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Cui bono? On the relative merits of technology-enhanced learning and teaching in higher education.

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Abstract: This article provides evidence from a 4 year longitudinal study on the comparative use of illustrative video podcasts during Economic Geography lectures vis-à-vis traditional educational methods in order to guide pedagogic practice and future research on the relative merits of technology-enhanced learning in higher education. Key benefits derived from the introduction of video podcasts identified in this study included positive affective and cognitive attitudes of students towards educational technologies, increased teacher satisfaction, and improved teaching evaluations. Key challenges included negative impact of video podcasts on student behaviour (attendance and broader engagement), and uncertain impact on learning performance (exam scores). The study highlights the benefit of sequencing the improvements to the learning/teaching process, starting with a module review and revised content, before proceeding towards the integration of learning technologies into the content delivery. More broadly, the paper calls for pedagogy to remain vigilant, critically reflecting on the intricate relationship between educational technologies, teaching content, and the wider socio-political context.

Key words: technology-enhanced learning; video podcast; ZPD; benefits; evidence; career prospects.

Introduction: appreciating technology-enhanced learning

Technology-enhanced learning (TEL) or “e-Learning” is a broad concept, typically encompassing the expansion and “effective use of digital technologies to support learning and teaching” in schools, colleges, and universities, aimed at providing students with an opportunity to “enjoy a more flexible learning experience” (Jisc, 2014, online). TEL features prominently in the UK Higher Education Academy’s *Professional Standards Framework for Teaching and Supporting Learning in Higher Education*, where it is listed as amongst six “core knowledge” attributes of a university lecturer (HEA, 2011, p. 3). Equally important, the application of learning technologies is considered now to be not just a crucial part of learning and teaching in higher education, but also a vital piece of evidence of innovative teaching practices used as a criterion for promotion (see University of Salford, n.d., online).

The advent of the personal computer, followed by the development of the World Wide Web, and the proliferation of auxiliary information and communication technologies (ICT), has led to fundamental shifts in all three main activities (i.e., research, teaching, and administration) in the sector of higher education (HE). Macias and Richter (2009) argue that universities in the Western context have found themselves under increasing pressure to keep up-to-date on technological developments in pedagogical practice, facing a great deal of contradicting societal expectations and public policy targets. At the same time, at least at face value, the education professionals appear to be fully-embracing TEL, enthusiastically welcoming high aspirations and setting very ambitious goals for e-learning. And although the pedagogic theory has long recognised that the delivery medium should not be considered the determining quality factor in the process of learning, some early adopters of TEL extolled it as truly a wonder strategy, capable of motivating students, catering for individual differences, promoting interaction, facilitating “deep processing”, fostering meaningful and “contextual” learning, and even building “the whole person” (Ally, 2004, p. 6).

This paper’s major aim is to put to test some of these propositions about the perceived benefits and advantages of TEL, and its major benefactors in a real University working environment. In a fast-changing world of electronic technologies, key stake-holders have stressed the need to avoid fixed and constricting definitions of TEL (HEFCE, 2009, p. 8). Consequently, this paper takes a generic view of TEL by focussing on the actual and potential usage of educational technologies, tools and techniques in the context of large classroom teaching. This research deals with a group of Level 2 (Second Year) undergraduates, studying at an elite British *Russell Group* (i.e. research-intensive) university in the Midlands region of England.

Following this introduction, the paper provides a review of opportunities and constraints in using learning technologies in the HE sector. Consequently, the paper describes a set of newly-designed learning activities implemented as part of a “blended” approach to teach a core Urban and Regional Studies module (unit) in a Geography Department. The particular focus here is on the use in classroom of online *video podcasts* described as “video files that are distributed in a digital format through the Internet using personal computers or mobile devices” (Kay, 2012, p. 821). The paper then reports a series of gradual changes introduced over the course of four academic years, before comparing the outcomes of *ad hoc* modifications, a comprehensive module review, and the introduction of video podcasts in lecturing. The paper concludes with a discussion about TEL-orientated pedagogical innovations, compared with “traditional” non-TEL interventions, and their repercussions for pedagogical decisions and academic careers.

Using learning technologies in higher education: competing rationales, divided constituencies

The current public policy in the Western educational context appears to be extremely positive about TEL. As exemplified by a revised approach to the Higher Education Funding Council for England’s strategy for e-learning, educational technologies should benefit the sector in three following ways:

- *Efficiency*, when “existing processes are carried out in a more cost-effective, time-effective, sustainable or scalable manner”;

- *Enhancement*, meaning “an improvement of existing processes and the outcomes”; and
- *Transformation*, namely “a positive change in existing processes or an introduction of new processes” (HEFCE, 2009, p.2).

HEFCE’s strategic document praises specifically “the transformative potential of technology”, which should translate “into improved satisfaction, retention and achievement” (HEFCE, 2009, p. 5; cf. HEFCW, n.d., online).

The ongoing restructuring of the university in the Western Anglophone context, often with “militaristic goal-setting” dictated by governments and funding bodies (Giroux, 2010), has gradually pushed the sector towards TEL compliance in the name of transforming the student experience (Macias & Richter, 2009). Simultaneously, the rise of e-learning is often explained as a function of the developing technology, the affordances of such tools, access to computing power, and the power of computers networks. The interest of many HE institutions to globalise, become more “corporate”, and increase their market share online, has undoubtedly helped the advance of learning technologies, boosting profit-seeking opportunities for ICT firms, computer electronics manufacturers, private education and distance learning providers (see EIU, 2014). As early as 2001, a JISC survey was able to identify at least 16,000 “learning technology practitioners” working in the UK HE sector alone (Jones, 2004).

Educational technologies have been sold with a promise of equipping students with the key high-order skills of analysis, synthesis, and evaluation (critique) that students ought to acquire (Bloom, 1956). Yet, markedly, pedagogical theorists have resisted for quite some time jumping on the TEL bandwagon. On the one hand, the foundations of educational theory for TEL can be related to (almost) any branch of the pedagogic theory: opportunities for e-learning reportedly exist within the *behaviourist school* of learning, the *cognitivist* paradigm, in *connectivism*, in the now fashionable *transformative* pedagogies and *social constructivism* (Ally, 2004; Harasim, 2012; Koohang *et al.*, 2009; Wang, 2008; Wicks, 2009). On the other, when one examines the majority of today’s most influential learning theorists (e.g., Illeris, 2009), one cannot fail but notice how little they talk about learning technologies, if at all. And when they do, their musings may well be described as “awkward” and “mildly anachronistic” (Johnson, 2010, p. E114). (For a great example, inspect Bruner (2009, p. 162) on the likelihood of artificial intelligence replacing real human teachers). At the other extreme one may find learning technologists (Conole *et al.*, 2003) – education professionals, practitioners, and university technicians, typically with a science, technology, engineering, and mathematics background, whose job is to “embed, develop, and support” learning technologies in HE (Armitage & O’Leary, 2003). Learning technologists seem to consider theory – educational or generic – in Thomas’s (2002, p. 419) manner as “sterile”, “overblown and pretentious, a gloss on plain thinking”, emphasising instead “untheorised practice as a corrective to excessive theoretical concern” (Jones, 2004, online). As *The Economist Intelligence Unit’s* report on how technology will shape learning puts it, “the means sometimes *is* the end” (EIU, 2008, p. 16, emphasis in the original)

This tension between “high” theory and “lowly” practice was undoubtedly a reflection of the growing disillusionment on part of the academic community with the original failure (dead birth?) of the so-called virtual university. As early as spring 2001, one learning technologist confessed:

As I write, some of the ‘hype’ around e-learning as the panacea and the trigger for changes in education is dying away... Instead of the predicted replacement of education by electronic means, we witness a web of educational providers, using ever more sophisticated networked technologies, constantly repositioning themselves in a slipper market place. (Salmon, 2002, p. ix)

Eleven years on, and journals of teaching innovations continue to be filled with admissions by practitioners that online education is still something academics are reluctant to embrace in their campus-based institutions, amidst growing journalistic cries and criticisms in the blogosphere about people still craving face-to-face contact, worrying about presence, and complaining about a lack of intimacy and connection with their expert lecturers (Moron-Garcia, 2013, p. 104-105). As noted by Beetham and Sharpe (2013, p. 5) even today the entirely virtual learning experience remains a minority choice, provided by a few specialist HEIs such as the Open University in the UK and the Netherlands and Phoenix University in the US. It feels for TEL to become a meaningful pedagogical tool, teachers’ whole mind-sets have to undergo a revolutionary cultural change to install the idea that teaching is not effective without the appropriate use of ICT resources and educational technologies to facilitate student learning (Ertmer & Ottenbreit-Leftwich, 2010). Tellingly, after more than two decades in existence, the *Association for Learning Technology* – Britain’s leading organisation dedicated to the field of ICT in education – still describes itself as a small organisation with limited resources, no core funding from central agencies, with just twelve hundred members (see ALT, 2015, online).

TEL: technocentric or theory-led?

The initially lukewarm reception of TEL amongst the broader academic community should not be interpreted as being a product of technophobia or lack of effort on teachers’ behalf. The root of the problem appears to lie in the incongruity of teacher-centred experiences and technocentrism (often technological determinism) of TEL practitioners, proclaiming teaching technologies to be more important than “content delivery” (Salmon, 2002, p. x). One comprehensive review of TEL-inspired pedagogic interventions has recently found the field rife with technologic determinism:

We discovered that many interventions were technology led (e.g., ‘how can we use podcasts/wikis . . .?’), rather than being derived from an identified educational need or aspiration. There seemed to be many cases of deterministic expectations that introducing technology would, by itself, bring about changes in teaching/learning practices. This might contribute to the lack of an explicit educational rationale for many interventions. (Kirkwood & Price, 2014, pp.25-26; see also Singh, 2014)

Worst still, critical observers of TEL policies implemented so far question their revolutionary and transformative nature, arguing that, at least in the UK, “to date much e-learning has tended to *replicate* or *supplement* existing academic practices” (Kirkwood, 2009, p. 108; emphasis in the original cf. Littlejohn *et al.*, 2012). Consequently, Livingstone (2012, p. 9) raised even more fundamental questions “over whether society really desires a transformed, technologically-mediated relation between teacher and learner”. In this regard, one finds it rather intriguing (and perturbing to the same extent) that the above quote on the technology-centred nature of many TEL interventions fully confirms a

prediction made thirty years earlier by Yurii Gilbukh. Writing in *Problems of Psychology*, the Soviet pedagogy theorist decried Western technological determinism in-built in emerging computer-based learning programmes:

Apparently, it could not be otherwise in the capitalist world. In a socialist society, however, the question should be turned on its head: one needs to start travelling not from the computer towards a more or less suitable theory, but, on the contrary, from the theory adopted in advance towards its realisation with the computer's help ... "In order to apply these principles, we have to get from the computer the following..." – in our view, something like this is how the question should be raised today. And here L.S. Vygotskii's concept of ZPD comes to the rescue". (Gilbukh, 1987, pp. 39-40; the author's own translation from Russian)

Back in "the capitalist world", the pedagogy of Vygotsky has indeed become a source of inspiration for a vast number of education professionals, spreading to the Global South, too (see Jaffer, 2010). Vygotsky's social process model, with the idea of a *zone of proximal development* (ZPD) – understood as the learning stage when students "can do with help" (Anderson, 2013, online) – seems to open many opportunities for TEL practitioners. Vygotsky argued that working in close collaboration with the teacher-facilitator, students could be stretched and helped to perform a task, an activity, which they were not able to perform by themselves at the beginning of the class (Veer & Yasnitsky, 2011; Wertsch, 1984).

Most recently, in a daring attempt to build a brand new learning theory for TEL, Harasim (2012) repeatedly referred to Vygotsky to support her claim that in the "21st century Knowledge Age", the role of the instructor moderator is to mediate between the learners and the knowledge community (Harasim, 2012, pp. 83-84). Yet Mayes and de Freitas (2013) disagreed, stressing it is not yet clear how the role of the educator will evolve under the influence of TEL. Drawing on Vygotsky in a much more profound way, Wenger (1998) provided a robust rebuff to technological determinism in defence of a practical pedagogical theory:

If we believe, for instance, that ... information stored in explicit ways is only a small part of knowing, and that knowing involves primarily active participation in social communities, then the traditional format [a teacher lecturing a class] does not look so productive. What does look promising are inventive ways of engaging students in meaningful practices, of providing access to resources that enhance their participation, of opening their horizons so they can put themselves on learning trajectories they can identify with, and of involving them in actions, discussions, and reflections that make a difference to the communities that they value (Wenger, 2009, p. 215).

At the most basic level, educational technologies – even as simple as video podcasts and clips viewed in class – could provide students with an opportunity to learn through participation in the attainment of knowledge (SCTL, no data, online). It is contended, however, that this potential may only be unlocked when learning technologies are firmly linked to activities in a lecture hall, facilitated and moderated by the teacher to unlock the students' ZPD. Vygotsky's pedagogy, Wenger's "social theory of learning", Heron's "co-operative reversal learning cycle of the person" (Heron, 2009), and Biggs's "constructive alignment" (Biggs & Tang, 2011) all point to the teacher's primary job being the creator of a

learning environment (classroom or online), which promotes the learning activities aimed at reaching the chosen learning outcome (Biggs, 2003). In other words:

No one has yet shown that we need to change our understanding of how students learn. There have been some wild statements from opinion-formers about technology revolutionizing how students will learn in the 21st century, but the research-based fundamentals of what it takes to learn have not been challenged. The theoretical concepts and approaches still call on Dewey, Vygotsky, Bruner, Papert, Lave and Wenger, with no challenge to our fundamental understanding of what it takes to learn in formal education. Pedagogy is still seen as guiding the learner to learn. The emphasis is still on pedagogy leading the use of technology, rather than adapting to what technology offers (Laurillard, 2013, p. xxi)

Video podcasts in HE: enhancing learning?

From very early accounts (Friel and Carbonari, 2000), video-based pedagogy emerged as a way of providing students with opportunities to practice analysis, problem solving, and to articulate possible courses of action with respect to a particular dilemma. Seidel and others (2013, p. 57) stress that activities involving video have this potential, but “should not be regarded as effective in itself: Video is a technology for delivering content” and nothing more than that. The use of video-assisted TEL started with fairly rudimentary examples (McGreal and Elliott, 2004), soon progressing to “lecture capture” – a process, in which the audio of a lecture, video of the presenter, and on-screen projected content are recorded and distributed to students via the institutional VLE (Davis *et al.*, 2009). In the 2010s, the examples of video-assisted TEL expanded to very ambitious and technologically-sophisticated accounts of technology-enhanced blended learning designs, including online lectures, communications tools, electronic workbooks, recording learning development, and online video case studies (Cooner, 2010; Smyth, 2011, p. 113).

The effectiveness of online video podcasts as a learning technology has been reported in a number of recent studies in Biosciences (Cann, 2007), Medical and Dental education (Jham *et al.*, 2008), Media and Communication studies (Dupagne *et al.*, 2009), and Architecture and Urban Design (Comiskey and McCartan, 2011). In the early 2010s, “Flipped Learning” or F-L-I-P™ emerged as one of the most transformative pedagogical approaches using video-based technology. By capturing the lecture material on video for students to (re-)view at home prior to class sessions, flipped learning potentially allows to re-focus classroom activities from “content delivery” into a more “dynamic” and “interactive learning environment” (FLN, 2014).

Within Geography, e-learning arrived into a fairly sceptical environment, with a number of initial studies claiming that “student impressions of Internet-enhanced classes are high, yet student performance seems unaffected” (Lemke & Ritter, 2000, p. 90; see also Knight, 2006). Yet, similar to other disciplines, gradually, academic Geographers have shifted towards a more positive and optimistic perspective on the use of learning technologies, including video podcasting (Brown, 2011). In a series of thorough studies of Geography teaching/learning practices, Hill and Nelson (2011), and Hill *et al.* (2012) showed, for example, how audio-visual material from fieldwork locations can be used directly to supplement thematic lecture material: “video podcasts, as a form of film, might help to engage students and exemplify novel processes and concepts from environments with which they have limited or no direct experience” (Hill *et al.*, 2012, p. 438; see also Higgins & Coe, 2014).

The most comprehensive, critical literature review of video podcast usage in HE so far was carried out by Kay (2012), who assessed the evidence from 53 top peer-reviewed articles published between 2002 and 2011. His review identified five key benefits regarding the use of video podcasts (VPs) in their various forms:

First, almost half of the studies reviewed, suggest that the main reason video podcasts are used is to improve learning. Students particularly welcomed the fact that video podcasts permitted them to learn when, where, and at the pace they wanted. Second, more than half the studies analyzed suggest that students have very positive attitudes toward video podcasts describing them as useful, helpful and effective, as well as enjoyable, motivating, and stimulating. Third, a number of papers indicated that study habits change as a result of having video podcasts available and that students use podcasts frequently, especially prior to a test or examination. Fourth, in some cases, video podcast use does not reduce class attendance. Finally, there is some evidence, that use of video podcasts has a direct and positive impact on test and skill performance. (Kay, 2012, p. 825)

Overall, the number of studies reporting challenges with using video podcasts was almost 2.5 times fewer (40 cases) than reporting benefits (98 cases) (Kay, 2012, pp. 823-826). One has to note that most of the research reviewed above involved some form of lecture capture – video podcasts of the entire content delivery process; hence the concern about its negative impact on class attendance (see Holbrook & Dupont, 2009; Pritchard, 2010). Problems associated with using VPs in HE have also involved learners' preference for lectures (instead of a substitute): students reportedly like being able to ask questions and interact with the lecturer face-to-face. Last but not least, out of the fifty three most recent high quality studies of video podcasts as a learning technology, not a single one of them reported the teacher's perspective of video podcasts used; yet "it is important to ask instructors their attitudes about the role and effectiveness of video podcasts" (Kay, 2012, p. 829).

Data, methods, and procedures

Sharing the criticisms of TEL mentioned in the literature, the main objective of this study is to consider the efficacy of video podcasts embedded in the lecturing process *relative to other* TEL (e.g., visual aids, Microsoft PowerPoint slides) and traditional non-TEL improvements (e.g., a comprehensive and aids (e.g., (e.g., printed hand-outs). Subsequently, this study is to fill the reported gap in the literature by providing an honest *teacher's* assessment of the benefits emanating from the use of video podcasts, and educational technologies in general, in HE. This section describes the data and methods used to achieve the main research objectives, followed by a brief review of the TEL-related interventions implemented in the course of this study.

The object of a TEL-informed intervention implemented over the course of this study was a Level 2 (i.e. second year undergraduate) module (code URS201), worth 20 credits (i.e. 1/6th of the overall mark in Level 2) and involving 200 study hours. The course entitled *The Urban and Regional Economies, Problems and Policies* was taught at a major research-intensive (*Russell Group*) university in the Midlands region of England, UK, between 2011-12 and 2014-15 (Year 0 to Year 3 of this research) to well over 110 students on average. A number of major structural changes were made to this module in three annual cycles, with a new module leader undertaking a comprehensive syllabus review and learning design modifications, introducing brand new content in Year 2. Module modifications were

followed the following year by an introduction of TEL processes and activities, including the use of video podcasts (VPs) in the lecture theatre, in Year 3. (see Table 1).

TABLE 1 ABOUT HERE

It has to be mentioned that most of the module modifications reported here were inspired by John Briggs's *constructive alignment* pedagogy (Biggs and Tang, 2011), by designing and delivering a coherent 20-credit package, with revised intended learning outcomes (ILOs), a reformed module's assessment strategy, and new teaching/learning activities. VPs appealed as being a) one of the easiest educational technologies to use during the lecturing process in class, and b) reportedly quite an effective way of ensuring a better understanding of the theory through worked examples, practically-focussed scenarios, and interactive graphic components. Another set of reasons was related to the need to entertain a fairly large group of undergraduates for up to 120 minutes; VPs were deemed to be potentially useful "ice-breakers" (SCTL, no data, online). They could also provide material for (slightly) more exciting "Think-Pair-Share" activities, in comparison with newspaper clippings. In the course of the module's third year of running, nineteen short VPs were prepared and shown to the students during S2 lectures, with the aggregate viewing time of 70 minutes. Sixteen of the video podcasts were of conceptual nature, supplementing the lecture material with audio-visual stimulations, real-life narratives, and applied case-study scenarios (see Table 2). Being envisaged as a tool to foster deeper learning and reflection by students, the VPs used in class were to encourage the learners to be more critical, taking and justifying a particular stand.

Individual video podcasts shown in class and/or viewed by students at home via the institutional virtual learning environment, were aimed at stimulating and encouraging the students a) to apply difficult regional science models (e.g., the Edgworth-Bowley box diagram) to real-life examples; b) to analyse complex policy problems and their welfare implications (e.g., the pros and cons of gentrification); c) to synthesise persuasive conclusions (e.g., on the merits of supra-national regional policy); and d) to evaluate biases involved in policy-making (e.g., by contrasting anti-European views of the United Kingdom Independence Party -UKIP, with those of the European Commission in Brussels).

This list of the desired higher-order cognitive skills to be acquired by students through the realisation of the module's intended learning outcomes was informed by Bloom's Taxonomy in its updated variants (see Anderson, 2005; Crow et al., 2008; Stefani, 2009). Despite e-learning flexibility of the video podcasts used in the study, watching them *collectively* during the lectures in class and discussing and/or reflecting upon them *in situ* (rather than online via a blogpost or a discussion thread on Canvas VLE) was a conscious decision. It was partly driven by the preferred "blended" mode of learning adopted across the campus, mixing networked ICT and e-learning platforms with traditional teaching in the lecture hall (Brenton, 2009). However, the primary motivation for having a synchronous student-teacher interaction and communication, prompted by a video podcast just watched, was influenced by the social constructivist theories of learning. The promise of the teacher entering into a dialogue with learners to enhance their understanding "until it corresponds with that of the teacher" (Anderson, 2013, online) was quite appealing.

TABLE 2 ABOUT HERE

The evaluation strategy to assess the enhanced learning capacity of VPs and other activities introduced to URS201 – in comparison with other TEL and non-TEL interventions – was designed to combine both quantitative and qualitative evidence. Using and comparing different pieces of data and methods, this study adopted triangulation as a way to confirm its findings (see Coe *et. al.*, 2012, and Coe *et. al.*, 2014, for a discussion on evaluation strategies). Overall, this study utilised seven data sources and assessment methods covering the module's 4 academic years of running (Year0 to Year3). Those included i) student completion rates (percentage of module fails, broken down by Semester 1 (S1) and Semester 2 (S2) failed assessments); ii) average module marks (mean aggregates, broken down by S1 and S2); iii) institutional module evaluation questionnaires (MEQ): the University-approved EvaSys™ student self-report surveys, completed and collected during the final lecture of the module in Week 10, S2; iv) open-ended comments by students in the MEQs themselves; vi) qualitative scrutiny of student-generated artefacts in the form of examination answer scripts submitted for the final summative assessment; vii) the module's annual handbooks, examination papers, marking criteria, and other relevant paperwork. Descriptive statistical analysis as well as multivariate co-relations were used to examine the quantitative data gathered in the course of this study.

In terms of data reliability and validity issues (Phelan and Wren, 2005/2006), this study paid attention to its assessment tools producing reliable, stable and consistent results, whilst measuring the purported attributes unambiguously. *Parallel forms of reliability* were introduced by comparing S1 coursework marks (grades) (as the control) with S2 examination marks in the years before and after the TEL integration. In addition, quantitative data were collected alongside qualitative data, with a number of module evaluation scores corresponding to qualitative evaluations of open-ended questions administered to the same group of individuals. Importantly, the questionnaires used for student self-reports were designed not to prompt the respondents to tick any particular teaching method, in-class activity, or approach to learning they enjoyed. It is contended that the studies begging the question “how much did you like these videos?”, then reporting a 90% student satisfaction rate do not exhibit a particularly robust methodology to be replicated (e.g., Yarbro *et al.*, 2014, p. 14). In terms of *inter-rater reliability*, all of the examination scores and self-report surveys were related to the same lecturer, who marked the final examination as well, ensuring consistency in academic judgement.

Results: how did the TEL experiment go?

There are six major findings that the study generated over the course of 4 years. These cover the students' affective attitudes towards VPs; their cognitive attitudes towards VPs; the impact of VPs on student behaviour; the impact of VPs on learning performance; VPs and teacher satisfaction; the impact of VPs on teaching evaluations; and, finally, the relative merits of the TEL integration as a whole.

1. Positive affective attitudes towards video podcasts

Overall, whilst unprompted, the students expressed overwhelmingly positive feelings and emotions towards VPs frequently mentioned in their general, open-ended comments. The quantifiable data from the MEQs revealed a 5% increase (from 3.8 to 4.0 points on a 1-4 scale, with 0.04 points thus equalling 1%) in the number of students, finding the module

“intellectually stimulating”. It is remarkable that in Year 2, prior to the TEL integration (but post content review), the positive answers to this question registered a drop of 5%, from 4.0 to 3.8 points (see Figure 1 below). Hence, to a significant extent, the improvement in Year 3 should be attributed to the use of video podcasts.

2. Positive cognitive attitudes towards video podcasts

Most of the data analysed in this study pointed out to generally positive cognitive attitudes towards VPs. In Year 2, when some students complained about the (newly-revised) module’s content being “too heavy” theoretically, “dry”, and “hard to understand”, the student evaluations of the effectiveness of the teaching methods used declined by 5% (from 4.0 to 3.8 points), in comparison with Year 1. By contrast, following the TEL integration, positive responses to the VP-assisted teaching methods increased by 7.5%, reaching the highest score on record, 4.1 point (see Figure 1).

FIGURE 1 ABOUT HERE

One has to note that, following the TEL integration, the number of students agreeing that their understanding of the subject increased as a result of taking the module dropped by 2.5% (from 4.2 to 4.1 point, see Figure 1). Similarly, the students did not report any improvement in the development of their transferable skills after the roll-out of video podcasts; indeed, there was a 2.5% decrease in the evaluations, from 4.0 to 3.9 points (see Figure 7 below). These negative cognitive attitudes appeared to be self-contradictory, if triangulated with the previous and the following results. In particular, Figure 2 summarises all open-ended comments made by the students with regard to the aspects of the lecturer’s approach to teaching that best helped them to learn, and include the related suggestions to the lecturer by the students on what could have been done differently to help them learn more effectively, and any other open-ended comments related to teaching/learning methods used.

FIGURE 2 ABOUT HERE

It shows that in Year 2, before the TEL-focussed interventions, the lecturer’s PowerPoint slides were reported as the most effective aspect of student learning experience, followed by the in-class discussions and, interactions (described by most students as “case studies”). Following the roll-out of VPs, the student appreciation of them also significantly increased, by almost 16 percentage points (see Fig. 2). At the same time, positive attitudes and demands from the students for more in-class interactions (described by students variously as “case studies”, “in-class activities”, “discussions”, “engaging” or “interactive teaching resources”) increased even further, from 15.6% to 23.8% of all respondents. The lecturing slides were significantly devalued, whilst – rather astonishingly – the highest score in terms of a learning tool was attributed to printed hand-outs of the lecture slides themselves. Indeed, following the introduction of VPs into the lecturing process, almost 4 times as many respondents than before declared printed hand-outs to be *the* key aspect in the lecturer’s approach to teaching that best helped them learn: 37% of students praised being given “Handouts every lecture!”.

3. Negative impact of video podcasts on student behaviour

All the evidence suggests there was a negative change in student behaviour, following the introduction of VPs, in comparison to the previous years. As reported in Table 1 above, the complete overhaul of the module in Year 2 resulted in a dramatic improvement in student attendance record, amounting to 23.4 percentage points registered during the final lecture. By contrast, the implementation of TEL practices in Year 3 resulted in a visible *drop* in attendance (by 4.4 percentage points). Similarly, the MEQs registered a decline in “student engagement” of 2.5% on all three measures used, with the students reporting less engagement with the pre-, in-, and after-class learning activities (from 3.8 to 3.7; 3.4 to 3.3; and 3.6 to 3.5 points respectively; see Figure 3).

FIGURE 3 ABOUT HERE

One has to highlight, however, that student attendance record in Year 3, even after a slight decline, was still 22 to 19 percentage points higher than in in Years 0 and 1 respectively, before the module was modified (see Table 1). Regarding attendance, Kay (2012, p. 826) raises an intriguing point that no pedagogical study of the TEL impact on student behaviour he reviewed had actually articulated why not attending classes should be a concern. From the pedagogical philosophy underpinning the present study, student attendance was considered to be an obvious concern, given the value and emphasis put on collaborative, co-operative nature of learner-learner and learner-teacher interactions in class by the key educational theories.

The issues related to attendance and student engagement may not be as straightforward, however. As argued by Gourlay, since the late 1990s, the traditional lecture has been under attack from the professional and corporate promoters of “student interactivity”:

Silent listening and thinking are assumed to be markers of passivity and therefore not indicative of engagement. Related notions such as ‘active learning’ may also be seen to act in the service of this ideology, which is apparently benign and almost unassailable as an orthodoxy. However, it might also be read as an underscoring of a particular Western, post-enlightenment fantasy of the ‘ideal’ student (and teacher) and arguably neoliberal notions of the graduate as a product ready to participate in the ‘knowledge society’. Gourlay (2015, p. 3-4),

In this context, and given that the module data registered a *continuous* decline in the self-reported student engagement, both before and after the major module review in Year 2, from 3.63 in Year 1 to 3.60 in Year 2 and 3.50 in Year 3 (see Figure 9 below), one could argue the students felt they continuously could do better, read more, and watch more VPs. More prosaically, with the undergraduate tuition fees trebling to £9,000 a year during the duration of this study, an increasing number of students had to turn to part-time jobs, thus, leaving them with less time for reading, preparation, and independent study; hence, less “engagement”.

4. Varied impact of video podcasts on learning performance

The study uncovered a mixed bag of evidence related to the impact of VPs on learning performance, ranging from overtly negative to fairly positive outcomes. Prior to the roll-out of TEL, in Year 2, there were a lot of improvements. The changes occurring after the comprehensive module review resulted in a very significant increase in the average module mark by 6.61 percentage points, from 61.12% to 67.73% (see Table 1 above). Furthermore, the share of students failing the module decreased from 6.5% in Year 0 and 6.3% in Year 1 to to 1.7% in Year 2. By contrast, following the TEL integration, the student attainment data worsened, with the average examination mark declining by 6.9 percentage points, from 72.42% in Year 2 to 65.52% in Year 3. Using Semester 1 (with no TEL activities) as a control, it is noteworthy that the learning performance in Year 3 S1 also dropped significantly – the average coursework mark declined by 5.6 percentage points, with the share of fails growing from 2.5% in S1 Y2 to 5.9% twelve months later (see Table 1). The age cohort effect might explain a marked improvement registered in Year 2. For instance, a qualitative analysis of the student-generated artefacts - Year 2 hand-written examination scripts - indicated that not a single one of them had contained anything but the focussed answer to the question set, with zero fails. In Year 3, at least half a dozen of scripts looked as opportunistic, “brain dump” answers, regurgitating vaguely relevant material from other modules. Nevertheless, , if one puts Year 2 aside, the learning performance results that directly followed the TEL integration activities were still *superior* to the status quo. The S2 Y3 average exam mark was 3.3 percentage points higher than the corresponding figures from Years 0 to 1, whilst its fails rate were just a half, in comparison with the earlier years (see Table 1 above).

FIGURES 4(A)-4(B) ABOUT HERE

FIGURES 5(A)-5(B) ABOUT HERE

Another aspect worth highlighting relates to a 49% increase in the exam rate’s standard deviation in Year 3. The evidence suggests the students were stretched in assessment to a much higher extent. The spread between the chosen examination questions grew significantly, too. Given that the key intervening variable – the examination paper itself – did not change between Years 2 and 3, the mechanism of change is fairly clear: the observed shift in student attitudes between individual topics must be explained by the use of VPs in during the lectures better to clarify specific concepts and theoretical models. The students had either acquired more confidence for revising certain exam questions or they had found certain exam topics more accessible and exciting to revise for, after watching the video podcasts. Figures 4-5 indicate that the roll-out of TEL in Year 3 had a positive influence on growing interest in VP-saturated examination topics. Even with possible age cohort anomalies, it is contended that the TEL integration did have a positive impact on learning performance. The video podcasts shown in S2 Y3 influenced the choice of examination questions, rebalancing the spread of individual answers, leading to a fuller attainment of the intended learning outcomes.

FIGURES 6(A), (B), (C), (D) ABOUT HERE

As Figures 6(a) to 6(d) show, the module managed to reverse the previous trend of ever increasing negative relationship between the mean exam mark (per each exam question) and its standard deviation score. Until the TEL integration into the module, each year there

was at least one significant outlier, usually the lowest-scoring exam question, with the highest standard deviation score. In Year 3, the picture changed distinctly, with all 10 exam questions registering a fairly close average mark, with a much more balanced distribution of the ILO attainment patterns (see Figure 6d).

5. Positive impact of video podcasts on teacher satisfaction

Teacher satisfaction is an often-overlooked aspect in HE research, leading to frequent cries in the literature for the “learner-centred” pedagogical theory to stop undermining the value of teaching. “Where is teaching in learning?” “What does it mean to be a *teacher* when it is argued that the practice of *teaching* should be minimised?”, asked Graven and Lerman (2003, p. 190; emphasis in the original). Undoubtedly, it must be a delight to work with learners, who “have open egos and are living and learning through the apertures” (Heron, 2009, p. 144). Yet some of the readers would probably agree that Heron’s description does not equally apply to their own students in everyday practice.. In this context, the paper gathered enough evidence to support the beneficial impact of VPs on teacher satisfaction, with students noticing the lecturer’s enthusiasm in delivering the module. Following the TEL integration, the MEQ entry on the staff enthusiasm about their subject registered the highest score (4.5 out of 5) across the entire survey, rising by 2.5% after the roll-out of VPs. Indeed, the three highest scores in the MEQs all reported the lecturer’s affective attitudes, being animated, approachable, and easy to reach (see Figures 7-8).

FIGURE 7 ABOUT HERE

FIGURE 8 ABOUT HERE

From the open-ended comments made by the students following the final lecture, it was apparent that the teacher’s “humour” made an important contribution to their positive perception of the member of staff involved. Some of the VPs shown in class provided the lecturer with an opportunity to be/appear humorous, cracking jocks, even if they come at the expense of the people appearing in the videos themselves. The anti-European United Kingdom Independence Party political broadcast (2005) featuring a man-eating “Big Blue Octopus Monster of Brussels”, for instance, was one of those occasions of hilarity, entirely irresistible in its comical value (see Table 2).

6. Positive impact of video podcasts on teaching evaluations

The most visible and significant TEL improvement reported in this paper concerns the “lecturer focussed questions”, with the teacher’s score growing on average by an impressive 6.7%, from 4.00 in Year 2 to 4.27 points in Year 3. The Year 3 evidence also suggested a 4% increase (from 4.0 to 4.2 points) in students finding the lecturer inspiring them to learn, followed by a huge improvement of 14.3% (from 3.5 to 4.2 points!) in the lecturer being able to communicate clearly with the learners (see Figure 8). Given there was no syllabus content change from Y2 to Y3, the improved “teacher-learner” communication in the lecture hall must be attributed to the use of VPs.

FIGURE 9 ABOUT HERE

The evidence gathered in the course of this study overwhelmingly supports the claim that it is the *teacher*, who stands to gain the most from the TEL integration. The aggregate scores across four MEQ themes presented in Figure 9 points in one direction – the improvement in the lecturer-focussed questions registered in Year 3 beat all the other aspects of the module by a clear margin.

Discussion: who stands to gain from the TEL integration and what it means pedagogically

Six major research findings are drawn from the analysis presented in this study, which was based on four years' worth of student attainment and course evaluation data, alongside all the relevant teaching materials related to the delivery of a large Level Two 20-credit module on the Urban and Regional Economy at a major research-intensive British University in the Midlands region of England. This study has found the students to be very positive about the use of VPs to support learning. Furthermore, this paper has problematised the impact of VPs on student behaviour, which appeared to be negative both in terms of attendance and engagement, however conceived. The paper has stressed the immense pedagogic value of having in-class interactions, the "teacher-learner" and "learner-learner" dialogues happening collectively, in situ, and in synchronous time. In this regard, the roll-out of the lecture capture technology (i.e. the enhanced video recording of entire lectures) across the British higher education institutions, would thus create a number of challenges for the educators: given the expected decline in attendance, how can we (re-)structure our teaching activities in such a way as to continue pushing the learners' *zone of proximal development* expanding further, whilst left with fewer chances for collective physical contact and engagement?

This study has also uncovered a very mixed picture with regard to the impact of VPs on learning performance. Some headline figures on attainment (including exam scores and student fails) were rather negative. A lot of evidence emanating from the students' module evaluation questionnaires was inconclusive. There were some promising signs with regard to a more productive and balanced realisation of the module's intended learning outcomes. Yet, on the evidence presented in the paper, it was the individual teachers involved in the introduction of VPs, who benefited the most from the TEL integration. The impact of video podcasts on teacher satisfaction reported here was overwhelmingly positive: the three highest scores listed amongst the 15 indicators of the module evaluation questionnaire used in this study were on the perception of teacher satisfaction. Relatively to other aspects of teaching/learning, the lecturer-focussed scores enjoyed by far the most significant boost after the roll-out of VPs. Thus, the substantial impact that TEL innovations may have on career development prospects of individual members of staff involved could provide a serious (non-pedagogical) reason for exploring the use of educational technologies, which one may find personally compelling.

Consequently, this study has revealed that more traditional methods of enhancing the student experience, ranging from a comprehensive module to a regular provision of printed hand-outs during lectures, could have a considerably higher positive impact on the learning performance and student attitudes than TEL. To simplify, in this case, a technologically improved delivery method was beaten by better module content 4-1. Thus, this paper has confirmed findings reported by Coe *et al.* (2014) that the two factors with the strongest evidence of improving student attainment were teachers' content knowledge and

the quality of instruction. This calls for an appropriate sequencing of improvements to the learning process, starting with a full module review, (re-)formulating one's desired learning outcomes, revising content, designing an appropriate assessment strategy, and so on. It may appear beneficial to introduce TEL-inspired interventions only after a reform of the course's fundamentals. Figure 9 shows that in Year 2, following the structural change aimed at constructive alignment of the module, the aggregate evaluation scores improved by as much as 20.8%, from a grand total of 15.16 points in Year 1 to 15.99 in Year 2. By contrast, the net improvement to the module evaluations registered after the introduction of VPs amounted only to 5.5% (from 15.99 to 16.21 on aggregate).

Notwithstanding a series of fairly disappointing results reported here, due caution should be exercised in how one interprets these data and what generalisations can be made out of a single study, albeit a robust one. Even if a traditional, "off-line" pedagogical strategy like a module review leads to superior learning/teaching outcomes vis-à-vis certain TEL interventions, it is important to remember that one can only radically alter the course content once in a long while. By contrast, learning/teaching can be facilitated and supported through the use of educational technologies continuously in every session, week after week. Hence, learning technologists ought not to despair. Moreover, following a 4-year longitudinal study of their own, Underwood and Dillon (2011) confirmed the existence of "the technology dip" where student performance dipped in the years immediately following the introduction of TEL. The consequent post-dip recovery was reportedly swift and strong (Underwood & Dillon, 2001, p. 321). More research is needed fully to uncover the causes of such technology dips. What is clear, however, is that even if the academics' scepticism about the efficacy of TEL is somewhat misplaced (Loveless, 2011), pedagogy has to remain cautious about the intricate relationship between educational technologies, teaching content, and the wider socio-political context.

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Tables:

Table 1. URS201 Module, Year 0 to Year 3 registration and learning performance data

	<i>Year 0</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
Curriculum development	Legacy module; new module leader and 3 staff	<i>Ad hoc</i> staff and content changes	New module leader; full syllabus re-design	TEL roll-out; same content and staff
Contributing staff	6	3 (6-3)	3 (3-1+1)	3
Registered students	123	126	120	119
No. of S2 module evaluations returned	60	65	90	84
S2 final lecture attendance, % of total	48.8	51.6	75.0	70.6
Average module mark, % (coursework; exam)	59.60 (61.70; 61.20)	61.12 (60.76; 63.21)	67.73 (63.90; 72.42)	62.03 (58.28; 65.52)
Standard deviation of module marks (coursework; exam)	9.6 (6.8; 8.0)	12.4 (10.1; 14.2)	9.1 (9.4; 6.7)	9.8 (13.5; 10.0)
Student fails, % of total (coursework; exam)	6.5 (0.0; 1.8)	6.3 (1.6; 4.9)	1.7 (2.5; 0.0)	3.4 (5.9; 1.7)

Table 2. URS201 The Urban and Regional Economy, video podcasts (VPs) used, Semester 2, Year 3

Week	Lecture	No. VPs	VP Type	Length (min.)	Pedagogy	Focus	VP Title	VP Origin / Source
1	Industrial location: the location of the firm in theory							
2	Regional specialisation, trade, and multiplier analysis							
3	Regional labour market analysis	i)	Sup	6	RV	con	<i>Miners' strike - 30 years since the pit crisis of 1984</i>	Channel 4 News; http://youtu.be/OA-76QeiuSQ
4	Regional growth and factor allocation	i)	WE	10	P-S	prac	<i>An Introduction to the Edgeworth Box Diagram</i>	David Longstreet; http://www.youtube.com/watch?v=7QFAQJBq1uk
		ii)	WE	9	P-S	prac	<i>Production Possibilities Curve</i>	1funkyteacher; https://youtu.be/83m0_pCky50
5	Geographies of uneven development: convergent growth or divergent growth?	i)	Sup	3	RV	con	<i>Labour Productivity March 2014</i>	Office for National Statistics; https://youtu.be/7TjgZiByUlk
6	The modern local economic development policy: the urban context	i)	Sup	2	RV	con	<i>Zoning Changes Could Bring Urban Farms to Sacramento</i>	KCRA Channel 3 News; http://on.aol.com/video/zoning-changes-could-bring-urban-farms-to-sacramento-518413430
		ii)	Sup	1	RV	con	<i>Jane</i>	The Guardian; http://www.theguardian.com/society/2014/may/18/-sp-truth-about-gentrification-how-woodberry-down-became-woodberry-park
		iii)	Sup	1	RV	con	<i>Maxwell</i>	As above
		iv)	Sup	1	RV	con	<i>Micky</i>	As above
7	Regional policy: interventions and policy instruments	i)	Sup	2	RV	con	<i>The North South/Divide (Hal Cruttenden)</i>	Mock The Week; https://youtu.be/OYb4ylURvAM
		ii)	Sup	2	RV	con	<i>Gross Value Added - How do different regions compare to the UK average?</i>	Office for National Statistics; https://youtu.be/pMRVFoO_Fbo
		iii)	Sup	5	RV	con	<i>Prescott: The North South Divide</i>	BBC Two; http://bobnational.net/record/16524
		iv)	Sup	2	RV	con	<i>Gross Value Added - How does it compare across</i>	Office for National Statistics; https://youtu.be/tSm_GLW4IXM

		v)	Sup	2	RV	con	<i>regions</i> <i>HS2 phase two initial preferred route flyover</i>	Department for Transport; https://youtu.be/yCAkmi5i1tU
8	Regional policy and the European Union	i)	Sup	1	RV	prac	<i>EC-EU Enlargements</i>	Kolja21; https://commons.wikimedia.org/wiki/File:EC-EU-enlargement_animation.gif
		ii)	Sup	5	RV	con	<i>The Big Blue Octopus</i>	United Kingdom Independence Party TV; https://youtu.be/UgfQwhKkVR8
		iii)	Sup	3	RV	con	<i>The European Union's Cohesion Policy: investing in your Regions and Cities</i>	Directorate-General for Regional and Urban Policy; http://ec.europa.eu/regional_policy/index.cfm/en/information/videos/the-european-union-s-cohesion-policy-investing-in-your-regions-and-cities
9	Regional policy and devolution	i)	Sup	4	RV	con	<i>A federal UK?</i>	The Financial Times; http://video.ft.com/4103390963001/A-federal-UK-/World
10	New debates in urban and regional policy	i)	Sup	5	RV	con	<i>The future of cities</i>	World Economic Forum; http://www.weforum.org/videos/future-cities
		ii)	Sup	6	RV	con	<i>Disunited kingdom: Resurgent Manchester</i>	The Financial Times; http://video.ft.com/4068686666001/Disunited-kingdom-Resurgent-Manchester/World

Note: VP Type – Enh (enhanced PowerPoint), Sup (supplementary); Sub (substitutional or lecture-captured), WE (worked example); pedagogy – RV (receptive viewing), P-S (problem-solving); CR (created) video podcasts; academic focus – Prac (practical skills), Con (conceptual / higher level concepts). Following Kay (2012), VPs introduced into the lecture hall may be classified into four kinds by **purpose** as *substitutional* or lecture-based (lecture-capture) VPs; *enhanced* VPs (involving video footage of MS PowerPoint slides with an audio voiceover); *supplementary* VPs, aimed at augmenting the teaching/learning through real-world demonstrations, administrative support, and additional material to broaden or deepen student understanding; and *worked examples* – video clips explaining specific problems or showing techniques that students need to solve, acquire, and practice. Another category divides VPs by **segmentation** into *non-segmented* (e.g., an uninterrupted VP of an entire lecture) and *segmented* VPs, involving short clips on a particular aspect of the lecture theme. **Pedagogical strategy** covers three distinct types of VPs: *receptive viewing* (content delivery VPs); *problem-solving* VPs (popular in science, technology, engineering, and maths subjects); and *student-created* VPs. By **academic focus**, VPs can be differentiated between *practical* (skills-acquiring or problem-solving) ones, typically shorter and/or segmented VPs; and *conceptual* VPs, usually longer and/or non-segmented items, presenting or elaborating upon higher level concepts.

Figures:

Figure 1. URS201 module evaluation scores: institution-wide questions, Years 1-3 (S2).

Figure 2. URS201 module evaluation scores: "What aspects of this lecturer's approach to teaching best helped your learning?" Years 2-3 (S2).

Figure 3. URS201 module evaluation scores: student engagement, Years 1-3 (S2).

Figures 4(a) - 4(b). The correlation between the roll-out of TEL (the number and length of video podcasts shown in class) and a change in popularity of individual examination questions, Year 3 (S2).

Figures 5(a) - 5(b). The correlation between the roll-out of TEL (the number and length of video podcasts shown in class) and a change in standard deviation rates for individual examination questions, Year 3 (S2).

Figures 6(a) - 6(b). The correlation between the mean examination mark per question and the standard deviation score for individual questions, Years 0-1 (S2).

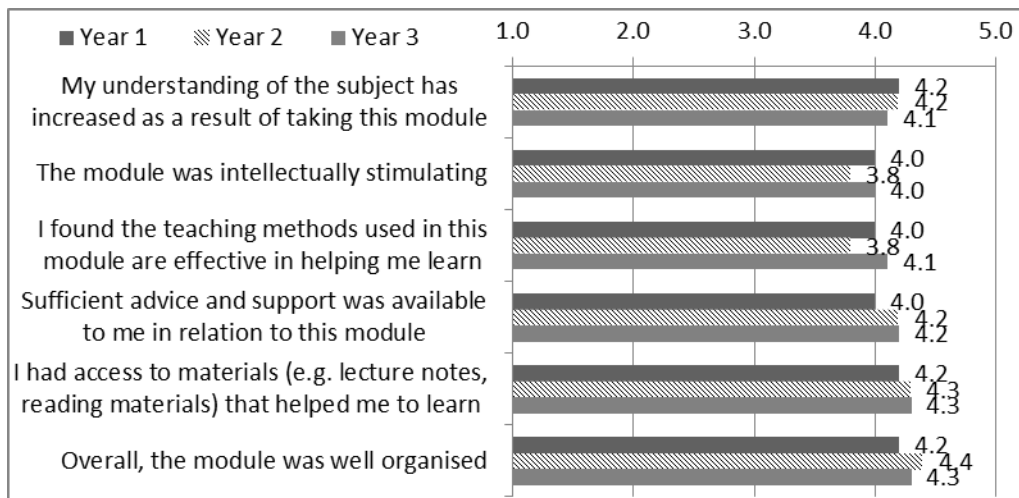
Figures 6(c) - 6(d). The correlation between the mean examination mark per question and the standard deviation score for individual questions, Years 2-3 (S2).

Figure 7. URS201 module evaluation scores: module specific questions, Years 1-3 (S2).

Figure 8. URS201 module evaluation scores: lecturer focussed questions, Years 1-3 (S2).

Figure 9. URS201 aggregate module evaluation scores, Years 0-3 (S2)

Figure 1. URS201 module evaluation scores: institution-wide questions, Years 1-3 (S2)



Note: (5) Strongly Agree, (4) Agree, (3) Neutral, (2) Disagree, (1) Strongly Disagree.

Figure 2. URS201 module evaluation scores: “What aspects of this lecturer’s approach to teaching best helped your learning?” Years 2-3 (S2)

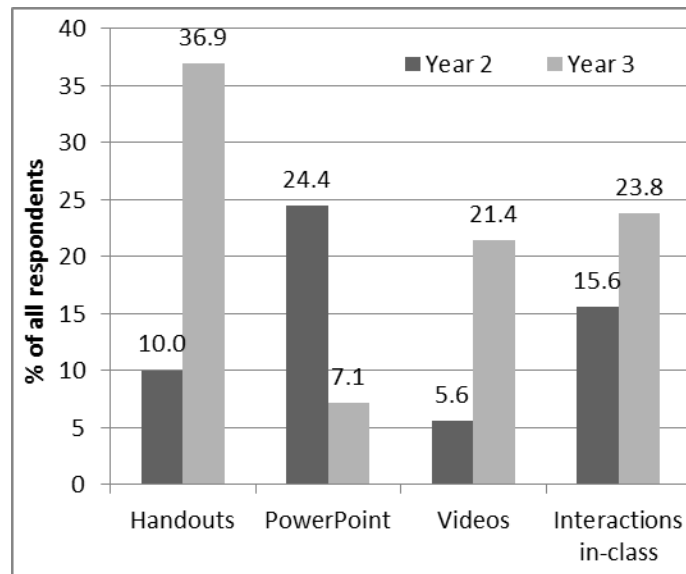
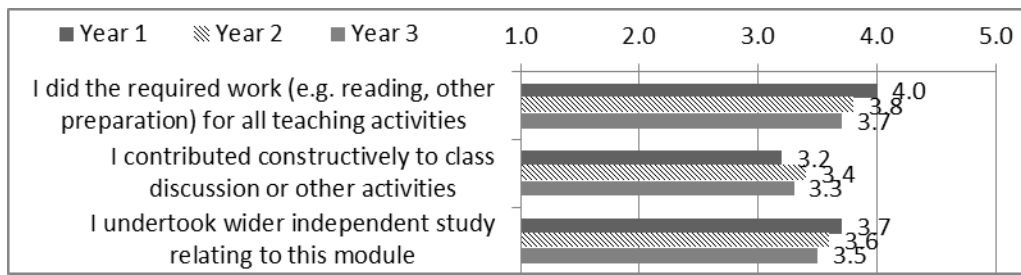
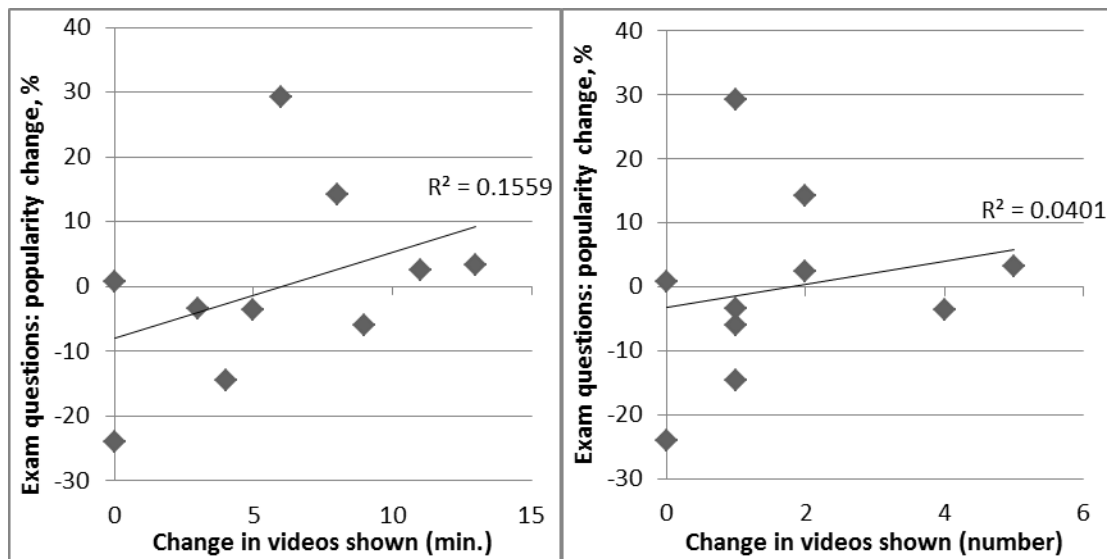


Figure 3. URS201 module evaluation scores: student engagement, Years 1-3 (S2)

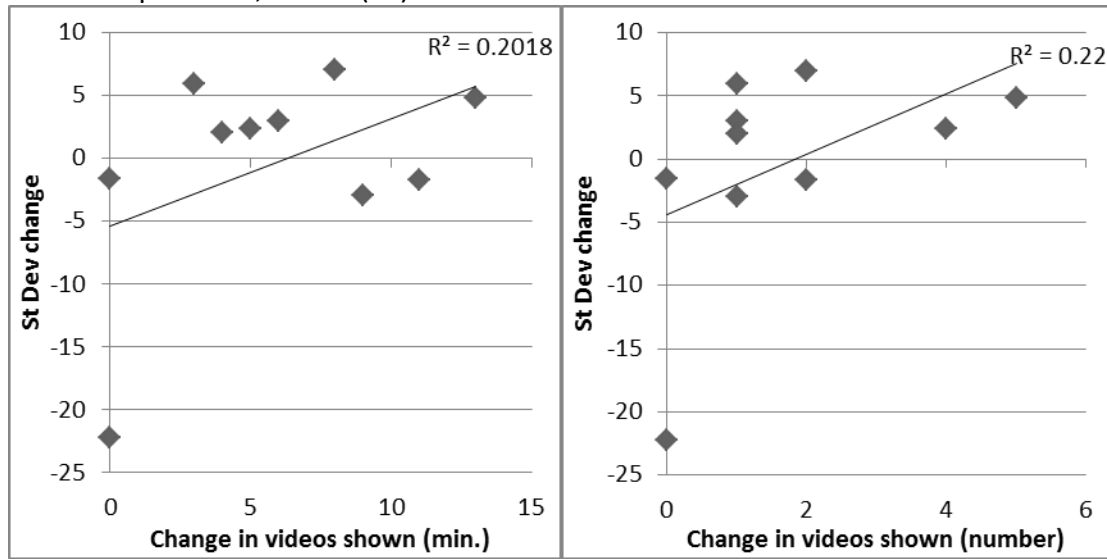


Note: (5) Strongly Agree, (4) Agree, (3) Neutral, (2) Disagree, (1) Strongly Disagree.

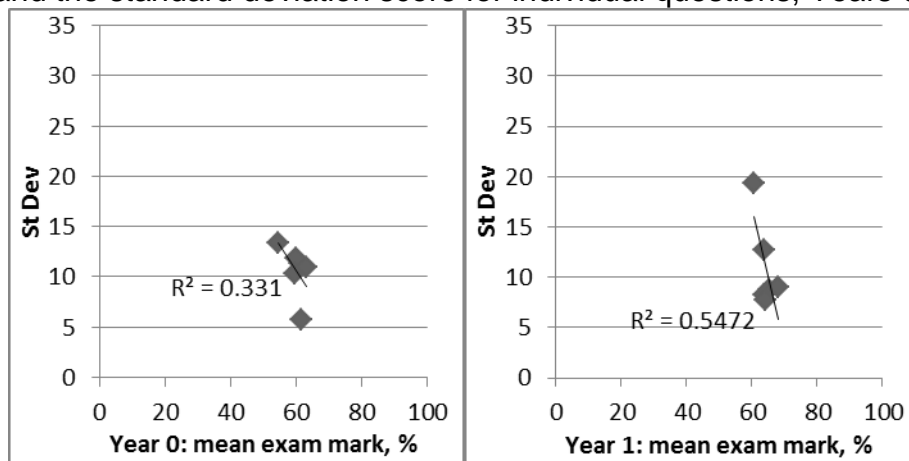
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Figures 6(c) - 6(d). The correlation between the mean examination mark per question and the standard deviation score for individual questions, Years 2-3 (S2)

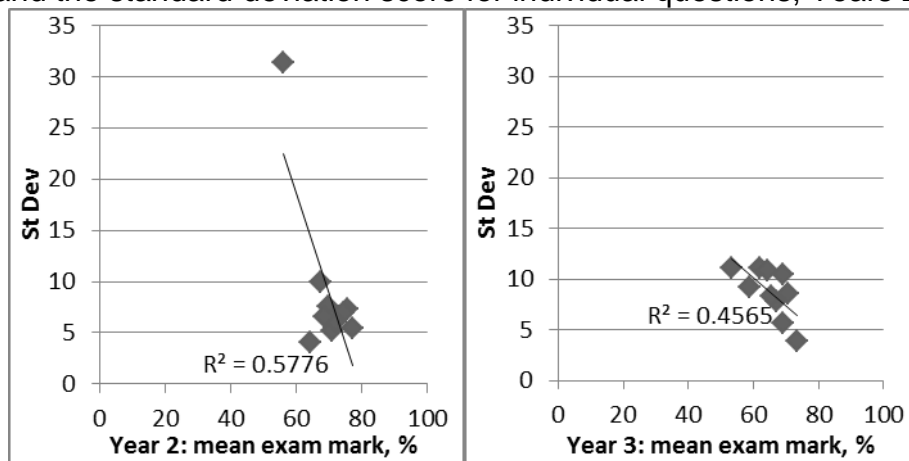
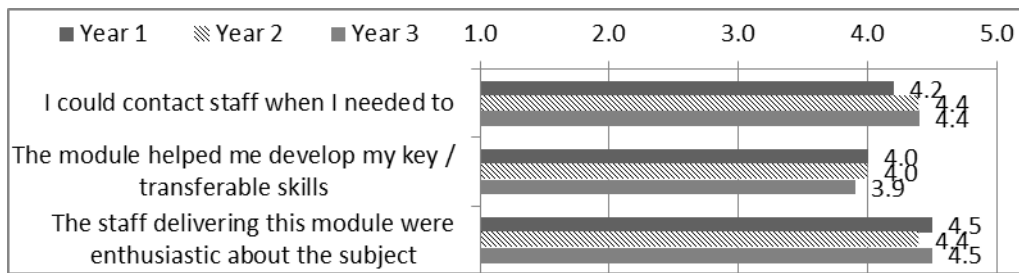
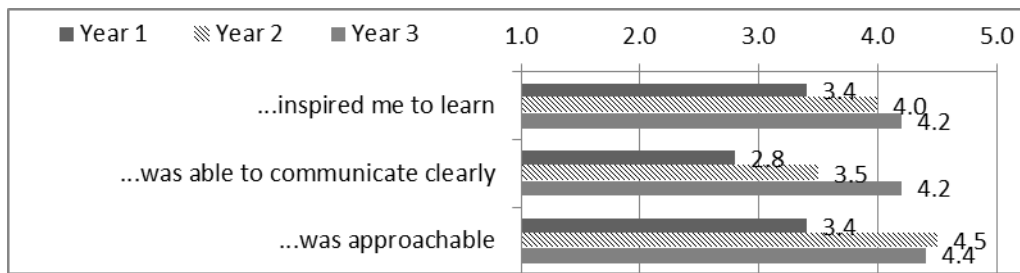


Figure 7. URS201 module evaluation scores: module specific questions, Years 1-3 (S2)



Note: (5) Strongly Agree, (4) Agree, (3) Neutral, (2) Disagree, (1) Strongly Disagree.

Figure 8. URS201 module evaluation scores: lecturer focussed questions, Years 1-3 (S2)



Note: (5) Strongly Agree, (4) Agree, (3) Neutral, (2) Disagree, (1) Strongly Disagree.

Figure 9. URS201 aggregate module evaluation scores, Years 0-3 (S2)

