall, I argue that, based on the reviewed literature, the question of the potential increased implementation of data machines applied to evaluation and improvement of the quality of higher education is not a trivial matter; on the contrary, the contended narratives

can be argued as suggesting that studying and understanding how data analytics impact quality enhancement in higher education is of critical importance for contemporary debate, higher education and society. Accordingly, this diagnostic of the current literature provides both a wider educational and social and background and a justification for this dissertation focused within the scope of the use of data for the improvement of the student experience via student-staff partnerships.

Appendix C. Summary of findings from discovery phase

C.1 Target users of the SXA app prototype

Following the insights from preliminary exploration a design ethnography with academics and student representatives from Scottish universities, a number of potential target users of the SXA prototype was identified. The criteria to identify a potential user is their potential interest in access to data from a SXA app.

Potential academic staff users (in bottom-up order):

1. teaching staff (i.e., involved in lectures or other teaching activities) from programmes' modules/courses/placements,
2. module/course/placement leaders,
3. programme managers,
4. teaching or quality managers at departmental levels,
5. academic department heads,
6. Institution-wide teaching or quality leadership.

Potential Student users:

1. Students
2. Student representatives at programme level
3. Student representatives at academic department levels
4. Student representatives at student union/association levels

Potential external users

1. National student unions
2. National accreditation agencies
3. Government higher education departments
4. Prospective students
5. Civic society

For the case of this dissertation, it was decided to **select as target users academics and student representatives from programme, academic department and institutional levels plus student representatives at institution-wide level** (no external users were considered). This decision was primarily based on the assumption that these stakeholders are the ones ultimately discussing and agreements on what

happens in educational activiies of courses/modules of higher education programmes, and thus, the ones who would normally have closer access to data about the learning experiences of students.

C.2 Profile and requirements of target users

From conversations with participants of interviews and focus groups a number of main tasks, needs and requirements were identified for the selected target users of the SXA prototype app. These users required access (although to different degrees) to data about learning and the curriculum, quality processes, improvements, students, among others.

Teaching staff

Main tasks

- Plan, deliver, assess and evaluate teaching activities

Main needs

- Plan and implement relevant learning and assessment activities
- Evaluate experience of students with learning activities taught
- Find improvement opportunities at this level
- Appraise impacts of the changes made
- Documenting and sharing this information

Main user requirements

- Allow users to access, collect and analyse mixed data about planned activities taught
- Allow users to access, collect, analyse data about students and their experiences
- Allow users to access and analyse data about improvement opportunities, plans, changes made and impacts
- Quickly visualise, share and export data (e.g., for use in a meeting or a report)

Course/Module leaders

Main tasks

- Normally the same than teaching staff plus:
    - Lead the organisation of all teaching activities in a course/module taught
    - Report to teaching staff and programme managers.

Main needs

- Normally the same than teaching staff plus:
    - Evaluate the student experience across all the learning activities of the module
    - Find improvement opportunities at this level
    - Appraise impacts of the changes made
    - Documenting and sharing this information

Main user requirements

- Allow users to access, collect and analyse mixed data about activities across the particular course
- Allow users to access, collect, analyse data about students and their experiences
- Quickly visualise, share and export data (e.g., for use in a meeting or a report)

Programme managers

Main tasks

- Normally the same than teaching staff plus:
    - Lead the organisation of all courses in the programme.
    - Report to course organisers and department leaders.

Main needs

- Normally the same than teaching staff:
    - Evaluate the student experience across the courses of the programme
    - Find improvement opportunities at this level
    - Appraise impacts of the changes made
    - Documenting and sharing this information

Main user requirements

- Allow users to access, collect and analyse mixed data about activities across the particular course
- Allow users to access, collect, analyse data about students and their experiences
- Quickly visualise, share and export data (e.g., for use in a meeting or a report)

Teaching/Quality leaders at department levels

Main tasks

- Normally the same than teaching staff plus:
- Oversee the educational improvement of programmes within their department or subdepartments
- Report to programme managger and higher academic levels (e.g., Faculty or College with multiple academic departments) or institution-wide management.

Main needs

- Normally the same than teaching staff plus:
- Evaluate the experience of students across the programmes within
- Find improvement opportunities at this level
- Appraise impacts of the changes made
- Documenting and sharing this information

Main user requirements

- Allow users to access, collect and analyse mixed data about activities across the particular course
- Allow users to access, collect, analyse data about students and their experiences
- Quickly visualise, share and export data (e.g., for use in a meeting or a report)

Institution-wide teaching and quality leadership

Main tasks

- Oversee teaching and learning quality across the different academic departments of the institution
- Lead institution wide teaching and quality support and policy

Main needs

- Access to data about teaching and learning across the institution
- Access to data about quality processes and impact across the institution

Main user requirements

- Allow users to obtain relevant teaching data at institutional level
- Allow users to obtain relevant data about quality processes and impact

Students

Main tasks

- Study
- Reflecting on their studies
- Participate in the improvement of their programmes and departments

Main needs

- Obtain feedback about their studies and programme
- Obtain reports from academic staff and student representatives

Main user requirements

- Access data about their studies and programme (e.g., learning activities, assessment results)
- Access to reports from academic staff and student representatives

Student reps at programme levels

Main tasks

- Represent the student body in a programme (e.g., class, course/module, cohort)
- Dialogue with student body
- Dialogue about teaching with relevant teaching, course and programme-level academics.

Main needs

- Get and evaluate student feedback about the experience they had in courses/modules
- Document and share information with the student body and relevant teaching, course and programme staff.

Main user requirements

- Allow users to collect and analyse qualitative and quantitative student feedback about their activities in courses/modules.
- Quickly visualise, share and export data (e.g., for use in a meeting or a report)

Student reps at department levels

Main tasks

- Represent the student body of an entire academic department or subdepartment (i.e., students from different programmes of the same academic department).
- Dialogue with the student body
- Dialogue with student reps from the department
- Dialogue with relevant programme and department academics.

Main needs

- Normally the same as teaching staff plus:
    - Evaluate the experience of students across the programmes within
    - Find improvement opportunities at this level
    - Appraise impacts of the changes made
    - Documenting and sharing this information

Main user requirements

- Allow users to access, collect and analyse mixed data about activities across the particular course
- Allow users to access, collect, analyse data about students and their experiences
- Quickly visualise, share and export data (e.g., for use in a meeting or a report)

Institution-wide student representatives

Main tasks

- Represent the student body at institution-wide level in issues pertaining to educational quality
- Dialogue with the student body
- Dialogue with student representatives at all levels
- Inform policymaking and institution-wide activities

Main needs

- Get and evaluate student feedback (from students and student reps) about institution-wide issues
- Share information with student reps (e.g., student proposals)
- Share information with senior authorities and policymakers of the HEI and the student body (e.g., Chancellors, Rectors, Principals, Vice Rectors/Principals, directors of different institutional bodies and services)
- Share information with senior academic leaders and student representatives form academic departments of the institution.

Main user requirements

- Allow users to collect and analyse qualitative and quantitative student feedback about institution-wide matters (e.g., institution-wide teaching and quality policies, programmes and projects)
- Quickly visualise, share and export data (e.g., for use in a meeting or a report)

Appendix D. Details of SXA prototype (Hypatia)

D.1 Final SXA app prototype

The final iteration of the SXA prototype application can be found in the following link in a clickable PDF format below. *Please note, for the clickable functions to work it is needed to download and open the PDF in a PDF reader application (clickable functions do not work in document previews). **Please do not share this unpublished prototype/document.

Link to final prototype iteration: 24 March Beta.pdf

D.2 Prototype Demo

The demo video used to introduce participants to the prototype prior to the interview can be found below. *Please note that participants were informed in advance that the prototype was a research artifact (not a real product), and the demo video was for introductory purposes only.

Link to Hypatia's Demo:
https://www.youtube.com/watch?v=5DY3YsufhXc&ab_channel=DiegoRM

Appendix E. Data collection instruments

E.1 Interview schedule for design ethnography interviews

Interviews for the design ethnography of the discovery phase were semi-structure and followed a list of questions. The list of questions to guide interviews was updated based on ongoing research's insights and experience. The following list of questions illustrates the main questions used to guide interviews.

Ice-breaking and context (5 min max)

1. Can you please tell me about your role as academic/student representative in your programme/department?
2. How are student-staff meetings for quality improvement organised in your programme/department?
3. Who participates in these activities?

Main questions

1. What type of issues are discussed in these meetings/activities? Examples?
2. What type of information is important for these issues/discussions? Why?
3. How do you access this information currently?

4. Do you have problems accessing or using relevant information for these meetings/activities? Examples?

E.2 Tasks and questions of prototype testing sessions

Prototype testing sections with participants were guided by predefined tasks and questions. Many tasks and related questions were asked through the prototype iteration. A list with examples of the main questions and tasks used is presented below for reference purposes.

Examples of tasks tested in prototype testing sessions

Task 1. Find information about student feedback related to a learning activity/module

Instruction to participants:

Imagine that tomorrow you have a programme/department student-staff meeting and you want to check some feedback received on a learning activity/module that you heard some comments about. Please try to use the prototype to find this information. If you are seeing or thinking about something in particular, please think-allow.

Task 2. Find data about impact of improvements made

Instruction to participants:

For this meeting tomorrow it is expected to talk about an improvement X made in your module/programme/department earlier in the term. Please try to use the prototype to find data about the impact of the improvement X. Again, if you can please think-allow while you search this information.

Examples of questions asked

Warm-up questions

1. Can you please tell me about your role as academic leader/student representative in your programme/department?
2. How are student-staff meetings organised in your programme/department?

Post-testing questions

1. After having a look at the prototype, do you think it could be helpful for the tasks related to your role? Why?
2. Did the prototype seem easy to use?
3. Would you have any concern about such a tool being implemented in your context?

E.3 Interview schedule for contextual interviews

The final contextual interviews were semi-structured and were guided by a list of questions. The list of questions asked was iterated following insights obtained from previous interviews. The following list represents examples of the main questions asked across all interviews.

Warm-up questions

1. Can you please tell me about your role as academic leader/student representative in your programme/department?
2. How are student-staff meetings organised in your programme/department?

Demo

1. After watching the demo, what is your first thought? Does it reflect some of your context?

Review of prototype app

1. Please click in this section. Here, users could do X, Y tasks. Do you think this functionality could be useful for your role or other colleagues/reps? Why?
2. Do you think this functionality could create problems? Why?
3. Do you think the functionality/app could be easily adopted in your context? Why?
4. Would you think the potential benefits would outweight the possible negative effects or not? Why?
5. Do you have final thought on top of your head that you would like to share?

Appendix F. Potential challenges for the adoption of SXA

Please note, these are <u>unedited</u> results, only for reference purposes only.

Potential challenges for adoption

5.2.3.1 (Lack of required) data and educational literacies

A common emergent challenge identified was the need to ensure academics and the student body have the required digital and data literacies needed to adequately use analytics tools as part of the improvement of higher education quality. From the point of view of participants, this seemed far from guaranteed. The concerns discussed about misuse triggered by misleading data implied that users of such tools would require to have advanced understanding of quantitative and qualitative data analysis. While some of these skills are part of many subject areas, more sophisticated techniques may not be used if users are not qualified to do so. A brief comment of one participant sheds light on this key obstacle by showing something such as machine learning is not necessarily known or understood by most academics.

But yeah, machine learning. What is machine learning? [TD7]

While the initial design ethnography and rapid prototyping also recognised that data literacies of academics and reps appeared to be limited in general, and the design attempted to offer a

degree of support, the previous response shows that attempting to implemented advanced data analysis capabilities in higher education practice must bridge a significant knowledge-gap. However, beyond data analysis skills being identified as critical for the effective and sage use of analytics to improve the experience of higher education students, participants also mentioned a range of other literacies and capabilities which could become a stumbling block for the implementation of SXA applications. One academic leader at-department level expressed that many academics could struggle to learn to use yet another system:

> *But it also would be very hard for probably half of our staff to learn a new system. [TD4]*

This participant also mentioned that limited expertise in the use of digital technologies might create difficulties for a quick and widespread uptake of a new system:

> *[Out of 10 staff], we have, we have a couple of staff [who] don't have a phone that has apps, right. [and] probably only two or three of our 10 are really quite tech savvy. You know what I mean? Like 'yes, download new app and use that'. [TD4]*

While this could be considered as superficial challenges that may be easily overcome by offering specific training, the analysis of interviews also found that academics' time shortage was a crucial barrier for a successful adoption of the prototype. More is discussed later, but it is important to early on recognise that bridging skill-gaps could be difficult to achieve in these current conditions. Hence, more than a superficial challenge, the limited literacies and capabilities of users, particularly academic staff, can be arguably assumed as a difficult barrier which could greatly restrict the feasibility of adopting analytics tools to support the improvement of the student experience. With this background, the next speculative problem identified was related to skills needed to set up and administrate a system like the prototype.

> *I mean, it could, but I generally find, again, it goes back to time and capacity to do these things, right? So, in each school will probably actually, there's only one or two people in the entire school and we're talking, they're 50 or 60 people, when you include postdocs and but and teaching and stuff, probably only a tiny handful of people would have the capacity to do such changes. And somebody I don't, I will put myself in a second category of somebody who could probably go through all the training modules and figure it out and make some adjustments over time. Doesn't have the time. And then the bulk of staff would go, well, I I don't know anything about programming has got nothing to do with me. And so wouldn't want anything to do with it. [TD4]*

Although I didn't provide much detail to participants about the technical way in that customisation settings could operate more than stating that it would be an open architecture , one academic reflected on the challenges that little technical and programming capabilities were available in their department, which then would pose serious limitations for academic staff in having direct control of the configuration of the system. Either academic departments had internal capacity to set the systems up, hire an specialist (which requires funding), or simply fail to be able to configurate such system in the agreed conditions. In the case that the capacity to configurate such systems, another participant noted that, without training, there were clear risks of skipping steps needed for the setting up system:

I think it would be useful, but I think that subject areas or departments or whoever would need a lot of training in... exactly...And they need to have really good conversation about what they mean with all the different bits of data that are being gathered and that they really understand what they're customising. Because, I'd be a bit worried that that would be a step that got skipped. [TD12]

One academic leader at department level expressed a a similar view and pimplied that the design of the system costumisation options has to be as simple as possible to decrease the efforts needed to complete these tasks.

I can see the issue being there. I don't think an admin, an academic, necessarily will have the admin ability or the knowledge to do all the setups. So again, something easily for setup can be useful.

The analysis of interviews suggests that the problems of limited literacies and skills to set and use an analytics app is equally an issue for students, or perhaps, an even deeper challenge compared to academics. One academic leader at department level synthesised this aspect of the challenge:

I was at an event last week with [a colleague] and he was talking about research he's been doing with the students about data analysis. He was arguing that that's a real issue with students' abilities to analyse data. And I can immediately think about your app, because you know when I had a look at it, look at select option, option to by topic. And if I look at, let's see, students performance, or learning pathways, […] or custom analysis, like. And I'm just thinking all these kind of things... and what I'm saying here is that [,,,] is research saying that, that [it] appears to be real issues with the student's ability to analyse data. And I think that, one of the things I saw, [..] you seem to have support and training. […] [That is s]omething [that] we would try to address […] So data literacies training and I think […] this is a thing that you may want to reflect on as that, that's the, just because I saw that research presentation last week, I think this relates to what you're trying to do because you could end up with a really good tool, that does all this stuff, but our student group, or the evidence he seems to find, [it] might be they can't use it to the extent you maybe hope for. [TD5]

5.2.3.2 Academics' shortage of time

Knowledge and skills gaps appeared a major challenges for the adoption of a tool like the prototype, yet, the very limited time-availability of academic staff were also identified as one the most critical barriers for effective adoption of a tool like the prototype in practice. Some previous quotes have already pointed this out. One participant put it simply:

So the issue isn't, could something like this be useful? The issue is, you know, as you're, as you're pointing out with the kind of the layers that you can have in this and the fact that it will incorporate, say, data from evaluating a course, from surveys, focus groups, et cetera […] which is staff labour that nobody has time for. [TD4]

Another participant shared a similar view, particularly in regard to customising the system:

And I think as always with technology, it's great. But now it's not, it doesn't function in a, in a vacuum. And it's, so it's that framework that needs to be set. And that is something that requires a fair bit of commitment and understanding from staff. And my worry would be that there isn't enough time... for colleagues to do that. [TD12]

More extensive elaboration was also offered by one participant:

But generally it's more an issue of like, again, it kind of goes back to the initial kind of concern... And maybe it's how it's being pitched. This seems like a lot. Like I guess it depends. Maybe it's super easy [to use], right? Like maybe kinda looks, this is all relatively simple. You can dip in and dip out and get a perspective. But it seems like a research project. You know what I mean? Like it seems like kind of like I already don't have time to do my research. I'm certainly not going to engage in yet more research, that isn't actually my research. It's actually just an extension of my teaching (laughs). If you know what I mean. And so, for most staff, I understand your PhD students who don't want to hear this (laughs). But academic life, unless you're working at a very, very elite institution, and you're a senior white male academic over the age of 55, academic life doesn't allow such time! (laughs). You are sprinting from one thing to the next. And so, my concern isn't so much... I again, I think I do think the actual tool you're proposing could be really, really valuable, but, but […] you know... I could see people getting into it because they get got they a weird, fetish for student data. And on the weekend, just like a hobby for them to dig into their course feedback forms. But most staff will have no interest in spending time doing this. Not because they have no interest generally and how their students feel about the course, but because it's going to fall, continually fall to the bottom of the priority list. [TD4]

Regarding this critical problem and its connection with knowledge gaps, another academic noted that allocating training time for staff might be necessary in order ensure such system can be effectively used.

I think definitely needs to have the training provided. The biggest challenge with this training, wherever it is, it's persuading staff to do it. That's unfair. Maybe it's not persuading staff to do it. Maybe it's about making sure that they've got the time to do it. A So I guess having the training available is that step 1 [and] then there's a thing about how we help, help staff to look at it. [TD15]

5.2.3.3 Culture and protocols

An additional higher-level challenge for the adoption of SXA was the need of ensuing aligned cultures and protocols. Beyond direct skills, participants pointed out a broader set of ideas, customs, dynamics and behaviours that may be required for an effective implementation of these tools in practice. In a previous quote, one participant expressed the view that people need to have a common background in order to 'sign from the same hymn sheet', describing the issue that people ideas and methods are known across the board. One participant noted this in

a way that links to the concern about the complex human environments where SXA might be integrated.

> *I think you will need to build that into the culture, of the whole living dynamic. There would need to be a real push towards the students to see and make sure that you've evaluated today's input. Yeah, I think something we need to change. I don't think you can just, I don't think you could just make this app available. Some of the stuff we've done, like something because you're building technology and because it works, you think it's going to work. But you don't know how people are gonna humanly respond to it.*

In particular, the participant then argued that such a cultural change could be necessary to ensure that students can provide feedback about their periodic learning activities. Specifically, the participant said that this might imply changing students' conception of their learner responsibility.

> *[…] and I think that would maybe be the case here that you would need to ensure that there was a real focus and promotion of this and an expectation that this is part of the kind of, like their learner responsibility. […] I think students would I think students would just zoom out of this, unless they were reminded over and over as part of their identity, because their expectation as a student on the programme to ensure they give that course feedback, at a regular basis that youth that it appears here, to be being asked for here on the screen. [TD5]*

More in general, one participant argued that adopting SXA effectively would require an intense academic culture that sustains dedicated commitment to pedagogical discussions. The participant notes that, these culture and commitment to pedagogical discussions may not be a transversal trait. Furthermore, the participant returned to the vicious cycle of academics' time-shortage.

> *I think that it would work in a university where these issues are really quite clearly thought about. So for instance, where I used to work at the University of X things are really pretty clear across the board. I think U4 has such an devolved structure that's basically not only each college, but each school almost works as a sovereign unit in itself. And and that's where I think it would be difficult. […] Now, I don't I mean, I think I I mean, you know how I feel about these things. I think ultimately it would be helpful if academics thought a bit more about pedagogy and generally and, and would have time for these sorts of discussions. Unfortunately, you know, if people are willing, then times simply doesn't allow for that. And I think that, that's, you know, there's a, there's a tension there, but that's just the way it is. And I just think that's a shame, but I don't have any solutions for that.[TD12]*

Additionally, two student unresponsiveness and academic resistance where to attitudes that the participants recognised as a cultural challenge and are next discussed.

5.2.2.4 Attitudes

Participants also suggested that pre-existing reticence from some academics might also become a significant challenge. One academic indicated that some staff are 'techphobes' that dislike technological changes, which would put them in antagonistic position.

> *Our staff don't like changes in [our LMS] because they are 'techphobes'. So, something like this, they'd be kinda like straightaway they will feel antagonistic towards. [TD4]*

One student vice-president observed staff buy-in would not be a straightforward issue and that academics can take a defensive stance against critique coming from student feedback.

> *I do think I think that it will definitely take some convincing for staff members and setting boundaries with students as well because some students are really curious and would probably want access to more data than they should have access to, realistically. And, and then staff members can be really protective as well, and, and they don't like, no one wants to be perceived in a negative light and there's always that chance with feedback, […] I do think that it's still a really good idea. I don't have an answer for how to kind of manage that, those concerns, to kind of mitigate those concerns. But I do think that it's still like could be realistic.[VP4]*

One academic declared that even the idea of additional training could trigger resistance by academic staff.

> *Again, that's none of that takes away from the really what I think this product could provide. It's simply that you're entering a fully saturated and exhausted market. You know what I mean? So so even with these training, the guy when I was listening to the YouTube, I was kind of like 'Oh yeah, more training. Because academics staff really want more training'. That...(laughs). […]*

This participant further added that this contention could in part be linked to a cynical view of tech solutions, which some academics may develop in light of their prior experiences.

> *So I mean, so again, there's just, there's this kind of inbuilt resistance among academic staff, at least in the social sciences to these kind of solutions. That is, you know, it's bread of a, of a, of, of a cynicism that related to prior solutions. That pretty much always mean more work. And two years from now they'll come in with a new solution because this one didn't work. Do you see what I'm saying, so... [TD4]*

Further discussion over this topic will provided later, but it synthesis, the analysis suggests that, as mentioned, multiple external factors could influence the reception that staff has of new technologies like SXA tools. This could imply that the design and implementation of these tools might need to anticipate such issues and find ways to convince academics of the value and benefits that could be achieved. Yet, this final reference to academic cynicism may be

interpreted as that it would be important not to promise more than what can be delivered in order to avoid contributing to an already rarefied atmosphere.

Lastly, from the side of academics, participants also mentioned that some staff displays an antagonistic attitude towards feedback. The previous participant noted that:

> *And we have staff whose opinions is generally, 'why would I care what the students think of my teaching?' like' ...they don't know what good teaching is!' Like. 'I'm teaching'. Yeah. [TD4]*

A similar example was described by other academic who observed that some staff argued that they do not need course enhancement questionnaires for their modules, what could pose challenges for the implementation of a system like the prototype.

> *[…]we've had some, we've had a bit of a history of people saying, 'Oh, my course doesn't need the CEQ'.*

On the side of the student body, a frequent attitude among students was identified as a possible major challenge for the successful implementation of SXA systems. Participants recognised that the student body was somehow unresponsive to the requests for feedback. Low response rates and resulting small sample sizes was already mentioned as a critical problem faced by academics and reps when having to appraise the student feedback obtained. One academic synthesised this challenge:

> *I wasn't really clear on how the app would give us some more feedback. Nor why students would engage more in giving feedback than they normally do anyway. So, I didn't know if it was [the case] because it was an app [that] it was easier to use, because it's on your phone, you know. [TD2]*

A second academic shared a very similar view:

> *Again. Just trying to offer objective feedback, Diego. When I look at this, we on a semester basis, right? The response rate of our evaluations isn't always great. And, and you're looking at like one a semester, well, one per module, a semester, and I'm just thinking about would students increase the time they spend evaluating like [on and off]? [W]ould they take the time to evaluate each input, in view of the fact that we get a poor response rate to this, to the module evaluation [TD5]*

The words of a programme-level student representative give more details, specifying some possible solutions but also manifesting that the cause of this unresponsiveness to feedback request might be linked to the perception that feedback may not bring them any benefit.

> *It's just that it's people, there's, there's an issue with actually getting the feedback from the students. […] People is just very unresponsive.[…] I think so. I think again, we've tried a lot of different ways to make students give that feedback. And we found the most useful one is at the start of, say, the final lecture or at the end of, the lecturer themselves will put a QR code on the screen and say, 'okay, we're not starting the lecture until everybody has filled this out'. And I could see that that might get a bit*

> *frustrating if that happened every single lecture. But I think yeah, if there was some kind of incentive, I'm not sure what it could be because I think the issue with getting feedback is that the students don't see the value really in giving it. They don't see the point in improving the course for future years because they're not taking the course. So, I don't know what could be an incentive. [CR1]*

Of course, the suggested cause can be linked to the previously mentioned lack of educational and feedback literacies required to understand and value that giving feedback can make programmes better. Nevertheless, despite speculation of the causes of such unresponsiveness, and ways to address it, the design and implementation of SXA should consider, as this student vice-president recognises, that this challenge could lead to efforts backfiring.

> *The one thing I know is that engaging with our students in general is quite challenging. So something like this, like this, for example, it could either backfire or it could be great...[VP2]*

5.2.2.5 Alignment with policy (and practice)

Another type of challenge raised by participants was the need for SXA systems to be aligned with institutional and national quality enhancement policies. The quote from the next participants indicated that the prototype had potential to assist academics in this work. Yet, as it highlights at the end, coordinating the design with institutional quality enhancement teams would be a good thing to do in order to ensure these benefits.

> *I think it'll be quite good to make sure it links into the systems that allow us to, I don't know. I think we've talked about this before. Being able to export reports and things so that it then makes something like the Annual Teaching meeting, teaching review meeting more straightforward because it's like, 'well, we have exported this from Hypatia',[...] And so you'd be able to have that, but also to be able to even displayed on the screen. So one of the benefits of having an online tool is to be able to view in a meeting, just call it up on the screen, and then be able to work through the, the data as it's presented in a visual format within the meeting room. So being able to show how it makes those reports easier would be quite good. Having a look at maybe linking up with the quality assurance and enhancement teams. [TD16]*

However, another academic was more emphatic and argued that the use of SXA could become a duplication of work already being done when following enhancement policies, like the Scottish internal teaching reviews.

> *So, one of the things that you are going to be pushing against here is the university has kind of some of the government set requirements, right? Like we've, we have our ITER, so you're discouraged institution. You probably, somebody has probably brought up the issue of internal teaching reviews. There's a big thing that happens in Scottish institutions every six or seven years. Teaching review, it's like REF or TEF, I mean,*

but uhm, but it's a bit smaller and it's just a Scottish thing, right? So, but we have our internal teaching review. That's a required government thing. So we have this whole review of our teaching that will have to be done. The government isn't going to get rid of TEF because we now have this app, right? We'll simply have to do both, right? [TD4]

While the design of the prototype was aimed to actually reduce data collection and analysis work related to such quality enhancement processes, the risk of duplicating work could be a real problem which needs to be anticipated to guaranteed that SXA are aligned with existing quality policies and procedures in higher education institutions.

5.2.2.6 Power struggles

Up to now, multiple concerns and challenges related to access to data, control, policy alignment and other power-related topics have been described. It is no surprise then that one key potential challenge for the adoption of SXA could be the emergence of back-stage power struggles. In relation to the prototype design allowing full customisation, a senior academic noted that institution-wide management may oppose giving such autonomy back to academics. The participant also indicated that data-management systems were set up at institutional level in their context, a custom that may be difficult to modify.

[…] I think […] obviously giving staff greater control over such is, is, is helpful. I suppose the cynic within me would suggest that the university management would often be determined to keep hold of the control of such things because they would want to (laughs)... the data being produced that they wouldn't necessarily want staff to have that element of control. I think, I think all about data management systems are very much institutional, and any settings and things are set up at that level is we don't have any we don't have any say in any of that. And I'm not sure the institutions [unclear] would be all that interested in something that allows staff, too much freedom (laughs). [TD6]

Other senior academic said that customisation powers could become a controversial matter. However, this participant also highlighted that academics were acustomed to such tensions and would be something which would need to be consensuated as an organisation.

Yeah, for sure. I mean, I think, I think it could be, It could be, it's one of those things that could become a bit controversial. I can imagine that there might be some tensions between, for example, at university level [unclear] the degree of customization they wanted schools to have. That's a tension we're kind of used to anyway. And that, that's not criticism of the app. That's just something that organizationally would need to be agreed. [TD9]

One academic noted that if data was going to needed beyond internal use (i.e., programme and department level), then this would trigger problems for full customisation.

The next question then, of course, is, are the data that are then being generated only used internally? Or are you using them at say, a college or university level? In which case you need to make sure that you have everything customise the same way because otherwise you're comparing apples and pears. [TD12]

A student vicepresident shared a similar perspective, saying that wider access to data could involve more challenges and power struggles.

> *Setting the boundaries of what you want it to address. So if it's only going to be course specific and programme specific and actually about the learning output and input, then I think the data restriction stuff would be easier to understand across the board. But if you start being more holistic, that feedback, that I was discussing about general university experience, versus specific core programme experience. That's when I think that the boundary of the data will become like questionable, and people will start to want more access to other people's data and like data and from other school.[VP4]*

Overall, one department level student representative reflected on the possible institution resistance to more effective ways of critique and how SXA technologies could alter paradigms.

> *It's good. It's, if there's a will, there's a way for this thing. But the question is, institutions might be reluctant to provide the capital, research and development, to create a tool that potentially exposes them to more effective delivery of critique, more effective delivery of suggested changes to the operation. And I think as always, technology subverts existing paradigms. And the ambition of having this be a effort spearheaded by institutions for their students and institutions for their own improvement is ambitious but not over ambitious.*

Finally, this participant continued by arguing that, while private sector might be more willing to develop such tools, the open architecture and non-fro-profit ethos was an important thing to keep and may lead to ultimate success.

> *However, I think that the private sector would be more eager to spearhead this effort as it always is. But I think it's important to keep the ethos of open source, open access, not-for-profit. I think that's, that's respectable and commendable. And that in itself will, will be a cause of success and the long-term, I think. [SR3]*

5.2.2.7 Technical issues

Lastly but not least, several technical challenges were also identified. Some of them seem approachable, while others more complex. One issue was how would data-intensive SXA would integrate with the other systems that are 'already there'. As put by a senior academic:

> *So, it's how that would dovetail with what's already there. Or what's already being done in respect to feedback or providing, causing, causing the feedback cycle to students. […] So, you just get used to all these different systems coming out. [...] So it looks like it's, it's beneficial content within it, to be able to, to, to have that understanding [...], I think the key thing is just how it dovetails with everything else we have. And all the information there would have been pulled from other systems and how it would actually link to other systems. [TD3]*

Additionally, this participant also raised the challenge of some of the existing systems offering a number of similar functionalities than the prototype, which could mean that SXA could have to fight to replace what is already in place.

> *And and, and also the concern with, you know, other tech solutions are already claiming to do this kind of stuff, right. So we recently went from what were called SCAF? forms. I don't remember what SCAF stood for. But now we have course feedback forms. And the course feedback forms are on a new online system that's going to be better at tracking feedback and blah, blah, blah. And, and […] our [LMS] system claims to do similar things and, you know, everyone in essence claims to do similar things. And then the other issue is simply, does it [...] replace a service that the other tech solutions [offer]?... [TD4]*

Following this idea, the participant also recalled that the tech ecosystem that surrounds universities is always renovating itself and that overlapping and replication occurs between different systems.

> *And there's always constant initiatives on campus. A new tech thing that's going to solve all the problems... the other tech solutions claim to do? and it made it better. It may do it in a more consolidated way. I'm not, this isn't kind of a, this isn't a critique of the product. It's more a critique or a concern about how the product interacts within the kind of bigger ecosystem of the academic environments that includes people, workloads... and all these other tech solutions that are constantly being kind of targeted at us. To a great extent over the last decade, you know, the kind of constants, tech solution... initiative, inspiring gametes of options has resulted certainly in the social sciences anyway, in a real cynicism about any solution. Not because none of them work, but because it's an exhaustion that they don't work. But it's not because one product doesn't work. They don't work because all of the products are coming all at the same time. And they all do bits of each other's work. And so, there's overlaps. And so no, I don't know how much you try to incorporate 'this product will do everything' in reality because the other products aren't going to go anywhere, it's going to be replicating work. Right? So, so I guess […] Yeah, I'm sorry. [TD4]*

Although this ecosystem poses challenges for new individual solutions, the proposition of this research prototype to offer design patterns that can used as reference to refine or expand existing systems could arguably avoid a significant proportion of this technical problem. Finally, an important technical challenge identified was the need for systems to be user-friendly to help decrease the time, effort and learning required to effectively use SXA systems. Many of the described challenges and concerns maybe be resolved or partially mitigated by ensuring that these tools are easy and simple to use. Thus, it can be argued that the design of systems should consider usability as a priority requirement. As one academic said, being user-friendly for students could be a critical question to ensure that they can use the app to provide more feedback:

> *[W]e struggle to get lots of feedback from students, and that is a problem that we have as well as I'm sure every university has[,] you know, you put a module evaluation to 100 students and 10 students respond. So, I think the other key thing would be making sure that something like this was, uhm, accessible and used by the students in a way that it would enhance the number of responses that you get as well. Because again, if it doesn't do that, [...] if it doesn't increase the response rate you still got a problem of the students really happy and really unhappy are responding, and nothing in the middle. So, I guess I'd be I'd be really keen to... if something like this was an offer to be sure that it*

was going to be really student-friendly in a way that made it really so easy and so quick for them to give us feedback that there was no reason for them not to do it. [TD9]

The good news is that some participants who contributed to all the research phases noted that the interface design had progressed in a user-friendly direction. This reaffirms the importance of prototyping and user-testing as a way to produce systems that are easy-enough to use.

I think like it's really nice to see how the app's kind of grown from the first round of interviews. So, it's really interesting to see. And I think I do remember that the last time I used it, I don't know if this is helpful, but I'm the last sort of interface that I've found. I found it quite hard to navigate it, whereas now it's very clear and easy to navigate. [CR1]

Appendix G. Researcher reflexivity

As introduced in the method's chapter, it is widely expected to include the personal reflection of the researcher about its own personal experience and background and how these influence the perspective and interpretations of the author(s) of a study. To do this, next I briefly summarise some main academic, professional and philosophical influences which I deem to be essential for me to disclaim and for others to understand the framing of this study.

How did the ideas behind this study converged in its implementation? I think that my personal and academic background were determinant in the conception and performance of this project. Firstly, I graduated as bachelor in science in education, where I was introduced to educational philosophies, debates and research methods. Additionally, I specialised and obtained a professional qualification in physics and science teaching, which helped me develop robust analytical and experimental capabilities and confidence. Yet, before this I was also strongly influenced by philosophy, psychology, and Buddhist and ancient thinking. I first engaged with the thinking of Maturana and Varela when I was around 15 or 16 years old. What I did initiate in my higher education studies was the profound interest in design philosophy and research methods. My first induction into this fantastic world was from the angle of instructional or learning design, in my curriculum modules and then my dissertation. Human-centred design was the next step and further experience as e-learning instructional designer and project manager pushed these interests further. My critical and political positioning was strongly influenced by a year studying social sciences and humanities (before my change towards physics education). I was privileged to listen to the peripatetic lectures of Professor Tomas Chuaqui, from Plato and Aristotle, to Hobbes, Locke, Hume, Marx, Foucault, Schmitt, Habermas and Rawls, among others. When I first read David Hume, as part of these lectures, I was deeply impacted and experienced a profound intellectual stimulation, which lead to recovering a partially lost passion for thinking. When the opportunity came to move to Edinburgh, the strong inspiration of perhaps my dearest intellectual idol I could not say no. It was a scholarship that my partner got that brought me to Scotland. Then, of course, it was my contact with Dragan and Sian that helped me to materialise the interest in the use of analytics to assess the student experience and to then do a PhD on critical and strategic topics around data, experience, education and design. Overall, I was perhaps in no position to reject such trajectory and opportunities. More importantly for this study, I neither was in position to avoid the influence of the ideas (bioconstructivism, design, normalisation) which I integrated into my thinking

throughout my history of learning and being. Yet, the reader might consider this influential background and hopefully, to a certain extent, distance themselves from its carried weights and inevitable biases, blind points and limitations. At least this is the purpose for this reflection and disclosure.