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Technology Enhanced Learning in higher education; motivations, engagement and academic achievement

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Abstract

Technology Enhanced Learning (TEL) has become a common feature of Higher Education. However, research has been hindered by a lack of differentiation between usage and engagement and not recognising the heterogeneity of TEL applications. The current study aimed to assess the impact of emotional, cognitive and behavioural engagement with TEL on students' grades and to also look at how motivation levels differentially predict engagement across different types of TEL. In a sample of 524 undergraduate students, we measured engagement and usage of TEL, student learning motivations and self-report student grades. Our results indicate that intrinsic motivations predict engagement, whilst extrinsic motivations predict usage. Importantly, engagement was predictive of grades whereas usage was not. Furthermore, when TEL was broken down by type, the use of social media groups was a significant predictor of grade, whereas reviewing lecture slides/recordings, reading additional content and using course blogs/discussion boards were not. We conclude that a sole focus on usage of TEL is misleading. Implications for researchers and educators are discussed.

Introduction

Over the last decade, the use of Technology Enhanced Learning (TEL) has increased exponentially in Universities across the UK, partly due to Government incentives and also to meet students' expectations (UCISA, 2016). TEL can be considered as any form of e-learning and can be used to refer to technology enhanced classrooms and learning with technology (HEA, 2019). Alongside this, an emerging literature has begun to discuss the pedagogical value of TEL (Kirkwood & Price, 2014). At least conceptually, there are clear reasons to believe that TEL confers some pedagogical benefits (Beetham & Sharpe, 2013). For example, researchers have argued that TEL can allow students to explore educational content both in line with their own interests and at their own pace (De Jong & Van Joolingen, 1998), that TEL can place the students themselves in charge of their learning, rather than learning being purely teacher led (Saye & Brush, 2007), and even that TEL can be used as a means of closing the attainment gap in education (Becker et al., 2017). In terms of whether TEL promotes better learning outcomes, researchers have often conflated positive student appraisals with academic benefits (Heflin, Shewmaker, & Nguyen, 2017; Henderson, Selwyn, Finger, & Aston, 2015). The literature explicitly focusing on whether TEL confers academic advantages appears to be mixed, with some studies showing evidence of gains (e.g., Fonseca, Martí, Redondo, Navarro, & Sánchez, 2014) and others showing evidence of negative outcomes (e.g., Jacobsen & Forste, 2011). Rather than reflecting some fundamental issue about TEL, we argue here that this better reflects several issues within the literature. These issues, which the current paper aims to address include (i) the operationalising of engagement with TEL, (ii) disentangling the effects of motivation from those of TEL usage, and (iii) recognising and accounting for the heterogeneity of TEL itself.

A common feature of previous studies has been a focus on whether and/or how long for such technologies are being used. Frequently, this is measured in terms of usage of TEL, in terms of number of times students access materials, click on a hyperlink, or spend time on web pages/apps (e.g., Fikes, Arcuria, Morgan, & Pugliese, 2018). However, research has shown that such indicators are best conceptualised as behavioural engagement; arguably this reflects only one component of engagement, which is understood as comprising three separate, but related components, emotional, cognitive and behavioural (Fredricks, Blumenfeld, & Paris, 2004).

The role of behavioural engagement as a component of engagement more generally has a long history in the educational literature (e.g., Wu & Huang, 2007). In the 1980s and 1990s, engagement in education was defined narrowly, in terms of "time and effort" (Radloff, 2010), which was viewed purely mechanistically and was captured via the amount of time spent in the classroom, looking at the front of the class and frequency of attendance (Capie & Tobin, 1981). More recently, this has come to be accepted as

insufficient (Kahu, 2013). The current prevalent view is that such behavioural activities comprise only one component of learning engagement, alongside cognitive and emotional components. Put simply, the cognitive component refers to the extent to which students feel challenged by the content and emotional engagement refers to the amount that the student is invested in what they are learning about and their positive emotions towards the subject(s) (Fredericks, Blumenfeld, & Paris, 2004). This model of engagement has been validated extensively and has been found to reliably predict academic achievement in the wider academic literature (e.g., Wang & Eccles, 2012). Despite this, most research has focused on usage of TEL (e.g., data on number of unique visits and length of time spent logged in), rather than engagement more generally (Becker et al., 2017). Consequently, whilst usage can sometimes be referred to as engagement, such a definition is at odds with modern educational literature (Kahu, 2013). Measuring engagement with TEL is made more problematic due to there currently being no existing studies which look at engagement with TEL specifically. To address this gap, Havens (2014) published a list of questions, based upon the conceptual work of Fredricks et al (2004) which focus on behavioural, emotional and cognitive engagement. These questions were published with the aim of helping researchers investigate engagement in the context of TEL, but this scale has so far not been operationalised in the literature. The current study expands upon this by utilising these items to empirically assess students' engagment with TEL.

Research suggests that TEL in the UK is, for the most part, considered to be a vessel for “additional learning”. In other words, TEL is placed alongside traditional lectures and seminars and functions to compliment “core” learning. Consequently, students are free to choose to engage, or not. Research shows that students tend to hold positive views towards TEL (Kennedy & Dunn, 2018; Pechenkina & Aeschliman, 2017) and expect to see it as part of their studies (Margaryan, Littlejohn, & Vojt, 2011). Despite this, research has shown that when students are afforded greater agency over their learning via TEL, they invest less in the task and can perform worse as a consequence (e.g., Flowerday & Schraw, 2003; Heflin et al., 2017). More generally, a pattern of lower than expected usage has been observed across the higher education sector (UCISA, 2016).

In the education literature more broadly, research has consistently shown that engagement arises from student's motivation (e.g., Glynn, Brickman, Armstrong, & Taasoobshirazi, 2011; Tseng & Tsai, 2010). Lin, Liu, and Yuan (2001) found that when carrying out online activities, students learn effectively only when they are highly motivated. Early research looking at TEL usage suggests that those who are intrinsically motivated may also be more driven to seek out opportunities to explore their interests, possibly in the form of TEL (Oudeyer, Gottlieb, & Lopes, 2016; Sharples, Arnedillo-Sánchez, Milrad, & Vavoula, 2009, pp. 233–249) and that students who use more technology tend to have higher motivation levels (Trimmel & Bachmann, 2004). Tseng

and Tsai (2010) showed that intrinsic motivation and self-efficacy to be highly related when engaging with online tasks, in that students who tended to engage were intrinsically motivated to do so and demonstrated high levels of self efficacy. They argue that that self-efficacy is central for enhancing intrinsic motivations to engage in an online learning environment. In line with this, there is an emerging literature which aims to explore ways in which TEL can be designed to appeal to users' intrinsic motivations, in order to further *engage* students with TEL itself (Hamid, 2002; Nacke & Deterding, 2017). Given these previous studies' designs, it has been difficult to disentangle the individual effects of motivation and TEL on academic attainment. One of few studies that has addressed this is Huang, Su, Yang, and Liou (2017), who showed that when implementing a specific TEL-based learning technique, learning achievement improved but not learning motivation. One mediating factor between learning achievement and learning motivation may have been engagement. Thus, it is important to investigate the interrelation between learning motivations, TEL engagement and learning achievement.

Another area in need of attention is the manner with which TEL itself is defined and measured in educational research. A closer inspection of the literature reveals that much of the apparent ambiguity of findings is explained by the heterogeneity of TEL. For instance, Fonesca et al (2014) focused on the application of augmented reality in architecture projects and found it to be useful, Jacobsen and Forste (2011) looked at electronic messaging and noted it to be a distraction to learning, Huang et al. (2017) showed that the use of digital pen learning systems (DPLS) can improve learning achievement. Other studies have conflated various forms of TEL, thus making it difficult to know which of the very different technologies may be driving any effects (e.g., Chowdhry, Sieler, & Alwis, 2014). Consequently, the specialised forms of TEL that have typically been studied (e.g., AR, DPLS etc.), arguably do not reflect the common means with which TEL is currently utilised in higher education institutions and only capture specialised evaluation of TEL applications. A recent review suggests that UK institutions overwhelmingly tend to deliver TEL via the medium of VLEs (Virtual Learning Environments; UCISA, 2016). Thus, the majority of UK institutions rely on forms of TEL such as online lecture slides and recordings, additional content posted online (e.g., research articles, links to other sources), course blogs, course-specific discussion forums, and student-created social media groups (SMG). The core issue with extrapolating findings into practice is that when actually delivered, TEL comprises a wide range of separate technologies, ranging from repositories of lecture slides/recordings, to more recent advancements such as gamification and augmented reality (Becker et al., 2017, pp. 1–60). The most commonly employed VLE-style of TEL make up a range of individual technologies and the current study focused on the most frequently delivered forms. In contrast, uptake of augmented reality and gamification approaches seem to be measured. Consequently, there is a clear need to assess (a) individual contributions of

specific components of most commonly employed TEL and (b) engagement with TEL as a whole.

The purpose of the current study was to compare the relative predictive power of usage of, and engagement with, TEL on academic achievement, in the context of students' motivation levels. Research focused on academic attainment have operationalised this in a number of ways, such as completion rates, but most commonly, student grades (e.g., Boticki, Baksa, Seow, & Looi, 2015). As previously mentioned, there is currently no specific measure of engagement with TEL. However, Havens (2014) provided a series of questions for researchers to investigate the topic. From these items, we selected the questions relevant to cognitive, emotional and behavioural engagement for use in the current study. Furthermore, we aim to investigate what motivational factors predict engagement with TEL and what specific forms of commonly available TEL were associated with academic achievement. Hence, our initial aim was to validate our engagement with TEL scale, which drew upon items provided by Havens (2014), via assessing its internal consistency and model fit, using Exploratory and Confirmatory Factor Analysis, in line with established guidelines (e.g., Cabrera-Nguyen, 2010).

Following this, we aimed to address our core hypothesis, which was:
Does engagement, based on three components of general learning engagement (Emotional, Cognitive, Behavioural) predict student grades, over and above usage?

We also had the following research questions:

1. What types of learning motivation lead to *engagement* with TEL?
2. What types of learning motivation lead to *usage* of TEL?
3. What specific types of commonly used TEL predict academic performance?

Section snippets

Participants

Data were collected during the 2016 academic year from a large U.K. Higher Education institution with an undergraduate cohort of 16,150. The study was advertised via an internal intranet to psychology students received course credits for their participation. Consequently, all respondents were undertaking psychology or psychology-related courses at undergraduate level. The resulting self-selected sample of students comprised a total of 524 participants. The mean age of respondents was 19.83…

A measurement of TEL engagement (TES)

To address the first objective of this research, a scale for measuring TEL engagement was constructed and assessed for its psychometric properties. After selecting relevant items from Haven's conceptualisation of TEL engagement and the consensus of what comprises learning engagement more generally, a seven-item scale was developed (see Table 1 for the scale items).

Three items were included to represent emotional engagement, three items cognitive engagement, and one item behavioural engagement.…

Discussion

The current study makes three important contributions to the literature. Our findings suggest that engagement with TEL when defined as comprising emotional, cognitive and behavioural components confers a direct benefit to educational attainment. Critically, in contrast there was no association between TEL behavioural engagement (i.e, usage) alone and academic achievement. This finding is line with the education literature more generally (e.g., Fredericks et al., 2004) which show that engagement …

Conclusions

Consistent with educational literature on academic engagement more generally, behavioural engagement with TEL should be considered alongside emotional and cognitive engagement, rather than in isolation. Consequently, whilst data on frequency of use and duration of time spent logged into a VLE or accessing certain materials may be readily generated by software, such data is likely to be a poor predictor of academic attainment. Whilst TEL is highly valued by students and institutions are eager to …

Research data for this article

Data not available / Data will be made available on request

Further information on research data ↗

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