QAA

Modelling and Managing Student Satisfaction: Use of Student Feedback to Enhance Learning Experience

Subscriber Research Series 2015-16

Dr Bart Rienties, Dr Nai Li and Vicky Marsh
The Open University

Subscriber Research Series 2015-16

In 2014-15, following a call for expressions of interest open to its subscribers, QAA commissioned six small-scale primary research projects intended to encourage collaboration between providers and promote the formation of communities of practice.

This report is one of two on the topic of **the role of student satisfaction data in quality assurance and enhancement**. It was submitted to QAA by The Open University, and written by Dr Bart Rienties, Dr Nai Li and Vicky Marsh.

The reports are not QAA documents, so we have respected the authors' approach in terms of style and presentation. We hope that you will read them with interest.

Other topics in the series are the transition experiences of entrants to higher education from increasingly diverse prior educational experiences; and an impact study of the guidance documents for higher education providers published by QAA in 2013.

For more information, and to read other reports in the series, visit www.qaa.ac.uk/improving-higher-education/research

Contents

Executive summary **1**
Key challenges for higher education 1
Background and contextual setting 1
Key questions of the project 2
Research Design 2
Phase 1: Literature review of link student satisfaction surveys with QA/QE 2
Phase 2: Case-study Open University QA 2
Research findings **3**
Phase 1: Literature review 3
Learning satisfaction and quality enhancement 3
Measuring learning satisfaction: A review 4
Individual student characteristics and learning satisfaction 4
Learning design and learning satisfaction 5
Informal discussions with staff 6
Panel of Evasys student evaluation conference 7
Phase 2: Case study Open University QA 8
Research question 8
Methodology 8
Data analysis 9
Results 13
Discussion and implications 18
Limitations of the case study and future research 19
Implication for quality assurance and enhancement 21
Key challenges for higher education 22
References **23**
Appendix: Transcript of interview panel members Evasys conference **26**

Executive summary

The 2015 National Student Survey results released recently have highlighted that student satisfaction scores have not increased despite an increase in tuition fees (Havergal, 2015). Understanding the key enablers and barriers for integrating student satisfaction data with Quality Assurance (QA) and Quality Enhancement (QE) was a key focus of this small-scale research project. By combining a qualitative perspective (that is, literature review with integrated perspective of academics and academic-related staff) and quantitative perspective (that is, using a case study at the Open University (OU) as to what the key drivers of learning satisfaction were among 60,000 students), we have found five key challenges for HE.

Most UK institutions now systematically collect learning satisfaction. Nonetheless, there remain several critics about the appropriateness of these questionnaires (Baldwin & Blattner, 2003; Moskal, Stein, & Golding, 2015; Titus, 2008). Furthermore, Zerihun, Beishuizen, and Os (2012) argue that most learning satisfaction instruments are teacher-centred, focusing on what the instructor does in the learning environment, rather than what learners actually do, how they engage and whether learning occurred. While many institutions have become reasonably skilled in collecting large amounts of student satisfaction data, making sense of rich data sources and acting upon the data is complex and cumbersome.

Recently several studies have tried to close the loop. For example, Arbaugh (2014) and Rienties, Toetenel, and Bryan (2015) found across 40+ modules that learning design and teaching support in particular influenced learners' satisfaction. In our case study, using logistic regression modelling of 200 potential explanatory variables with 60K+ students we addressed the key drivers for students' learning satisfaction. Findings indicated that learning design had a strong and significant impact on overall satisfaction. Learners who were more satisfied with the quality of teaching materials, assessment strategies, and workload were significantly more satisfied with the overall learning experience. Furthermore, long-term goals of learners (that is, qualifications and relevance of modules with learners' professional careers) were important predictors for learning satisfaction.

Key challenges for higher education

- How to provide feedback to students (close the loop)
- How to provide synthesised feedback to staff to enhance their practice (academic development) in a format that can be easily understood and interpreted
- How to ensure that academics and the wider university sector are acting upon the students' voices (academic and professional development)
- How to recruit and train professionals who can accurately unpack and understand the complexities of rich student evaluation data (professional development)
- How to provide synthesised feedback to senior management (professional development).

Background and contextual setting

With the higher education sector becoming an increasingly competitive market, student satisfaction has become an important component of QA and QE (Kember and Ginns, 2012; Rienties, 2014). The measurement of student satisfaction is important to higher education institutions, to help them to pinpoint their strengths and identify areas for improvement (Coffey and Gibbs, 2001; Zerihun et al, 2012). The potential benefits and drawbacks of student evaluations have been well documented in the literature (see for example, Bennett and De Bellis, 2010; Crews & Curtis, 2011), although recent research continues to suggest strong resistance among academic staff (Crews and Curtis, 2011; Rienties, 2014).
This resistance might hamper improvements of the educational experience of students,

and subsequent QA. Another major limitation of most student survey instruments is the lack of focus on key elements of rich learning, such as interaction, assessment and feedback. Zerihun et al (2012) argue that most student evaluation instruments are teacher-centred, focusing on what the instructor does in the learning environment, rather than what students actually do, how they engage and whether learning occurred. With the increased importance of National Student Survey (NSS) and institutional surveys on academic and educational practice, there is a need for a critical review of how the data is used for QA and QE.

As one of the key contributors to the design and implementation of the (NSS), the Open University has over 20 years' experience of managing student satisfaction to enhance the learning experience of a diverse group of students and professionals. Because the NSS raw data is not available to participating institutions the degree to which we can understand the key drivers of satisfaction is limited. Satisfaction ratings go beyond teaching assessments and include broader aspects of the student learning experience. However, it is not enough to know the degree to which students are satisfied, it is important to understand the factors that contribute to student satisfaction, and how these results translate into effective QA and QE. This is possible because the OU conducts extensive institutional satisfaction surveys.

Key questions of the project

The project focused on these three key questions:

- To what extent are institutions using insights from NSS and institutional surveys to transform their students' experience?
- What are the key enablers and barriers for integrating student satisfaction data with QA and QE?
- How are student experiences influencing quality enhancements?

What influences students' perceptions of overall satisfaction the most? Are student characteristics or module/presentation related factors more predictive than satisfaction with other aspects of their learning experience?

Is the student cohort homogeneous when considering satisfaction key drivers? For example are there systematic differences depending on the level or programme of study?

Ultimately, the research findings are intended to enhance the evidence base in order to support HE for student retention, progression and a high quality learning experience.

Research Design

Phase 1: Literature review of link student satisfaction surveys with QA/QE

- In-depth and critical desk review of available resources, including academic journal publications, 'grey' literature and institutional websites
- Good and best practice of student satisfaction data and QA
- Informal discussions with staff
- Panel of Evasys student evaluation conference.

Phase 2: Case study Open University QA

- Explored the construct of student satisfaction based on data collected via an internal survey conducted by the OU (200,000+ students)
- Identified which aspects of the student experience are most associated with their overall expression of satisfaction
- How these findings are translated into QA and QE.

Research findings

Phase 1: Literature review

Learning satisfaction and quality enhancement

The 2015 National Student Survey results released recently have highlighted that student satisfaction scores have not increased despite an increase in tuition fees (Havergal, 2015). 86% of the 300,000+ respondents to the NSS survey were satisfied with their higher education experience, which is similar to 2012 for students with lower tuition fees (Havergal, 2015). This may be a rather surprising result given the substantial amounts of investment made by universities in the last couple of years, as well as the perceived change in role of students to 'customers' of higher education.

A key concern for most institutions and teachers is whether students, or learners in general, are satisfied with their learning experience (Kember and Ginns, 2012; Marsh, 1982; Onwuegbuzie et al, 2007). Besides the obvious long-term advantages of having 'satisfied customers', who are more likely to return for follow-up education or who share their positive experiences with peers (Gu, Schweisfurth and Day, 2010), an increasing number of institutions are using student evaluation instruments to monitor and improve the teaching and learning experience (Arbaugh, 2014; Eom, Wen, & Ashill, 2006; Rienties, 2014). In particular, in the UK, student evaluation scores are important, as higher educational institutions are ranked every year based upon students' learning satisfaction surveys, as measured by the National Student Survey (Ashby, Richardson and Woodley, 2011; Callender, Ramsden and Griggs, 2014). Substantial financial and reputational rewards can be reaped when institutions are listening and acting upon what students say in order to improve students' teaching and learning experience.

The analysis of learning satisfaction surveys allows teachers and managers to search for unobserved patterns and underlying information in learning processes (Gasevic, Rosé, Siemens, Wolff, & Zdrahal, 2014). In a recent important study measuring which factors predicted learning satisfaction and academic performance among 48 MBA online and blended learning modules in the US, Arbaugh (2014) found that learners' behaviour, as measured by social presence, predicted learning satisfaction and academic performance. In contrast, the technological environment used in these 48 modules did not significantly predict learners' learning experience and performance. Therefore, Arbaugh (2014, p 352) argued that 'a resource-strapped business school may get the most "bang for its buck" by allocating resources towards developing instructors when contemplating how best to support its online and blended offerings'.

Building on this study, 40 learning designs at the OU were compared with learner behaviour in the virtual learning environment (VLE), learning satisfaction and academic performance. Rienties, Toetenel, et al (2015) found that the way teachers designed online courses significantly influenced how learners engaged in the VLE over time. Furthermore, and particularly important for the implications to QA and QE, the learning design of modules significantly impacted student satisfaction, whereby modules with strong content focus were rated significantly higher by learners than modules with strong learner-centred focus, in particular activities requiring communication between peers and interactivity (Rienties, Toetenel et al, 2015).

By linking large datasets across a range of 40+ modules in online and blended learning settings, both studies (Arbaugh, 2014; Rienties, Toetenel, et al, 2015) point to the important notion often ignored in educational science: reviewing how learning designs influence learning satisfaction and academic performance. Analysing this across a large range of modules will provide crucial (aggregated) insights beyond research findings from a single module or discipline. Phase 2 of this report will build on these two studies by analysing 62,986 learners' satisfaction of 401 undergraduate blended and online modules. In line with principles of learning analytics, by taking into consideration both learning design characteristics of these 401 modules and individual student characteristics (for example, demographics, prior education, socioeconomic status) using logistic regression modelling, we will address the following research question: what are the key drivers for students' learning satisfaction? Following Arbaugh (2014), there is an urgent need for researchers and managers to combine research data and institutional data and work together in order to unpack how context, learner characteristics, and learning design activities impact on the learning satisfaction, which is critical to quality assurance and enhancement.

Measuring learning satisfaction: A review

The measurement of learning satisfaction is important to higher education institutions, to help them to pinpoint their strengths and identify areas for improvement (Eom et al, 2006; Kember and Ginns, 2012; Marsh, 1982; Zerihun et al, 2012). Most Western institutions in the USA and UK systematically collect learning satisfaction and learner performance data which could be considered to be key learning outcomes (Baldwin and Blattner, 2003; Electric Paper, 2013, 2015; Kember and Ginns, 2012; Rienties, 2014). According to Baldwin and Blattner (2003), historically, learner evaluation results were only used to improve teaching and learning. Over the years, a range of standardised student evaluation instruments have been developed, such as the Course Experience Questionnaire (Ramsden, 1991), National Student Survey (Ashby et al, 2011; Callender et al, 2014), or Students' Evaluations of Educational Quality Questionnaire (Marsh, 1982). However, the increased availability of learning evaluation instruments, and results in particular, has provided management with greater opportunity to compare academics across the board regarding 'teacher effectiveness' for tenure (Baldwin & Blattner, 2003).

While the use of learning satisfaction surveys is common practice in many universities, there remain several critics about the appropriateness of these questionnaires (Baldwin & Blattner, 2003; Moskal et al, 2015; Titus, 2008). For example, a recent study by Rienties (2014) indicated that the vast majority of academics were resistant to moving from paper-based to online-based learning satisfaction evaluations, despite that online methods led to three times more qualitative feedback and faster turnaround of feedback. Other scholars question whether questionnaire instruments can reliably assess learning experience. For example, Titus (2008) found that learners primarily filled in the questionnaires based upon their emotional reaction to a 'good experience' (for example, friendliness and helpfulness of lecturer; enthusiasm of the lecturer).

According to a large-scale review of common learning satisfaction instruments by Onwuegbuzie et al (2007), elements such as whether teachers are learner-centred, experts and/or 'connectors' are typically not explicitly incorporated into learner evaluations of instruction. A limitation of most learner survey instruments is the lack of focus on key elements of rich learning, such as interaction, assessment and feedback. Zerihun et al (2012) argue that most learning satisfaction instruments are teacher-centred, focusing on what the instructor does in the learning environment, rather than what learners actually do, how they engage and whether learning occurred. In addition, learning satisfaction and performance tend to be reviewed as independent outcomes with little consideration of what drives each of these outcomes and in particular whether their key drivers are interrelated.

Individual student characteristics and learning satisfaction

A vast body of literature has focused on the psychometric validity of questionnaires, and learning satisfaction survey instruments in particular. Demographic factors of students are known to potentially influence how students are responding to questionnaires.

Response bias is 'a systematic tendency to respond to a range of questionnaire items on some other basis than the specific item content' (Paulhus, 1991, p 17). For example, several studies have found that cultural backgrounds have a small to moderate effect on response styles (Johnson, Kulesa, Llc, Cho and Shavitt, 2005; Richardson, 2012). Furthermore, previous (successful) experience with online education might positively influence learning experience (Calvert, 2014; Wolff, Zdrahal, Herrmannova, Kuzilek and Hlosta, 2014). Several recent predictive learning analytics models seem to indicate that prior education and previous educational experience in particular (Calvert, 2014; Tempelaar, Rienties and Giesbers, 2015), gender, age (Ke and Xie, 2009), socio-economic status (Calvert, 2014), and employment status are important factors for learning experience and performance. Therefore, controlling for individual student characteristics may be essential for understanding and unpacking the factors that drive learning satisfaction.

Learning design and learning satisfaction

Over the last 20 years, a range of pedagogical approaches and learning designs has been suggested (Conole, 2012) to improve the experience of learners in higher education as well as their achievement. Few pedagogical approaches have been robustly analysed to ascertain whether they actually lead to consistent learning designs that enrich and improve learner outcomes (Arbaugh, 2014; Conole, 2012; Rienties, Toetenel, et al, 2015). Conole (2012, p 121) describes learning design as 'a methodology for enabling teachers and or designers to make more informed decisions in how they go about designing learning activities and interventions, which is pedagogically informed and makes effective use of appropriate resources and technologies'. Typically, learning design data is not captured in a comprehensive or systematic way, enabling it to be combined with learner outcome data and so making meaningful analysis and evaluation possible.

Recently, several studies have tried to close the loop in terms of linking learning satisfaction to actual learning behaviour and outcomes. Learning analytics data from the VLE may be a potential treasure trove for educational researchers, such as clicking behaviour, posting in discussion forums, or watching video lectures (Rienties, Toetenel et al, 2015; Tempelaar et al, 2015). For example, Siemens, Dawson, and Lynch (2013) suggest that, in addition to VLE data, data collected as learners are undertaking authentic learning tasks need to be included in order to represent the complexity of education. However, a recent longitudinal study with 100+ learning process variables among 900+ learners following a blended mathematics course, including 40 different proxies of VLE behaviour, indicated that VLE behaviour only predicted 10 to 15% of explained variance (Tempelaar et al, 2015).

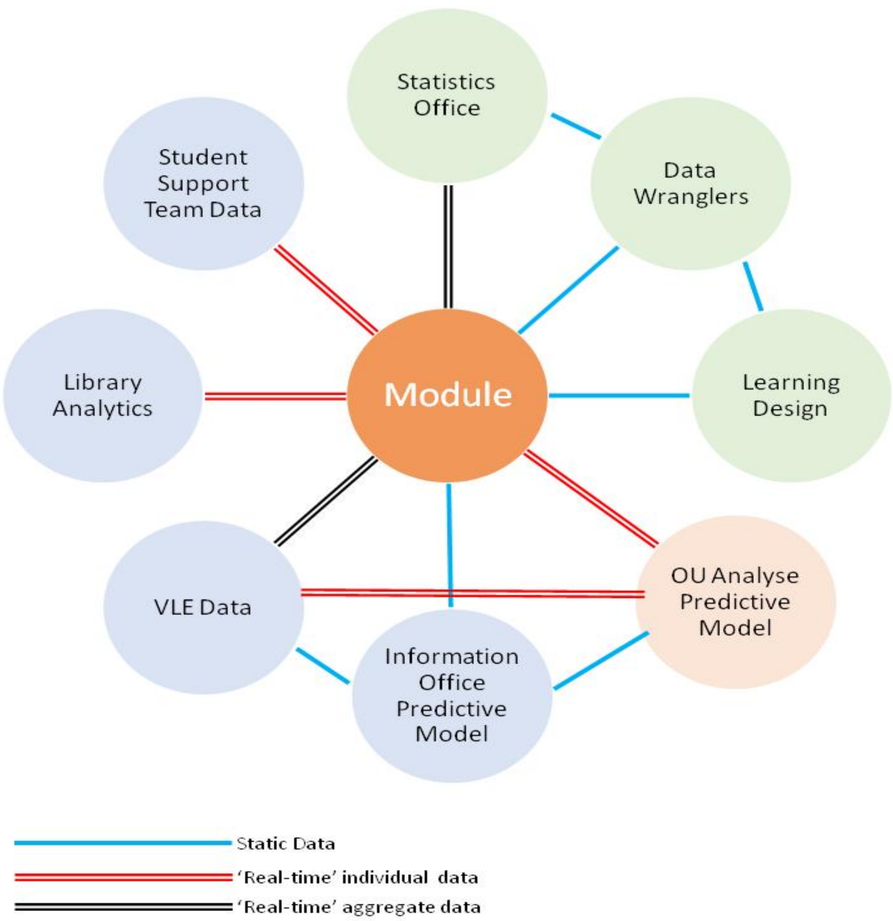
Using a structural equation model among 397 learners in the US following an online course, Eom et al (2006) found that learning satisfaction was a significant predictor for learning outcomes. Similarly, in an online MBA programme followed by 659 students, Marks, Sibley, and Arbaugh (2005) found that learning experience was significantly impacted by instructor-student interaction, followed by student-student interaction and student-content interaction. As mentioned, both Arbaugh (2014) and Rienties, Toetenel, et al (2015) found across 40+ modules that learning design and teaching support in particular influenced learners' satisfaction. Although these two studies provide substantial evidence of the usefulness of linking learning satisfaction with academic performance, a potential limitation of the first study is that it was nested primarily within an MBA context. As indicated by Rienties et al (2012), an analysis of 117 learning designs of blended and online remedial education indicated that disciplines significantly influenced how teachers were designing those courses, and which combination of pedagogical approaches and technologies were used. A potential limitation of the second study was the relatively small number of modules that were included in the analysis, therefore more advanced statistical techniques to unpack disciplinary and level differences could not be conducted.

Finally, it is important to recognise that there may be substantial differences in learning experiences between students who start a course for the first time, and those who have been studying at a particular institution for some time, who may have developed learning and coping mechanisms for 'surviving' in online learning environments (Arbaugh, 2014; Calvert, 2014). In comparison to new students, students who have successfully completed a module may be more sensitive to (changes in) learning design choices for the next module they follow.

Informal discussions with staff

First of all, as a convenient sample, the Analytics4Action (A4A) project chaired by the principal investigator (PI) was used to examine 40 to 50 academic staff and academic support staff perspectives of student evaluation practices at the OU UK. The A4A project is a university-wide organisational change project focused on enhancing student retention among 18 level 1 modules across the various disciplines and faculties within the OU (Rienties, Cross, & Zdrahal, 2015). Key stakeholders were brought together for each respective module for the purpose of presenting, unpacking and understanding learning data available taken from various VLE and related student survey systems (illustrated by Statistics Office BLOB in Figure 1). This is termed a data touch point meeting and the project held four of these with each module over a one-year period. These data touch points featured a review of weekly real-time and annually collected data about the progression and usage of specific VLE tools (see Figure 1). By bringing together these diverse experts and expertise, collectively we were able to start to translate the raw data and visualisations presented from various learning analytics sources, and formally and informally discuss the roles of learning satisfaction instruments.

Figure 1: Integrating student satisfaction data with learning design and analytics data at OU



In general, most academics seemed familiar with the need for student evaluations, and the importance to act upon feedback provided by students. At the same time, as the results of these student evaluations only become available after a module is completed, several academics indicated that at times they found it hard to relate specific comments and feedback to events and incidents in their module. In line with previous research (Rienties, 2014), some academics expressed strong anxiety towards student evaluation instruments and the results in particular, as the OU (like many other institutions) have explicit targets in terms of key performance indicators (KPIs) and expected student satisfaction rates.

A second opportunity to engage with a wider audience was during various internal events at the OU. For example, twice the initial results of the QAA project were presented during the informal learning analytics colloquium organised by the PI, which were attended by 20 to 25 participants per session. The preliminary results led to an interesting discussion regarding how student survey results were used as KPI indicators at the OU, and what teachers could do to further enhance the learning experience of their students. Furthermore, two presentations were held whereby the PVC Learning and Teaching explicitly invited us to present our initial findings to a wider audience. Similarly, the results were presented at the yearly OU LearnAboutFair, which was attended by 400+ participants.

Panel of Evasys student evaluation conference

The PI was invited as panel member of Evasys student evaluation international conference on 6 May 2015. This conference was attended by 100+ specialists in paper/online student surveying using Electric Paper, which is used by hundreds of HEIs in Europe. The main discussion was about a commercial report issued by Electric Paper about 'Breaking down the barriers: how to deliver best practice in HE course valuation'. The panel agreed that substantial progress has been made over the last couple of years in implementing student evaluation approaches in HEI. However, as argued by several panel members, having appropriate skilled staff to interpret the deeper meanings behind the numbers of student evaluations is crucial.

> I think it is important that we actually have people at our universities who are professional people who understand that data and who can draw out the real meaning of that data. And they actually then highlight this in reporting to committees and senior officers in the university. Senior people in the university haven't got the time to plough their way through huge amounts of data. You got to have somebody, or people, who are interpreting it and highlighting the issues.
> (Prof John Taylor, University of Liverpool)

> So for me Big Data offers lots of opportunities, but there is a skill and there is a lot of thinking that has to go behind how you might apply, how you collect information, and what we use it for, and what we draw as a conclusion...it is an opportunity for us to ask questions of the data, rather than drawing immediate conclusions from it.
> (Aisling McKenna, Dublin City University)

Furthermore, institutions really need to listen and act upon feedback from students, and make it clear that universities are closing the loop.

> One of the key things is that evaluation actually leads somewhere. Good evaluation is all about changing things and improving things, and actually leads to an overall improvement in the educational experience that we give to our students.
> (Prof John Taylor, University of Liverpool)

> For me the key phrase is closing the loop: so listening to what the students are saying in terms of their experience, then trying to see what this actually means for teachers and the wider higher education institution. But if students say something is

> working well, bringing that back to the organisation. If students are saying 'Ooh this is not going so well', then universities have to act upon that. I think it is closing the loop, so not only just measuring, but acting upon information that I think is key.
> (Bart Rienties, OU)

> I think it is engaging, it engages the students to fill it in in the first place and staff to actually make use of the feedback of the students so that there is an impact on improving their experience.
> (Neil McKay, Sheffield Hallam University)

The full transcripts of the video are listed in the Appendix.

Phase 2: Case study Open University QA

The case study aimed to:

- explore the construct of student satisfaction based on data collected via an internal survey conducted by the OU (200,000+ students)
- identify which aspects of the student experience are most associated with their overall expression of satisfaction.

This case study then demonstrated how these findings are translated into QA and QE.

Research question

Although most institutions across the globe collect learning satisfaction data, few institutions have such a rich data set as the OU. In the past 30 years, the OU has consistently collected student feedback to further improve the learning experience and learning designs.
The Student Experience on a Module (SEaM) institutional survey was introduced in 2012-13 combining two previous surveys using a census approach; so inviting all learners on all modules to participate. By taking into consideration both student perceptions of learning design characteristics of 401 undergraduate modules and individual student characteristics (n = 62,986) using logistic regression modelling of 200 potential explanatory variables we will address the following research question: what are the key drivers for students' learning satisfaction?

The purpose of this analysis is to identify which aspects of the learning experience are most associated with their overall expression of satisfaction. In particular, we are interested to explore whether satisfaction with learning design is more important than module and student characteristics, and whether new students differ in their experiences to those who already have experience with online learning. Identification of the key factors of the learning experience that are most closely related to satisfaction with learning design provides a clear evidence base for action.

Methodology

This case study took place at the OU, which is the largest higher education provider of online distance education in Europe. Unlike traditional universities, the OU does not restrict enrolment on the basis of previous attainment, resulting in a widely varied learner population (Calvert, 2014; Richardson, 2013). Given its size, an enormous amount of learning satisfaction data is collected at the OU among its 200, 000 learners. This study seeks to explore the construct of learning satisfaction based on data collected via the SEaM questionnaire.

In line with other learning satisfaction instruments (Marsh, 1982; Onwuegbuzie et al, 2007; Zerihun et al, 2012), three themed sets of 40 questions cover:

- the module overall (10 items)
- teaching, learning and assessment (14 items)
- feedback on the tutor (16 items).

Learners were sent an invitation to participate two to three weeks before the end of the module. The surveyed learners were those who were on the presentations that ended between 1 August 2013 and 31 July 2014, who had results available by 13 August 2014. All learners regardless of their completion status were included (that is, to control for non-response bias).

Dependent variable (Target variable)
One dependent variable was used in the study: overall learning satisfaction (Overall, I am satisfied with the quality of this module), this variable was coded as a binary variable. Satisfied (definitely agree/agree) was coded 1 and unsatisfied (definitely disagree/disagree/neither agree nor disagree) was coded 0.

Independent variables (Predictors)
Given the flexibility of OU study, learners from various backgrounds can choose very different paths and approaches for studying (Ashby et al, 2011; Calvert, 2014; Richardson, 2013). An enormous amount of information (> 200 variables) related to studying at the OU was available, all of which could be potential predictors (independent variables) for overall learning satisfaction. These variables were split into seven blocks: module, presentation, learner demographics, concurrent study, study history, learner/module/presentation and SEaM questions. The selected variables for each block are presented in Figure 2.

Data analysis

The SAS Enterprise Guide 4.3 and SAS Enterprise Miner 6.2 software packages were used for data interrogation and analysis respectively. The data was cleaned for missing values and outliers. Missing values were an issue mainly for the survey questions, where data was missing it was identified as a valid category for the survey questions and included in the analysis. Each block of selected variables were modelled in groups for each regression model. A comprehensive descriptive analysis was conducted to discount variables that were unsuitable for satisfaction modelling. Potential multicollinearity was investigated and any highly correlated predictors were identified, and the most appropriate variables methodically selected (see Figure 3, Modelling Process & Validation). The variables that were statistically significant from each block were then combined and modelled to identify key predictors for the final model of learning satisfaction. Continuing and new learners at the OU were modelled separately as there were significant differences in the availability of OU study history and experience data (Calvert, 2014).

Figure 2: Selected variables for each block modelling

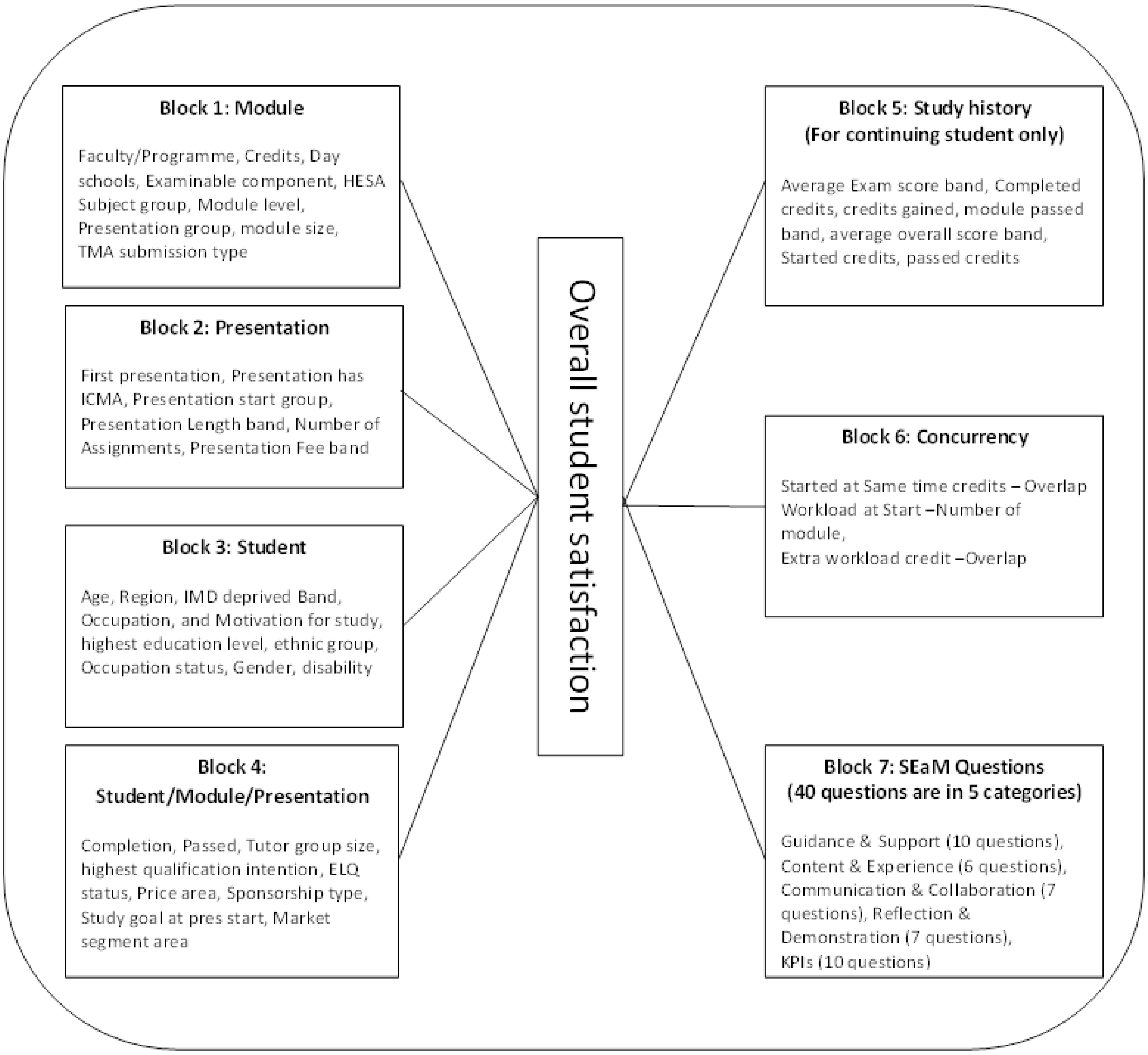


Figure 3: Modelling process and validation

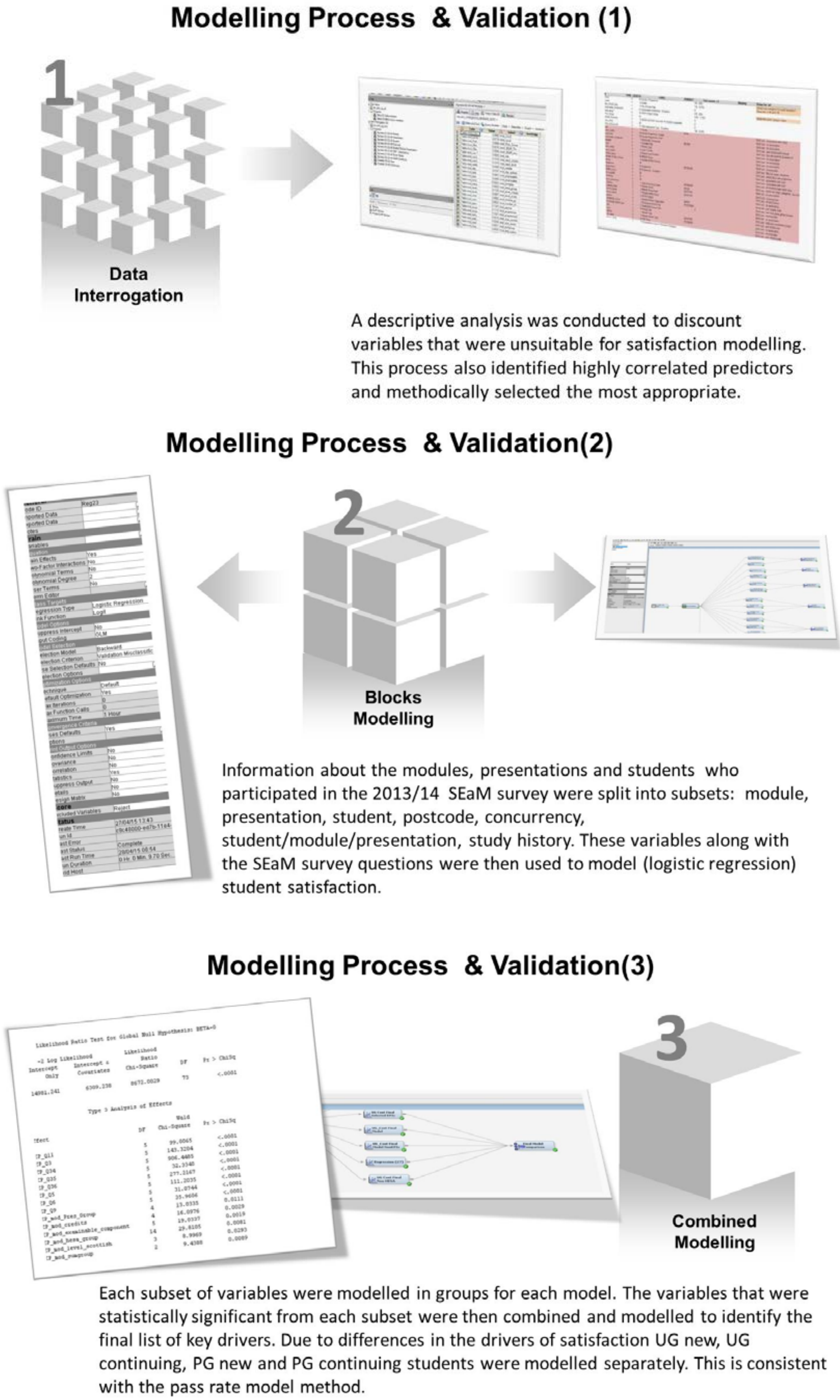
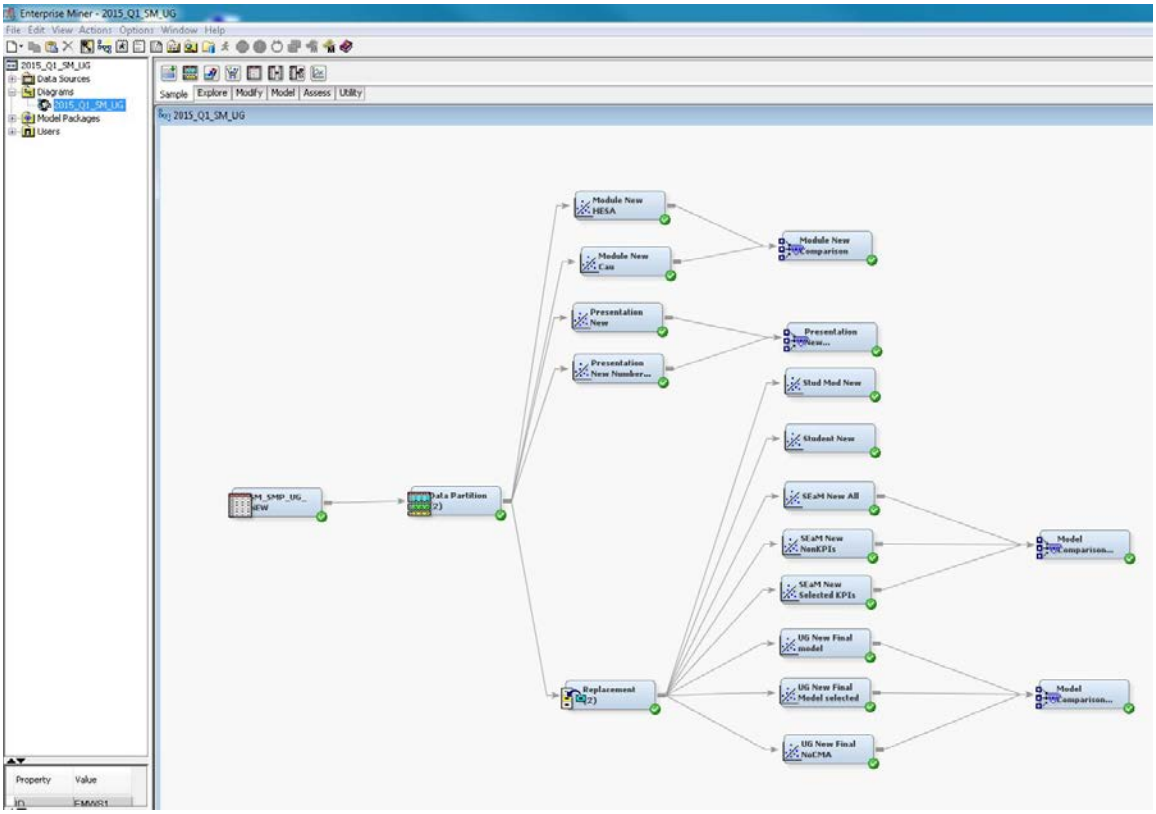


Figure 4: Screenshot of SAS Enterprise Guide Miner Project tree
(Undergraduate New learners)



In line with previous studies (Agresti, 1996; Hosmer and Lemeshow, 2004) logistic regression analysis was then used to measure the degree of influence of the independent variables (predictors) on learning satisfaction (dependent variable). The stepwise regression model procedure was applied to each block, and validation misclassification was used as the selection criterion when evaluating the step with the most optimum model solution. Stepwise selection begins with sequentially adding the inputs (independent variables) with the smallest p-value below the entry cut-off ($p<0.05$). All included inputs were evaluated based on the statistical significance criteria. The sequence terminated when all remaining inputs had a p-value that was less than the pre-determined stay cut-off. The stepwise regression was conducted for all seven blocks to limit the number of input variables in the final model (see Figure 4). The logistic regression coefficients were interpreted by transforming the logit into an odds ratio (Borenstein, Hedges, Higgins and Rothstein, 2009; Konstantopoulos, 2008). The odds ratio is the change in the odds of the outcome occurring. Multiple solutions were tested within each block, so the fit of the logistic regression models was assessed using the SAS Miner model comparison node with Kolmogorov-Smirnov Goodness-of-Fit Tests. Two final models for predicting overall learning satisfaction were obtained for continuing and new learners respectively.

Results

Table 1: Predicting undergraduate continuing learning overall learning satisfaction: results from logistic regression analysis (in order of magnitude)

	DF	Wald x2	*P**	Odds Ratio Estimates (Definitely disagree vs. Definitely agree)
Q34 Teaching materials	4	864.465	<.001	.014
Q36 Assessment	5	224.998	<.001	.136
Q13 Qualification aim	5	114.658	<.001	.296
Q5 Integration of materials	5	89.979	<.001	.308
Q3 Advice & guidance	5	66.488	<.001	.331
Q14 Career relevance	5	38.702	<.001	.544
Q23 Tutor knowledge	5	38.167	<.001	.530
Q9 Assignment instructions	5	37.591	<.001	1.008
Q11 Assignment completion	5	36.198	<.001	.669
Q35 Workload	5	31.396	<.001	.478
Q6 Method of delivery	5	24.196	<.001	.678
Module credits (10 vs 60)	4	17.370	<.01	1.878
Module level (Level 1 vs others)	4	11.946	<.05	.854
Module exam component (Portfolio vs others)	5	11.423	<.05	.411
% of planned module life cycle (25% less vs others)	4	10.603	<.05	.726

** Significant at the p <.05 level.*

Undergraduate continuing learner satisfaction modelling

In Table 1, the results indicated that within undergraduate continuing learners, their satisfaction with teaching materials provided on the module is the most important driver of their overall satisfaction. The learners who were less happy with the quality of teaching materials (Q34) were 99% less likely to be satisfied with the overall quality of the module, compared to those who were satisfied with the teaching materials, the difference was significant ($p < .001$). Learners' satisfaction with the assessment on modules studied (Q36) was the second most important driver for overall learning satisfaction. Learners who reported dissatisfaction with their assessment were 86% less likely to have positive overall learning satisfaction than those who had a much more positive experience of assessment.

The results also suggested that learners were 70% less likely to have positive overall learning satisfaction if the modules they studied did not contribute to the achievement of their wider qualification aim (Q13). Furthermore, satisfaction with advice and guidance provided for studies on modules (Q3) and the career relevance of knowledge and skills developed through studies (Q14) were also among the top 6 important drivers of overall learning satisfaction. Other factors such as helpfulness of tutor knowledge (Q23); clear assignment instructions (Q9) and completion of assignment (Q11); workload (Q35); and method of delivery of teaching materials and learning activities (Q6) were all important drivers for overall satisfaction. This showed that learning design related factors had a significant impact on learners' overall satisfaction above and beyond student or module related characteristics. This evidence suggests that improvements in learning design will help increase overall learning satisfaction.

As indicated at the base of Table 1, only a few module characteristics had a significant impact on overall learning satisfaction, such as module level, credits and exam component, and progress of their planned lifecycle. Learners studying relatively short 10 credit modules were twice as likely to be satisfied with their learning compared to those studying for long and intensive 60 credit modules. Learners studying at level one (that is, year 1) were 15% less likely to be satisfied than their counterparts studying for other undergraduate levels. Learners on modules that had portfolios as an examinable component were 59% less likely to have positive overall learning satisfaction than those modules with exams and projects. Learners on newly developed modules, especially those on modules that were less than 25% of the way through the planned module lifecycle, were 27% less likely to be satisfied with their overall learning experience. These variables had a significant impact on overall learning satisfaction. However, their importance was less pertinent than other learning design-related variables.

Interestingly, none of the learners' characteristics (for example, gender, age, ethnicity, prior education) had an impact on overall learning satisfaction once learning design was included in the modelling. This indicates that no matter what the OU learner's background is, their overall learning satisfaction was mainly driven by module design and learning experience. These findings imply that a well-designed module may help to increase online learning satisfaction; regardless of the cohort background in terms of demographics as well as their previous learning experience.

Table 2: Predicting new undergraduate overall learning satisfaction: results from logistic regression analysis

	DF	Wald x2	*P**	Odds Ratio Estimates (Definitely disagree vs. Definitely agree)
Q34 Teaching materials	4	102.629	<.001	.014
Q36 Assessment	4	46.398	<.001	.061
Q3 Advice & guidance	4	34.982	<.001	.190
Q5 Integration of materials	4	27.803	<.001	.373
Q14 Career relevance	5	20.647	<.001	.985
Q13 Qualification aim	5	17.521	<.05	.143
Age (Over 60s vs Under 21)	5	15.188	<.001	.303

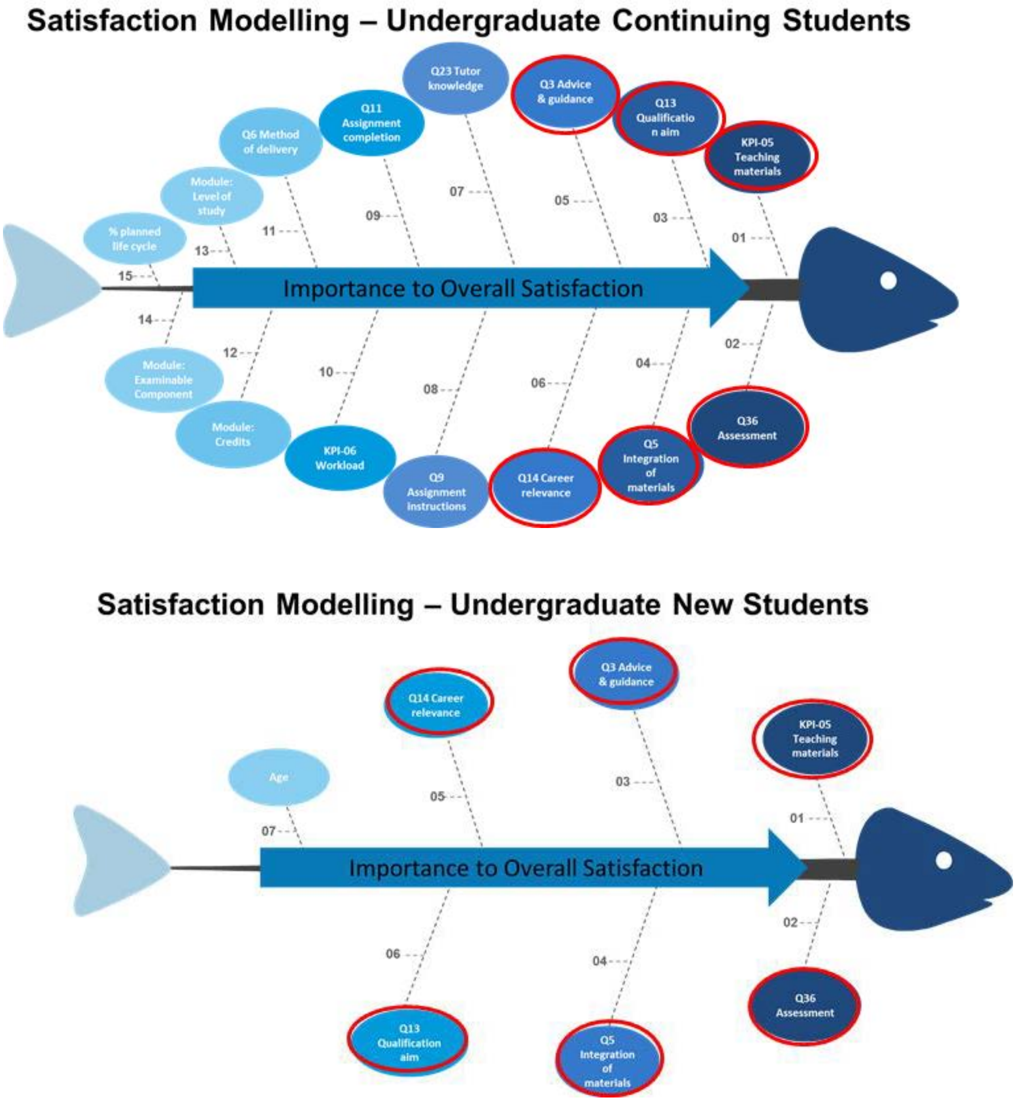
* *Significant at the p <.05 level.*

Undergraduate new learner satisfaction modelling

Although individual student characteristics were not significantly influencing learning satisfaction among students who already had some experience of studying at the OU, it is important to investigate whether any individual factors influence learning satisfaction among new students who have just begun studying for an online degree. The number of significant predictors in Table 2 was less than for continuing learners reported in Table 1, but similar patterns were found. The results indicated that a number of predictors contributed to overall learning satisfaction, the most significant predictors of overall learning satisfaction were dominated by the SEaM survey questions for new learners. The learners who were less satisfied with teaching materials (Q34) were 99% significantly less likely to be satisfied with overall learning compared with their counterparts with a much more positive perception. Those who were unhappy with their assessment (Q36), module contribution of their advice and guidance (Q3) provided on modules they studied, or integration of materials (Q5) were less likely to be satisfied with overall learning. Furthermore, career relevance (Q14) and relevance of the module towards qualification aim (Q13) also had an impact on learners' overall learning satisfaction.

In contrast to undergraduate continuing students (Figure 5), module characteristics did not have significant impact on overall learning satisfaction, as none of the variables related to module characteristics appeared to be significant predictors. The only exception of the predictors for the new learner model from the continuing learner model was age group, which was the only predictor related to learners' characteristics. Overall, these predictors were closely linked to the learning design of modules, suggesting again that learning satisfaction with learning design was a better driver for overall satisfaction than the characteristics of modules, presentations and learners. Therefore, in line with previous research (Arbaugh, 2014), a better module learning design may help to improve overall learning satisfaction.

Figure 5: Overall satisfaction modelling: Undergraduate continuing vs new learners



Postgraduate continuing learner satisfaction modelling

In Table 3, the results indicated that the pattern of key drivers of overall satisfaction are different between undergraduate and postgraduate learners, but still share some common elements. Within postgraduate continuing learners, their satisfaction with teaching materials provided on the module is also the most important driver of their overall satisfaction, which is consistent with their undergraduate counterparts. The learners who were less happy with quality of teaching materials (Q34) were about 86% less likely to be satisfied with the overall quality of the module, compared to those who had positive feedback, the difference was significant ($p < .001$). Learners' satisfaction with the assessment feedback (Q30) was the second most important driver for overall learning satisfaction. Learners who reported dissatisfaction with their assessment feedback were 87% less likely to have positive overall learning satisfaction than those who had a much more positive experience of assessment feedback.

The results also suggested that learners were 85% less likely to have positive overall learning satisfaction if they were not satisfied with the assessment on the module (Q36). Furthermore, satisfaction with integration of materials (Q5), the method of delivery (Q6), were also among the top 5 important drivers of overall learning satisfaction.

As indicated at Table 3, other factors related with module and learner characteristics such as, number of tutor group size, module result, and motivation for study and credit transfer also had a significant impact on overall satisfaction. The postgraduate analysis showed that learning design related factors had a significant impact on learners' overall satisfaction and student or module related characteristics also have impact but they were not among the top five important drivers. Learners studying within larger tutor groups were 50% less likely to be satisfied with their learning compared to those studying within smaller groups. Learners who passed their modules were twice as likely to be satisfied overall as their counterparts who did not pass. Learners who studied for career development were 86% less likely to have positive overall learning satisfaction than those studying for personal development. These variables had a significant impact on overall learning satisfaction. However, their importance was less pertinent than other learning design related variables. Again, none of the learners' characteristics (for example, gender, age, ethnicity, prior education) had an impact on overall learning satisfaction once learning design was included in the modelling. This confirmed the findings within undergraduate continuing learners that no matter what the OU learner's background is, their overall learning satisfaction was mainly driven by module design and learning experience.

Table 3: Predicting postgraduate continuing learners' overall learning satisfaction: results from logistic regression analysis (in order of magnitude)

	DF	Wald x2	*P**	Odds Ratio Estimates (Definitely disagree vs. Definitely agree)
Q34 Teaching materials	2	74.9754	<.0001	.137
Q30 Assessment feedback	3	49.1146	<.0001	.127
Q36 Assessment	2	43.032	<.0001	.148
Q5 Integration of materials	3	41.0066	<.0001	.172
Q6 Method of delivery	3	35.8344	<.0001	.212
Number of tutor group size	5	15.9046	<.0001	.508
Module result	7	11.6683	0.112	1.903
Motivation for study	3	9.0799	0.0282	1.866 (career vs personal)
Credit transfer	1	3.7966	0.0514	3.141

** Significant at the p <.05 level.*

Table 4: Predicting undergraduate continuing learners overall learning satisfaction: results from logistic regression analysis (in order of magnitude)

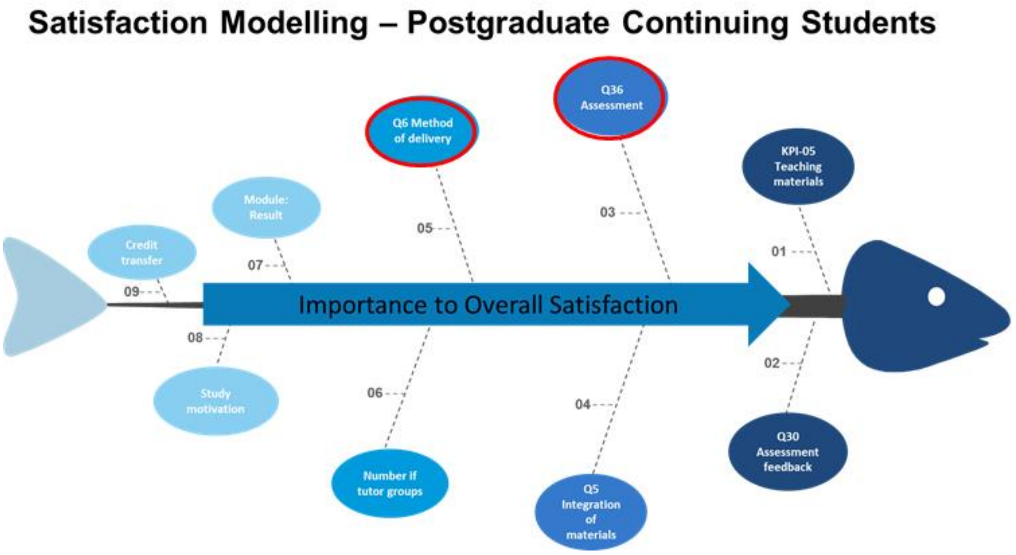
	DF	Wald x2	*P**	Odds Ratio Estimates (Definitely disagree vs. Definitely agree)
Q11 Assignment completion	2	20.7857	<.0001	.041
Q6 Method of delivery	2	17.0272	0.0002	.088
Q36 Assessment	2	12.5595	0.0019	.208
Q12 Collaborative activities	3	10.1288	0.0175	.141
Q16 Tutor contact at start	3	9.2942	0.0256	.292
Q22 Tutor help with online	3	6.7494	0.0803	.335

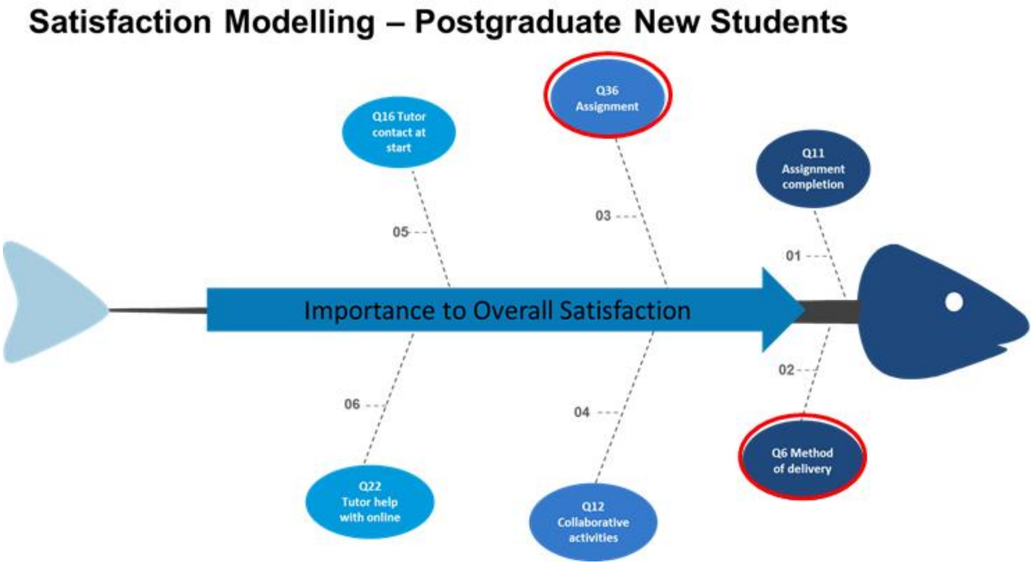
** Significant at the p <.05 level.*

Postgraduate new learner satisfaction modelling
In Table 4, the results indicated assignment completion (Q11) was the most important driver for overall satisfaction. Learners who did not have a positive experience of assignment completion were 96% less likely to be satisfied with their overall experience. Other module design related factors such as method of delivery (Q6), assessment (Q36) and collaborative activities (Q12) also had a significant impact on overall satisfaction. Two tutor support related factors - tutor contact at start, and tutor help online were also important drivers for overall satisfaction, but their importance was less pertinent than other learning/module design related variables.

Overall, satisfaction with particular aspects of the student experience remains key for postgraduate learners. Postgraduate continuing learners who were motivated by personal development were most likely to be satisfied with their overall experience. The postgraduate continuing model is much more similar to the undergraduate models than the postgraduate new (Figure 6). This is not surprising as there are a smaller number of students available to model for postgraduate new learners; therefore, this is the least stable of the four models and would benefit from the addition of another cohort of students to validate it robustly.

Figure 6: Overall satisfaction modelling: Postgraduate continuing vs new learners





Discussion and implications

For most institutions and teachers around the globe whether their students are satisfied with their learning experience is a key concern (Kember and Ginns, 2012; Moskal et al, 2015; Onwuegbuzie et al, 2007). In a very competitive, global educational marketplace having satisfied 'customers' is a key sustainable strategy for institutions to keep investing and developing their teaching and learning practice. At the same time, as indicated both from the literature (Baldwin and Blattner, 2003; Rienties, 2014; Titus, 2008), the convenient sampling of academics at the OU and survey specialists who present at the Evasys conference, many teachers are concerned about how student evaluations are used to 'close the loop' in the students' learning experience. Anecdotal evidence seems to suggest that many institutions have become reasonably skilled in collecting loads of student satisfaction data, but making sense of this rich data source and acting upon it is complex and at times cumbersome. As argued by Professor Taylor and several researchers in more general analytics (Buckingham Shum et al, 2013), there is a need for skilled professionals who can help to make sense of these rich data sources.

Phase 2 study analysed the learning satisfaction experiences of 62,986 learners following a range of 401 undergraduate blended and online modules at the largest university in Europe, namely the OU. In line with principles of learning analytics (Gasevic et al, 2014; Rienties, Toetenel, et al, 2015; Siemens et al, 2013; Tempelaar et al, 2015), by taking into consideration both learning design characteristics and individual student characteristics we unpacked the key drivers for learning satisfaction.

Over the last 20 years, a range of pedagogical approaches and learning designs have been implemented to improve the experience of online and blended learners (Arbaugh, 2014; Conole, 2012; Eom et al, 2006; Marks et al, 2005). Few pedagogical approaches have been robustly analysed to ascertain whether they actually lead to consistent learning designs that enrich and improve learning satisfaction (Arbaugh, 2014; Rienties, Toetenel, et al, 2015). Building on these studies, we compared the learning satisfaction of students who started an online course for the first time, and those who had been studying online for some time, who may have developed learning and coping mechanisms for 'surviving' in online learning environments.

Our first and most important finding is that our proxies for learning design had a strong and significant impact on overall satisfaction, for both new and continuing students. Learners who were more satisfied with the quality of teaching materials, assessment strategies, and workload were significantly more satisfied with the overall learning experience. A vast body of research has highlighted that instructional design and quality of learning materials are crucial for an effective online learning experience (Mayer, 2003; Sharples et al, 2014; Tobarra, Robles-Gómez, Ros, Hernández, & Caminero, 2014). Furthermore, previous research (Ashby et al, 2011; Hattie, 2009; Marks et al, 2005) has found that assessment and feedback strategies are important indicators for learning performance and learning satisfaction in particular. However, we believe that we are the first to provide such a strong, robust evidence base given the diversity and richness of 401 module designs, the size of our sample, and our ability to control for over 200 variables in terms of individual student characteristics and module learning design.

A second important finding is that long-term goals of learners (that is, qualifications and relevance of modules with learners' professional careers) were important predictors for learning satisfaction. If a module was not sufficiently linked with wider qualification aims, our results indicated that learners were 70% less likely to have positive overall learning satisfaction. As most of the OU learners are adults, who combine family lives with professional careers, the relevance to professional practice of learning design is a key concern for them, and this should also be in the mind-sets of instructional designers.

A third important finding is that several module characteristics (that is, # of credits, level, type of exam, maturity of module design) had an important influence on learning satisfaction, but a vast number of potential indicators from Block 1 Module and Block 2 Presentation in Figure 2 did not significantly influence learning satisfaction. One possible reason why disciplinary differences and several proxies for instructional design (for example, number of online assessments, blended vs. online) did not have a significant effect on learning satisfaction may be related to the rather basic categorisations of these proxies. In the near future we hope to extend our analyses with more detailed learning design mapping data using the OULDI tool, whereby more fine-grained information about design principles and learning activities per module are available (Rienties, Toetenel, et al, 2015).

Our fourth and final important finding is that individual student characteristics did not play a more pronounced role in predicting overall learning satisfaction. Blocks 3 to 6 from Figure 2 seemed to have a limited impact on whether students were satisfied with their learning experience. There was one exception among new students, whereby older learners, especially those aged over 60, were 70% less likely to have positive overall learning satisfaction, as was previously found (Ke and Xie, 2009), but the reasons behind this needs to be further explored. It is very important to understand this difference within undergraduate new learners, as the OU learners' population has substantially changed in the past 5 years, and there are now more early career learners registered to study online and distance learning. In a way, our findings are a positive encouragement for those instructional designers and teachers in blended and online courses, as learners are not necessarily negatively influenced by prior education and demographic background characteristics. While some research indicates that ethnic minority students (Richardson, 2013) and women (Herman, 2014) seem less successful in online learning settings, at least our large scale study seems to indicate that learner characteristics only play a minor role in learning satisfaction.

This analysis has evaluated learning satisfaction data in order to inform principles of good practice in learning design. The robustness of these findings is supported by the size of the data sets being considered. Key to this methodology is the consideration of how learning design impacts on learning satisfaction, and in particular provides guidance to module teams in terms of what they could focus on in order to improve learning outcomes. As our technical analysis may be rather complex, we have translated our findings into two visualisations (Figures 3 to 4). The key drivers of learning satisfaction are illustrated, whereby the variables closer to the right have a stronger impact on learning satisfaction than those who are positioned on the left. Although the key parameters in Figures 3 and 4 are fairly similar, it is important to acknowledge that the drivers for learning might be subtly different for new online students and those who have already some experience with online learning. Given the larger number of fish bones present for undergraduate continuing students, this might signal that experienced online learners might have more advanced, complex expectations of what leads to a satisfactory learning experience. Overall, these indicators provide clear guidelines for instructional designers and teachers as to which elements to focus on in terms of enhancing and maintaining learning satisfaction in blended and online environments.

Limitations of the case study and future research

A first and obvious limitation of our research is the convenience sample used for Phase 1. Although the PI has spoken to a vast number of academics and academic support staff in an informal manner, given the small scale of this project it was not feasible to do comprehensive cross-institutional study. However, the experiences expressed by panel members at the Evasys conference and contributions from the 100+ expert survey managers indicated similar (anecdotal) concerns in terms of closing the loop. We encourage further research to unpack the underlying reasons why some institutions are able to develop a coherent, holistic approach to student evaluation, while others seem to struggle to close the loop in using feedback to change the teaching practice.

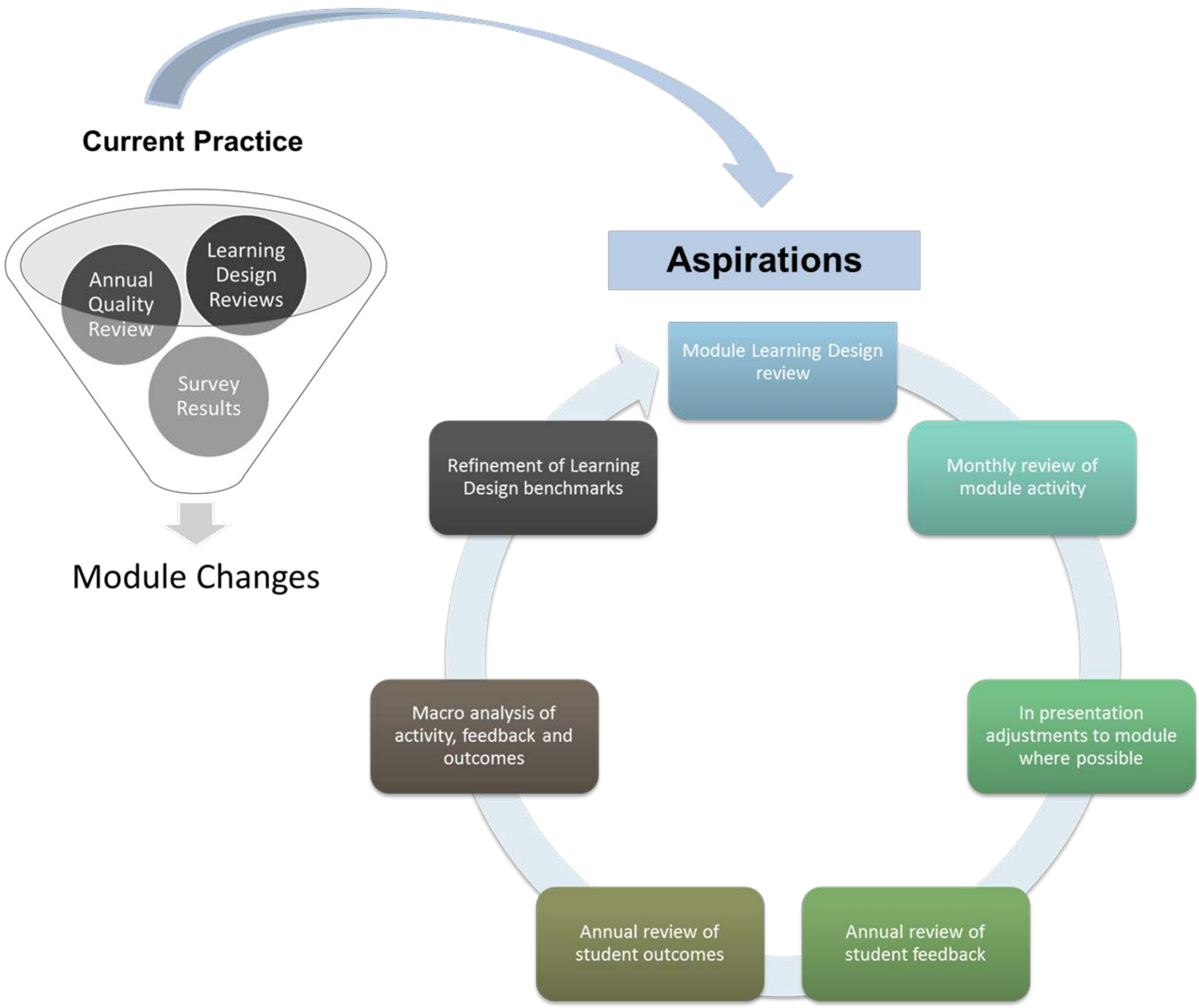
In terms of Phase 2, several of the items of the SEaM survey loaded heavily on overall learning satisfaction. This may be considered as an artefact, as a result of the fact that students were completing the respective surveys and these items at one point in time, whereby other individual student characteristics and learning design proxies were measured independently at different intervals. Nonetheless, our findings do indicate that not all 40 items strongly predicted overall learning satisfaction, and most items not related to learning design and professional careers were dropped in our logistical regression modelling. Furthermore, several Block 1 and 2 variables did significantly predict learning satisfaction over time. Thirdly, the predictors associated with learning design were based upon students' self-perceptions, with inevitable self-reporting bias issues. Although our data was inherently hierarchical in nature, in our current analyses all variables were entered at one level. Given the large sample size of respondents, including the relative and absolute academic performance, and the wider variety of modules we included in our modelling, we argue that the focus on learning satisfaction is justified. It is a common law in marketing and business that satisfied customers are more likely to continue buying new products and services. Finally, as this study was conducted within one institution, we encourage researchers to use our logistical regression modelling approach in order to test, verify and contrast whether similar key drivers for learning satisfaction are present within their own context.

With increasingly rich data available to institutions, powerful analytics engines (Calvert, 2014; Tobarra et al, 2014; Wolff et al, 2014) and skillfully designed visualisations of analytics results (González-Torres, García-Peñalvo and Therón, 2013) may help institutions and teachers in particular to use the experience of the past to create supportive, insightful models of primary (and perhaps real-time) learning processes. Our findings indicate that learning design parameters (that is, assessment, career focus, teaching materials, workload) have a strong impact on overall learning satisfaction. A next step in our research is to identify the optimal balance and interactions between these learning design activities, and how we can visualise the impact of these learning design activities to both instructional designers, teachers, and new and continuing students.

Implication for quality assurance and enhancement

Currently at the Open University, learning design, annual quality review and SEaM survey results feed into different committees and working groups and different points in time and not necessarily in a joined up way. Taking all the information provided, module teams then make decisions about changes. This practice is not as efficient as it could be.

Figure 7: Practice changes will be translated into QA and QE for future



Ideally we would like to be in a position where module teams have the ability to review key activity and engagement with learning design on a monthly basis and make changes to the presentation in real time if there are students in a particular cohort who are struggling. Feedback and outcomes such as pass, completion and retention could be annually analysed alongside module activity, for example VLE, TMA submissions, and concurrent study in order to refine principles of good practice in learning design. This in turn will then feed back into module review and the specific module activities that are regularly considered.

Key challenges for higher education

- How to provide feedback to students (close the loop)
- How to provide synthesised feedback to staff to enhance their practice (academic development) in a format that can be easily understood and interpreted
- How to ensure that academics and the wider university sector are acting upon the students' voices (academic and professional development)
- How to recruit and train professionals who can accurately unpack and understand the complexities of rich student evaluation data (professional development)
- How to provide synthesised feedback to senior management (professional development).

References

Agresti, A (1996) *An Introduction to Categorical Data Analysis*. New York: John Wiley & Sons Inc

Arbaugh, J B (2014) System, scholar, or students? Which most influences online MBA course effectiveness? *Journal of Computer Assisted Learning*, 30(4), 349-362

Ashby, A, Richardson, J T and Woodley, A (2011) National student feedback surveys in distance education: an investigation at the UK Open University. *Open Learning, 26*(1), 5-25

Baldwin, T & Blattner, N (2003) Guarding Against Potential Bias in Student Evaluations: What Every Faculty Member Needs to Know. *College Teaching*, 51(1), 27-32

Bennett, T and De Bellis, D (2010) The move to a system of flexible delivery mode (online v paper) unit of study student evaluations at Flinders University. Management issues and the study of initial changes in survey, volume, response rate and response level. *Journal of Institutional Research*, 15 (1), 41-53

Borenstein, M, Hedges, L V, Higgins, J and Rothstein, H R (2009) *Introduction to Meta-Analysis*. Chichester: Wiley Online Library

Buckingham Shum, S, Hawksey, M, Baker, R, Jeffery, N, Behrens, J T and Pea, R (2013) *Educational data scientists: a scarce breed*. Paper presented at the Proceedings of the Third International Conference on Learning Analytics and Knowledge, Leuven, Belgium

Callender, C, Ramsden, P and Griggs, J (2014) Review of the National Student Survey (ed). London: NatCen Social Research, the Institute of Education

Calvert, C E (2014) Developing a model and applications for probabilities of student success: a case study of predictive analytics. *Open Learning: The Journal of Open, Distance and e-Learning*, 29(2), 160-173.

Coffey, M and Gibbs, G (2001) The Evaluation of the Student Evaluation of Educational Quality Questionnaire (SEEQ) in UK Higher Education. *Assessment & Evaluation in Higher Education*, 26, 89-93

Conole, G (2012) *Designing for Learning in an Open World*. Dordrecht: Springer

Crews, T B and Curtis, D F (2011) Online Course Evaluations: Faculty Perspective and Strategies for Improved Response Rates. *Assessment & Evaluation in Higher Education*, 36(7), 865-878

Electric Paper (2013) Closing the loop: Are universities doing enough to act on student feedback from course evaluation surveys? London

Electric Paper (2015) Breaking down the barriers: how to deliver best practice in HE course evaluation. London

Eom, S B, Wen, H J and Ashill, N (2006) The Determinants of Students' Perceived Learning Outcomes and Satisfaction in University Online Education: An Empirical Investigation. *Decision Sciences Journal of Innovative Education*, 4(2), 215-235

Gasevic, D, Rosé, C, Siemens, G, Wolff, A and Zdrahal, Z (2014) *Learning analytics and machine learning*. Paper presented at the Proceedings of the Fourth International Conference on Learning Analytics And Knowledge, Indianapolis, Indiana

González-Torres, A, García-Peñalvo, F J and Therón, R (2013) Human-computer interaction in evolutionary visual software analytics. *Computers in Human Behavior*, 29(2), 486-495

Gu, Q, Schweisfurth, M and Day, C (2010) Learning and growing in a 'foreign' context: intercultural experiences of international students. *Compare: A Journal of Comparative and International Education*, 40(1), 7-23

Hattie, J (2009) Visible Learning: A synthesis of over 800 meta-analyses relating to achievement. New York: Routledge

Havergal, C (2015) National Student Survey 2015: £9K fees fail to dent satisfaction, *Times Higher Education*, available at: www.timeshighereducation.co.uk/news/national-student-survey-2015-9k-fees-fail-dent-satisfaction

Herman, C (2014) Returning to STEM: gendered factors affecting employability for mature women students. *Journal of Education and Work*. doi: 10.1080-13639080.2014.887198

Hosmer, D W and Lemeshow, S (2004) *Applied logistic regression* (2nd edn). Hoboken: John Wiley & Sons

Johnson, T, Kulesa, P, Llc, I, Cho, Y I and Shavitt, S (2005) The Relation Between Culture and Response Styles. *Journal of Cross-Cultural Psychology*, 36(2), 264-277

Ke, F and Xie, K (2009) Toward deep learning for adult students in online courses. *The Internet and Higher Education*

Kember, D and Ginns, P (2012) *Evaluating teaching and learning*: Routledge

Konstantopoulos, S (2008) Computing power of tests of the variance of treatment effects in designs with two levels of nesting. *Multivariate Behavioral Research*, 43(2), 327-352

Marks, R B, Sibley, S D and Arbaugh, J B (2005) A Structural Equation Model of Predictors for Effective Online Learning. *Journal of Management Education*, 29(4), 531-563

Marsh, H W (1982) SEEQ: A Reliable, Valid, and Useful Instrument for Collecting Students' Evaluations of University Teaching. *British Journal of Educational Psychology*, 52, 77-95

Mayer, R E (2003) The promise of multimedia learning: using the same instructional design methods across different media. *Learning and Instruction*, 13(2), 125-139

Moskal, A C M, Stein, S J and Golding, C (2015) Can you increase teacher engagement with evaluation simply by improving the evaluation system? *Assessment & Evaluation in Higher Education*, 1-15

Onwuegbuzie, A J, Witcher, A E, Collins, K M T, Filer, J D, Wiedmaier, C D and Moore, C W (2007) Students' Perceptions of Characteristics of Effective College Teachers: A Validity Study of a Teaching Evaluation Form Using a Mixed-Methods Analysis. *American Educational Research Journal*, 44(1), 113-160.

Paulhus, D L (1991) Measurement and control of response bias. In J P Robinson, P R Shaver and L S Wrightsman (eds), *Measures of personality and social psychological attitudes* (1st edn). San Diego, CA: Academic Press

Ramsden, P (1991) A performance indicator of teaching quality in higher education: The Course Experience Questionnaire. *Studies in Higher Education*, 16(2), 129-150

Richardson, J T E (2012) The role of response biases in the relationship between students' perceptions of their courses and their approaches to studying in higher education. *British Educational Research Journal*, 38(3), 399-418

Richardson, J T E (2013) Approaches to studying across the adult life span: Evidence from distance education. *Learning and Individual Differences*, 26(0), 74-80

Rienties, B (2014) Understanding academics' resistance towards (online) student evaluation. *Assessment & Evaluation in Higher Education*, 39(8), 987-1001

Rienties, B, Cross, S and Zdrahal, Z (2015) Implementing a Learning Analytics Intervention and Evaluation Framework: what works? In B Motidyang and R Butson (eds), *Big data and learning analytics in higher education*: Springer

Rienties, B, Kaper, W, Struyven, K, Tempelaar, D T, Van Gastel, L, Vrancken, S and Virgailaite-Meckauskaite, E (2012) A review of the role of Information Communication Technology and course design in transitional education practices. *Interactive Learning Environments*, 20(6), 563-581

Rienties, B, Toetenel, L, & Bryan, A (2015) *'Scaling up' learning design: impact of learning design activities on LMS behavior and performance.* Paper presented at the 5th Learning Analytics Knowledge conference, New York

Sharples, M, Adams, A, Ferguson, R, Gaved, M, McAndrew, P, Rienties, B and Whitelock, D (2014) Innovating Pedagogy 2014. Milton Keynes: Open University

Siemens, G, Dawson, S and Lynch, G (2013) Improving the quality of productivity of the higher education sector: Policy and strategy for systems-level deployment of learning analytics: Solarresearch

Tempelaar, D T, Rienties, B and Giesbers, B (2015) In search for the most informative data for feedback generation: Learning Analytics in a data-rich context. *Computers in Human Behavior*, 47, 157-167

Titus, J J (2008) Student Ratings in a Consumerist Academy: Leveraging Pedagogical Control and Authority. *Sociological Perspectives*, 51(2), 397-422

Tobarra, L, Robles-Gómez, A, Ros, S, Hernández, R and Caminero, A C (2014) Analyzing the students' behavior and relevant topics in virtual learning communities. *Computers in Human Behavior*, 31(0), 659-669

Wolff, A, Zdrahal, Z, Herrmannova, D, Kuzilek, J and Hlosta, M (2014) *Developing predictive models for early detection of at-risk students on distance learning modules*. Paper presented to the Machine Learning and Learning Analytics Workshop at the Learning Analytics and Knowledge Conference (2014), Indianapolis

Zerihun, Z, Beishuizen, J and Os, W (2012) Student learning experience as indicator of teaching quality. *Educational Assessment, Evaluation and Accountability*, 24(2), 99-111

Appendix: Transcript of interview panel members Evasys conference

The full interview and video can be found at:

- www.evasys.co.uk/news/newsreader/breaking-down-the-barriers-latest-evasys-research-unveiled.html
- www.youtube.com/watch?v=XmLZ5kWwiR8.

Erik Bohms (Electric Paper Ltd). The research is called 'Breaking down the barriers' and we actually commissioned this because we were finding after five years of working in the market we have customers who have been very successful in implementing our software Evasys as well as others who have struggled because of cultural policy, and practice at their institutions.

Prof John Taylor (University of Liverpool). One of the key things is that evaluation actually leads somewhere. Good evaluation is all about changing things and improving things, and actually leads to an overall improvement in the educational experience that we give to our students.

Bart Rienties (OU). For me the key word is closing the loop: so listening to what the students are saying in terms of their experience, then trying to see what this actually means for teachers and the wider higher education institution. But if students say something that is working well, bringing that back to the organisation. If students are saying 'Ooh this is not going so well', then universities have to act upon that. I think it is closing the loop, so not only just measuring, but acting upon information that I think is key.'

Aisling McKenna (Dublin City University). To me good evaluation is primarily it answers the question about the students' experience. So we can have all the reports that we want, I suppose, institutional reports, benchmarking, baselines, all these kinds of data terms that we throw around in terms of business intelligence and information, but for me unless the evaluation tells us a bit about the student experience, it helps us to understand that, and that can be used as a tool to improve the student experience, it is all a bit lost really.

Neil McKay (Sheffield Hallam University). I think it is engaging, it engages the students to fill it in in the first place and staff to actually make use of the feedback of the students so that there is an impact on improving their experience.

Aisling McKenna (Dublin City University). So for me Big Data offers lots of opportunities, but there is a skill and there is a lot of thinking that has to go behind how you might apply, how you collect information, and what we use it for, and what we draw as a conclusion. So as Professor John Taylor would have mentioned during the earlier (panel) session, it is an opportunity for us to ask questions of the data, rather than drawing immediate conclusions from it.

Erik Bohms (Electric Paper Ltd). Really the concept of survey fatigue a lot of times is because students aren't told what the results are and they drop out of the process.

Bart Rienties (OU). If you ask a student to fill in a questionnaire, you have to act upon that data then to actually do something with that data. If you (as student) have said X and we (as institution) have done Y, then students will actually see it as an opportunity to provide feedback'.

Prof John Taylor (University of Liverpool). I think it is important that we actually have people at our universities who are professional people who understand that data and who can draw out the real meaning of that data. And they actually then highlight this in reporting to committees and senior officers in the university. Senior people in the university haven't got the time to plough their way through huge amounts of data. You've got to have somebody, or people, who are interpreting it and highlighting the issues.

Bart Rienties (OU). Every number, say 80% of students are satisfied, there is always a narrative behind that number, because it means that 20% of students are not satisfied. So why are they not satisfied? What can you do to help them? It is really trying to unpack what is behind those numbers... that is the key message.

Prof John Taylor (Liverpool University). I think a problem that some universities still have is one of data ownership. People sort of saying that 'this is my information and you keep away'. I think we have to break away from some of that and view it as institutional data, university data, and share it as openly as we possibly can do.

Bart Rienties (OU). Data can help you to see where your strengths are, but also where there are areas of further improvement.

QAA1387 - Nov 15

Southgate House, Southgate Street, Gloucester GL1 1UB
Tel: 01452 557 000

Email: enquiries@qaa.ac.uk
Website: www.qaa.ac.uk

Registered charity numbers 1062746 and SC037786