An Exploration of a Situated Learning Approach to Increasing Instructors' Technology Self-Efficacy in the Use of Active Learning Tools Within Virtual Learning Environments

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Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work and has not been submitted as an exercise for a degree at this or any other university.

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Abstract

Virtual learning environments (VLEs) include tools such as blogs which allow students to engage in active learning. Despite these affordances, many instructors primarily use VLEs to transmit reading materials (Malikowski, Thompson, & Theis, 2007, p. 152). Professional development interventions such as workshops attempt to address this issue but are often ineffective at increasing the extent of technology use by instructors (Lawless & Pellegrino, 2007, p. 594).

The purpose of this case study therefore is to explore how a situated learning approach to professional development may be effective at increasing instructors' technology self-efficacy (TSE) in the use of active learning tools within VLEs.

The main argument of this paper is that self-efficacy is an important mediator in terms of the extent of technology use (Rienties, Giesbers, Lygo-Baker, Ma, & Rees, 2016, p. 550). Workshops are often ineffective at increasing TSE as they do not give sufficient opportunities for practice. Situated learning theory may address this problem as it emphasises the importance of practicing within an authentic social context.

The research method involved designing an artefact under the principles of situated learning which allows instructors to practice using a VLE's active learning tools via an interactive online scenario. 28 participants were recruited in Trinity College Dublin to engage with the artefact over a two week period. A technology self-efficacy scale, survey and individual interviews were used to explore the intervention's effect on participants' technology self-efficacy in the use of active learning tools within a VLE.

The research findings indicated that the ability to repeat and return to tasks within the artefact provided multiple opportunities for authentic practice which was cited as a positive by participants in terms of increasing their TSE. However, some participants had difficulties applying the concepts in the artefact to their specific teaching context. The small sample size and short timeframe of the research limits the case study's generalizability. Despite these limitations, the case study contributes to research on how professional development interventions which emphasise authentic practice and the context in which instructors make use of technology may be more effective than standard workshops.

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Initialisms Used

CPD: Continuous professional development

TSE: Technology self-efficacy

VLE: Virtual learning environment

Chapter 1: Introduction

1.1 Background and Context

The benefits for students of actively participating in the learning process – particularly in terms of developing critical thinking skills – have been documented extensively in the literature over the past three decades (Norton, Richardson, Hartley, Newstead, & Mayes, 2005, p. 124; Postareff, Lindblom-Ylänne, & Nevgi, 2007, p. 559; Prosser & Trigwell, 1999; Rienties, Brouwer, & Lygo-Baker, 2013). In the same time span, technological advances have created online environments that can support active learning through tools such as discussion boards, blogs, wikis and virtual classrooms. Despite this apparent pedagogical and technological alignment, educational technologies are often primarily used as a means of delivering content which limits the potential of students to engage in technology-mediated active learning (Kinchin, 2012, p. 43; Watling, 2009, pp. 86-87).

1.2 Technology Self-Efficacy

A large body of literature has explored the different factors affecting technology use by instructors in educational institutions. Of the many different individual and structural factors, technology self-efficacy (TSE) is important to examine given its role as a mediator in terms of the extent of technology use (Holden & Rada, 2011). Self-efficacy refers to an individual's perception of their ability to execute a behaviour or task and to overcome obstacles (Bandura, 2012, p. 14). Professional development is one of the key means by which institutions can influence instructors' TSE and thus the extent of their technology use.

1.3 Continuous Professional Development

However, research indicates that typical continuous professional development (CPD) interventions such as workshops are often not effective at increasing technology use (see Schneckenberg, 2009, p. 413). Fundamentally, the issue is that workshops are frequently delivered under an instructivist approach which focuses on informing participants about the different features of an application which assumes that participants can apply these concepts to their teaching context (Girvan, Conneely, & Tangney, 2016, p. 130). However, such interventions lack opportunities for authentic practice and often do not lead to a change in how instructors use technology (Bell, Maeng, & Binns, 2013). There is therefore a need for research into how CPD can be enhanced through interventions designed under different theoretical perspectives in order to increase instructors' TSE.

1.4 A Situated Learning Approach

Situated learning has significant potential as a theory under which to design professional development interventions. As Barab and Duffy note, a situated learning perspective is one in which '…practice is not conceived of as independent of learning and in which meaning is not conceived of as separate from the practices and contexts in which it was negotiated' (2000, p. 3). This approach may be of benefit in terms of developing CPD to increase instructors' TSE as it places a greater emphasis on practicing within an authentic context than instructivism.

1.5 Virtual Learning Environments in Higher Education

In terms of specific technologies used by instructors, virtual learning environments (VLEs) such as Blackboard Learn and Moodle are important to research given their role as one of the predominant technologies used in higher education institutions (see N. Park, Lee,

& Cheong, 2007). VLE use by instructors can be viewed as being on a continuum with delivery of content at one end and active learning approaches at the other (De Smet, Bourgonjon, De Wever, Schellens, & Valcke, 2012; Malikowski et al., 2007, p. 690). Research argues that instructors need professional development so that they can move along this continuum from content delivery to using active learning tools for teaching (see Guasch, Alvarez, & Espasa, 2010).

1.6 Purpose of this Research

Based on these factors, the purpose of this research is to explore how a situated learning approach to professional development may be effective in increasing instructors' technology self-efficacy in the use of active learning tools within virtual learning environments. As part of this, the research seeks to explore the following questions:

1. How can an artefact designed under the principles of situated learning be used to increase instructors' technology self-efficacy in the use of active learning tools within a VLE?
2. What are the advantages and disadvantages of this approach?
3. What are participants' perceptions of the remaining barriers to adopting active learning tools?

1.7 Research Methodology

In order to meet the research's requirements, an exploratory case study was implemented. This involved creating an artefact designed under the principles of situated learning which allows instructors to practice implementing a VLE's active learning tools within an interactive, browser-based scenario which provides multiple opportunities for authentic practice. Participants engaged with the artefact over a two week period while a

TSE scale, survey and individual interviews were used to explore participants' perceptions of the effect of the artefact and their professional context.

1.8 Chapter Overview

- The literature review analyses the importance and role of TSE, identifies issues with VLE use in higher education and evaluates problems with current CPD interventions. The chapter concludes by appraising why situated learning theory may be of benefit in terms of increasing instructors' TSE in the use of active learning tools within a VLE.
- The design chapter synthesises the elements of situated learning into a design table which is used as the basis for constructing a situated learning artefact. The chapter then provides a walkthrough of the artefact which highlights how the principles of situated learning were incorporated into the artefact.
- The methodology chapter describes the design of the exploratory case study in terms of its epistemology, methods and implementation.
- The findings & analysis chapter describes the data set and process of data analysis before presenting the research findings.
- The conclusion details the research's limitations and provides an overview of possibilities for future research.

Chapter 2: Literature Review

2.1 Introduction

The acceptance and adoption of educational technologies has the potential to transform teaching and learning in higher education (Schneckenberg, 2009, p. 412). Institutions have attempted to facilitate this transformation through the provision of technologies such as virtual learning environments (VLEs) (Jackson & Fearon, 2014, p. 245). However, due to various individual and structural factors, VLEs are typically used to transmit materials thus limiting opportunities for students to engage in technology-mediated active learning activities, the benefits of which have been well-documented in the literature (Baepler, Walker, & Driessen, 2014, p. 227; Deslauriers, Schelew, & Wieman, 2011). Research indicates that current continuous professional development (CPD) interventions are not effective at increasing the extent of technology use by instructors and that there is a need for research into new approaches (Alvarez, Guasch, & Espasa, 2009, pp. 321-323; Kopcha, 2010, p. 176; Stes, De Maeyer, Gijbels, & Van Petegem, 2012).

2.2 Literature Review Roadmap

The purpose of this literature review therefore is to identify key concepts in the area of technology acceptance such as the Technology Acceptance Model before examining the role of technology self-efficacy (TSE) within this model, problems with current professional development interventions and how these problems impact the extent of VLE use by instructors. This literature review is organised on a conceptual basis with a focus on theories and their applications with the goal of identifying central issues from the literature (see Cooper, 1988, p. 109). This process will result in a discussion of why a CPD intervention designed under the principles of situated learning may be an effective means of increasing instructors' TSE in the use of active learning tools within VLEs.

2.3 Literature Review Method

The literature review method involved searching Google Scholar, Web of Science, ACM Digital Library, Scopus and IEEE Explore for terms such as ‘technology acceptance’, ‘technology self-efficacy’, ‘technology professional development’, ‘virtual learning environments’ and related synonyms. The scope of the initial search was limited to literature published in the past five years from sources listed as peer reviewed in Ulrich’s Periodicals Directory. The scope and criteria for inclusion were then expanded to include key papers, books and seminal works which were referenced in the initial sources.

2.4 Technology Acceptance

Research has explored the individual and structural factors that promote or inhibit the extent of technology use by instructors. Two key factors are apparent from the literature: technology acceptance and the nature of professional development (Bell et al., 2013, p. 350; Rienties et al., 2016, p. 540). Several models have been proposed to account for the variance in the extent of technology acceptance among individuals. Of these models, the Technology Acceptance Model (Davis, 1989) and Unified Theory of Acceptance and Use of Technology (Venkatesh, Morris, Davis, & Davis, 2003) are the two most frequently cited in the literature. This research uses the Technology Acceptance Model as it is one of the most commonly used theories in the literature on technology acceptance (Šumak, Heričko, & Pušnik, 2011, p. 2068) and extended versions of the model have been used to examine the adoption of educational technologies such as VLEs (see De Smet et al., 2012, p. 689).

2.4.1 The Technology Acceptance Model

The Technology Acceptance Model is comprised of six components – external variables, perceived ease of use, perceived usefulness, attitude towards using, behavioural intention to use and actual system use – which provide a conceptual understanding of how an individual's perceptions, behaviours and attitudes towards a technology influence whether they actually use it (see figure 1). In a higher education context, the Technology Acceptance Model allows for an understanding of how external variables – such as technical support, self-efficacy and facilitating conditions – impact an instructor's perceptions of a technology's usefulness and ease of use. These elements in turn affect the instructor's attitude towards the technology, their intention to use the technology and ultimately whether they actually use the technology for teaching (Ngai, Poon, & Chan, 2007; Sánchez & Hueros, 2010).

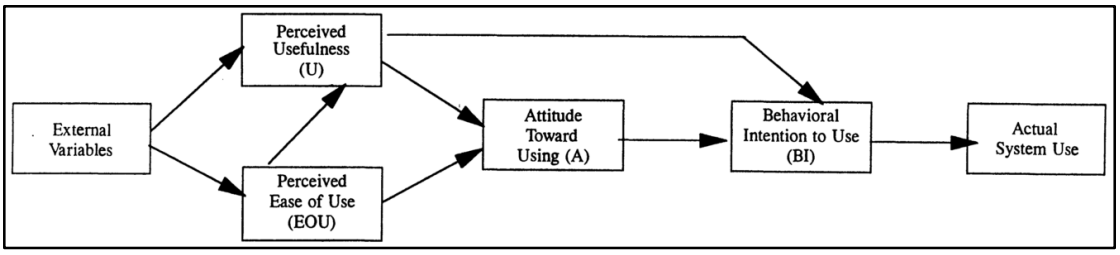


Figure 1. Technology Acceptance Model (diagram from Szajna, 1996)

2.4.2 Role of External Variables

The role of external variables – sometimes referred to as prior factors in the literature – on the technology acceptance of instructors has been the focus of much research in recent years (see meta-analysis in Šumak et al., 2011). External variables refer to the contextual, structural and individual variables that can inhibit or promote technology acceptance (Buchanan, Sainter, & Saunders, 2013; Holden & Rada, 2011, p. 349). The

impact of these external variables on the Technology Acceptance Model is summarised by Šumak in figure 2 below.

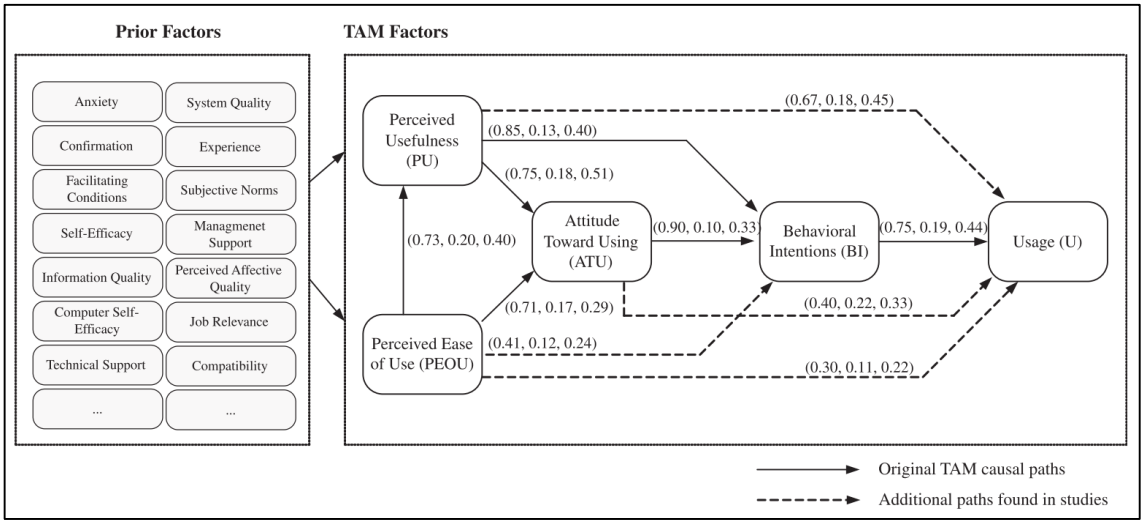


Figure 2. Summary of causal links among TAM-related constructs (Šumak 2011).

2.5 Importance of Self-Efficacy

Of these external variables, this research focuses on self-efficacy as there is a strong relationship between an instructor's self-efficacy regarding the use of a technology and the extent to which they use it for teaching (Holden & Rada, 2011; Hu, Clark, & Ma, 2003, p. 237; Rienties et al., 2016, p. 550). Self-efficacy is a psychological perception of one's ability to execute a particular task or behaviour (Bandura, 1997). Bandura notes that self-efficacy is distinct from the term confidence as self-efficacy is a theoretical construct by which perceived capability and level of belief can be measured and explored. Conversely, confidence is a colloquial term 'that refers to strength of belief but does not necessarily specify what the certainty is about [for example] I can be supremely confident that I will fail at an endeavour' (Bandura, 1997, p. 382). Research underlines the importance of self-efficacy in regulating the goals individuals set for themselves and on behaviour (Bandura, 2012, p. 14; Caprara, Vecchione, Alessandri, Gerbino, & Barbaranelli, 2011, p. 91).

2.5.1 Analysis of Self-Efficacy Theoretical Perspectives

There are four theoretical perspectives which attempt to explain how self-efficacy is developed: big five theory, trait self-efficacy, control theory and social cognitive theory (Bandura, 2012). Of these perspectives, social cognitive theory is the most appropriate in an educational context. The first theory, big five trait theory (McCrae & Costa, 1996) is composed of five behavioural groups: agreeableness, conscientiousness, openness to experience, emotional stability and extraversion. This model focuses too much on personal factors without due reference to context (Bandura, 2012, p. 34) which conflicts with research highlighting the complex interplay of individual and structural factors in educational settings (see Hamilton, Rosenberg, & Akcaoglu, 2016). Similarly, under trait self-efficacy theory (see Yeo & Neal, 2006) individuals hold a generalised belief about their abilities (Bandura, 2012) which is too simplistic in an educational context as instructors may have a high self-efficacy in terms of their subject matter but not towards using technology. The third perspective, control theory (Powers, 1973) suggests that individuals compare the inputs and outputs of an experience in order to make decisions (Bandura, 2012, p. 18) which also does not give sufficient space to explore the impact of context. These factors limit the suitability of these three theories in an educational setting.

Conversely, social cognitive theory views self-efficacy as socially situated, highly contextualised and variable across situations rather than as a general trait (Bandura, 1986, 1997, 2012). This is the most appropriate perspective in the context of technology acceptance by instructors for two key reasons. Firstly, there is a high degree of theoretical alignment between this theory and the Technology Acceptance Model as social cognitive theory was used in the formulation of the Technology Acceptance Model (see Pynoo et al.,

2011, p. 569). Secondly, this perspective is aligned closely with social constructivism and suggests that an individual's actions are based on an interplay of environmental, personal and behavioural factors (Bandura, 1986; Fletcher, 2005, p. 308). For these reasons, social cognitive theory is a particularly valuable construct when examining the effect of an instructor's context and support structures – such as professional development – on their technology self-efficacy.

2.6 Analysis of Technology Self-Efficacy Constructs

There are several self-efficacy constructs that can be used to understand technology acceptance such as internet self-efficacy, computer-self efficacy, eLearning self-efficacy, and technology self-efficacy. Internet self-efficacy refers to an individual's perceptions regarding their capability to use the internet to complete tasks (Joo, Bong, & Choi, 2000, p. 9). The eLearning self-efficacy construct refers to an individual's perceptions of their capability to use an online learning environment (see S. Y. Park, 2009). Computer self-efficacy measures an individual's perceptions of their ability to use a computer system (Venkatesh & Davis, 1996, p. 452). Finally, technology self-efficacy is similar to computer self-efficacy but focuses on the specific technology under investigation rather than general computer use (Holden & Rada, 2011, p. 359). Of these, technology self-efficacy is the most appropriate in the context of research into technology use by instructors as it allows for a flexible perspective that can focus on the unique characteristics of a specific technology. Conversely, constructs such as internet or computer self-efficacy are too narrowly focused on aspects such as web browsers and operating systems. Research also indicates that TSE has a greater influence on technology acceptance than constructs such as computer self-efficacy (Holden & Rada, 2011; Shank & Cotten, 2014, p. 190).

2.7 Increasing Technology Self-Efficacy

Under a social cognitive perspective, there are four ways to increase an individual's self-efficacy: through mastery experiences, social modelling, social persuasion, and reducing anxiety and depression (see Bandura, 2012, p. 13). These elements are summarised and defined in table 1 below. A large body of research has found these constructs to be reliable and they have been used in many different domains from academic attainment (for example Schunk, 2003; Zimmerman, 2000), physical activity (for example Ayotte, Margrett, & Hicks-Patrick, 2010) and technology use (for example Huffman, Whetten, & Huffman, 2013; Laver, George, Ratcliffe, & Crotty, 2012). This research focuses on increasing technology self-efficacy and thus table 1 provides a framework in terms of the requirements needed to increase instructors' TSE towards a particular technology.

Increasing Self-Efficacy Requirement	**Definition**
1. Mastery Experiences	Obstacles to overcome which require continued effort
2. Social Modelling	Seeing peers in similar roles to oneself succeed through effort
3. Social Persuasion	Persuading an individual of their abilities through self-improvement rather than competition with peers
4. Reducing Anxiety and Depression*	Building resilience and correcting perceptions about one's affective state
* This research focuses on reducing anxiety which is more appropriate in the context of technology acceptance than focusing on the affective state of depression.	

Table 1. Requirements for increasing self-efficacy (based on Bandura 2012)

2.8 Virtual Learning Environments in Higher Education

Of the many different technologies used by instructors in higher education, virtual learning environments (VLEs) are important to examine as they occupy a central position in the technological infrastructure of many institutions. VLEs such as Blackboard Learn and Moodle allow instructors to upload course materials – such as lecture notes – and also afford the implementation of activities using tools such as blogs, discussion boards, wikis

and journals. However, a body of recent research indicates that these affordances are not utilised and that VLEs are predominantly used as repositories for reading materials (see for example Browne, Jenkins, & Walker, 2006; Jenkins, Browne, Walker, & Hewitt, 2011; Rienties et al., 2016).

The extent of VLE use has been conceptualised by researchers such as Hamuy and Galaz (2010) as a range between informational and communicational levels – see table 2 below. Informational use typically includes uploading course materials while the communicational level involves using tools such as blogs, journals and virtual classrooms which can facilitate active learning. Active learning is defined as 'any instructional method that engages students in the learning process… [requiring] students to do meaningful learning activities and [to] think about what they are doing' (Bonwell & Eison, 1991; Prince, 2004, p. 223). This research uses the term active learning tools as a shorthand to describe technologies within a VLE that support students in interacting with each other and their instructor to construct knowledge and meaning, share ideas, reflect on experiences and engage in peer learning (see Dori & Belcher, 2005, pp. 246-248; Ruckert et al., 2014, p. 3). Using a VLE to transmit material is often a precursor to instructors incorporating more active learning tools (De Smet et al., 2012) but there are several barriers such as low TSE that can inhibit the extent of VLE use.

Level of VLE Use	**Use Case**	**Examples of VLE Tools Used**
Informational Level	Delivery of lecture and reading materials, adding links to websites and journal articles, posting announcements relating to class activities, examinations etc.	File upload, web links, announcements
Communicational Level	Using the VLE to engage students in active learning which supports asynchronous and synchronous social interactions	Blogs, discussion boards, reflective journals, webinars, wikis

Table 2. Instructors' VLE usage levels (based on Hamuy 2010)

2.8.1 Barriers to Increasing VLE Use

Jackson's (2014) meta-analysis categorises barriers to increasing VLE use (see figure 3). Barriers include individual factors such as instructors not possessing the necessary skills (Bhati, Mercer, Rankin, & Thomas, 2009) and more structural factors such as technical reliability (Virkus et al., 2009), poor management including cultural and political issues (Jackson, 2011) and issues of professional development (Sinayigaye, 2010). This paper focuses on the individual barrier of low technology self-efficacy given the role of TSE in mediating the extent of technology use. In order to address this barrier and increase instructors' TSE, institutions need to provide effective continuous professional development (CPD).

Barrier	*Challenge*
Teacher-centred	Not possessing the necessary technological skills/knowledge
	Time/workload constraints
	Lack of interest
	Concerns that technology undermines the quality of teaching
Technical-related	Interoperability issues
	Reliability of technology
	Problems with systems access—authentication, firewall and security issues
Student-related	Lack of personal interaction with the tutor
	Information overload
Institutional	Lack of funding/resource constraints
	Culture and political issues—interdepartmental rivalry, competition, territoriality, resistance to change
Managerial	Poor change management
	Lack of user involvement/communication
	Unplanned/uncoordinated implementation strategies by management and policy makers
	Issues of training

Figure 3. Barriers to VLE adoption (Jackson, 2014).

2.8.2 CPD Interventions

Research has long recognised the role of CPD in increasing an individual's TSE (see for example Compeau, Higgins, & Huff, 1999, p. 155). However, the problem is that current CPD interventions are often not effective at increasing the extent of technology use by instructors in higher education (see Rienties et al., 2013; Schneckenberg, 2009). CPD is often delivered under an instructivist approach focused on the transmission of information through workshops and manuals. This approach has been criticised in the literature for perpetuating 'out-dated forms of professional development' (Girvan et al., 2016, p. 130; Monahan, 1996) which are 'insufficient to foster learning which fundamentally alters what teachers teach or how they teach' (Boyle, While, & Boyle, 2004, p. 47; Girvan et al., 2016, p. 130; Guskey, 2002). A participant in Jackson's 2014 study encapsulates the issue with workshops: '[staff] were being sat down to be shown how to do [a task], to press that button to get that response, they did not see it as mind changing' (p. 254). This problem with CPD means that there is a need for research into new approaches that could potentially increase instructors' technology self-efficacy in the use of VLEs.

2.9 Potential of Situated Learning Interventions

There are many learning theories that could support the development of improved CPD to increase the technology self-efficacy of instructors in the use of VLEs. A theory which stands in opposition to instructivist approaches is situated learning (see Cobb & Bowers, 1999). The fundamental characteristic of situated learning is that it recognises the importance of practice and of locating learning in authentic contexts through activities where 'learning is an integral part of generative social practice in the lived-in world' (Barab & Duffy, 2000, p. 3; Bell et al., 2013; Brown, Collins, & Duguid, 1989; Lave & Wenger,

1991, p. 35). Situated learning frequently involves scenarios in which learners practice in a meaningful manner within particular, authentic social and professional contexts (Feng et al., 2013; Hwang & Wang, 2016, p. 189; Lave & Wenger, 1991; Mann, 2011; Onda, 2012; Scott, Asoko, Leach, Abell, & Lederman, 2007, p. 45). This situated learning perspective has a strong alignment with Bandura's social cognitive theory as both place an emphasis on the connection between context and personal factors.

Situated learning can be viewed under an anthropological perspective which focuses on communities and a psychological perspective which focuses on individual cognition (Barab & Duffy, 2000, p. 7). Cobb remarks that the situated perspective allows for a pragmatic choice in selecting the units of analysis depending on the purposes of the research (Cobb & Bowers, 1999, p. 6; Cobb & Yackel, 1996). As this research focuses on the individual variable of TSE, it will focus on the psychological perspective of situated learning which emphasises the link between individual learning and the wider social context. Under this perspective it is possible to criticise existing CPD approaches for not accounting for the fact that knowledge '... exists not as a separate entity in the mind of an individual, but ... is generated as an individual interacts with his or her environment (context) to achieve a goal' (Orgill, 2007, p. 187). Based on these elements, it is of value to investigate how situated learning might provide a framework for designing CPD interventions.

2.9.1 A Situated Learning Approach to Professional Development

Emerging out of the literature on situated learning are several instructional guidelines. McLellan suggests that the key elements of situated learning as a mode of instruction are narratives, reflection, cognitive apprenticeship, collaboration, coaching,

opportunities for multiple practice, articulation of learning skills (decomposing large tasks into smaller parts) and the use of technology – all of which are embedded in an authentic context (Bell et al., 2013, p. 351; McLellan, 1996, p. 2). Under this perspective, learning is developed through activity in which authentic practice constitutes learning and understanding (Barab & Duffy, 2000, p. 5). These elements provide a potential means by which instructors' TSE in the use of active learning tools within VLEs can be increased – see table 3 below. Fundamentally, this approach enables the creation of interventions which focus on authentic practice and this may in turn provide instructors with an increased TSE towards implementing active learning tools within a VLE. The implications of these elements in terms of the design of an intervention will be discussed in more detail in Chapter 3.

Individual Barriers to VLE Adoption	**Increasing Technology Self-Efficacy Requires**	**Principles of Situated Learning (based on McLellan 1996)**
Instructors do not possess the necessary technological skills/knowledge (Jackson 2014)	1. Mastery Experiences (obstacles to overcome)	Opportunities for multiple practice
Concerns around the benefit of using technology for teaching (Jackson 2014)	2. Social Modelling (seeing peers succeed through effort)	Collaboration and social practice Using narratives to frame the learning process
Lack of skills/knowledge (Jackson 2014)	3. Social Persuasion (persuading an individual of their abilities through self-improvement rather than competition)	Cognitive apprenticeship and coaching whereby instructors feel able to apply what was learnt during professional development to their teaching context
Instructors concerned about engaging with the technology (Jackson 2014)	4. Reducing Anxiety (building resilience)	Providing opportunities for reflection Articulation of learning skills which involves separating out large tasks into smaller components

Table 3. Alignment of issues in VLE adoption and TSE with situated learning

2.10 Conclusion

Recent literature recommends that researchers should evaluate the impact of external variables such as technology self-efficacy on the technology acceptance and usage behaviour of different groups (Holden & Rada, 2011, p. 363). The literature also recommends that researchers should evaluate the efficacy of aligning professional development of instructors with situated learning (Bell et al., 2013, pp. 374-375). This paper therefore seeks to leverage situated learning theory in order to design a professional development artefact which is described in the next chapter and then explore the effect of this approach on increasing instructors' technology self-efficacy in the use of active learnings tools within VLEs.

Chapter 3: Design

3.1 Introduction

This chapter describes the design of an artefact which will be used to explore how situated learning may be used to increase instructors' technology self-efficacy in the use of active learning tools within virtual learning environments. The chapter begins with the theoretical implications of situated learning followed by a design table summarising the elements of situated learning. The chapter concludes with a walkthrough of the artefact which highlights how these elements were implemented in the design.

3.2 Design Implications of Situated Learning

Situated learning theory emphasises the power of authentic practice within a realistic social context. Situated learning interventions can be delivered through in-person classroom-based activities (for example Bell et al., 2013) or through computer-mediated interventions. This research identified several applications of computer-mediated situated learning in a variety of circumstances such as earthquake preparation in schools (Chou et al., 2012), teaching trainee doctors using virtual patients (Feng et al., 2013) and using virtual worlds to teach students how to undertake accident investigations and risk assessments (Falconer, 2013). These different computer-mediated applications of situated learning involve creating interactive scenarios in which learners practice the different elements of a task within an artefact in order to gain knowledge which they can apply to real-world situations.

This research sought to create a similar artefact designed under the principles of situated learning which would task learners with implementing active learning tools such as blogs, journals and webinars through an interactive scenario which would run via a web

browser. The aim of the design process was to create an approximation of a VLE which would enable learners to practice the social and technical elements required to implement active learning tools. The intervention would contain characters and interactive elements framed by a narrative which would allow learners to practice in as authentic a manner as possible. The decision was taken to create a computer-mediated intervention as learners could engage with the artefact repeatedly at their own time and pace. This approach is in contrast to a workshop intervention as the artefact would allow for multiple opportunities for practice as learners could return to the artefact at any time. The intention is that by practicing the different elements of implementing a VLE's active learning tools within this artefact, participants would have an increased degree of technology self-efficacy in the use of these tools in the actual VLE.

A design table was created in order to clarify the elements required to create a computer-mediated situated learning artefact. Table 4 below details key points from the literature on situated learning and the design implications of these elements.

Situated Learning Literature Reference	Key Point	Design Implications	Mapping to Requirements for Increasing Self-Efficacy
(Barab & Duffy, 2000, p. 3; McLellan, 1996)	Learners should be provided with multiple opportunities to practice in an authentic manner	The artefact should allow instructors to practice and return to tasks over time	Mastery experiences
(McLellan, 1996)	Individuals learn more effectively when large tasks are decomposed/articulated into smaller components	There should be individual tasks to complete that build towards larger goals	Social persuasion; mastery experiences
(Collins, Brown, & Holum, 1991; Knobelsdorf, 2015, p. 15; McLellan, 1996)	Activities gain meaning when part of a coherent whole that arises from the demands of specific workplaces	The practice elements should be embedded in an authentic social and professional context through the use of a narrative	Social persuasion; mastery experiences
(Bell et al., 2013, p. 351; McLellan, 1996)	Coaching and cognitive apprenticeships are key aspects of learning	The artefact should enable the learner to participate in cognitive apprenticeship through coaching and practice	Mastery experiences
(Bell et al., 2013, p. 351; McLellan, 1996)	There should be opportunities for collaboration and discussion	The artefact should contain characters which the learner can interact with	Reducing anxiety
(Bell et al., 2013, p. 351; Camburn & Han, 2015; McLellan, 1996)	There should be opportunities for reflection	The learner should be asked to reflect on what they have learnt	Mastery experiences; reducing anxiety
(Brown et al., 1989; Camburn & Han, 2015, p. 515; Putnam & Borko, 2000; Rodgers, 2002)	Expose instructors to potential 'solution paths' to resolve dilemmas encountered in their teaching	The artefact should present authentic problems and guide the instructor through the inquiry process	Social Persuasion
(Axel, 1997; Cobb & Bowers, 1999, p. 5; Forman, 1996; Saxe, 2015; Scribner, 1990)	Individuals participate in social practices even when in isolation from others	The artefact should emulate a social context for the practice elements and contain examples from other instructors	Social modelling

Table 4. Design elements of situated learning.

3.3 Scenario Design

In order to incorporate the elements outlined in table 4, an interactive, scenario-based artefact was created which runs via a web browser. Bell notes that 'during cognitive apprenticeship, the teacher selects authentic problems for students to solve and provides them with opportunities to apply the skills learned in solving this problem to new situations, gradually increasing task complexity' (2013, p. 351). This aligns to the importance of using a narrative in the artefact as 'narratives play a vital role in the transfer of information and discoveries. And stories help people keep track of their discoveries, providing a meaningful structure for remembering what has been learned' (McLellan, 1996, p. 3).

A narrative was selected for the artefact in which the instructor would be asked to implement active learning tools in an existing VLE module for students on work placements. This narrative was chosen as research suggests that use of a VLE as a file repository is a precursor to communicational uses (De Smet et al., 2012, p. 690) and thus the task of implementing active learning tools within an existing VLE module would provide an authentic context. Three tools: online reflective journals, blogs, and webinars were selected as they would allow for increasing task complexity; journals have a direct analogue equivalent, blogs allow for communication amongst students and webinars allow for collaborative teaching approaches involving webcams, video and interactive whiteboards. An approximation of Blackboard Learn was created using Articulate Storyline 2 – a tool used for creating online multimedia packages – then interactive elements such as buttons, text entry fields, tasks and characters were added in order to meet the requirements of situated learning. A walkthrough highlighting how these elements were implemented is provided below. The artefact can also be accessed online – see appendix 1 for further details.

3.4 Walkthrough of the Artefact

3.4.1 Introduction – Providing a Realistic Social Setting

Under a situated learning perspective, activities and tasks become meaningful when they arise from authentic demands situated in a realistic social setting (Collins et al., 1991; Knobelsdorf, 2015). This aligns with research which suggests that instructors learn to integrate technology into teaching most effectively when provided with an authentic context (Bell et al., 2013, p. 352; Hennessy, Deaney, & Ruthven, 2006; Smetana & Bell, 2012, p. 1358). In order to achieve a high degree of authenticity, a number of elements were implemented.

The scenario begins with an introductory segment which provides a context and rationale for the practice elements. Learners are first asked to provide their name and subject area (see figure 4). These elements are used throughout to customise the scenario to the learner's context by allowing characters to address the learner by name. After entering these details, the learner is introduced to a character called Professor Crux (see figure 5) who is listed as their head of department.

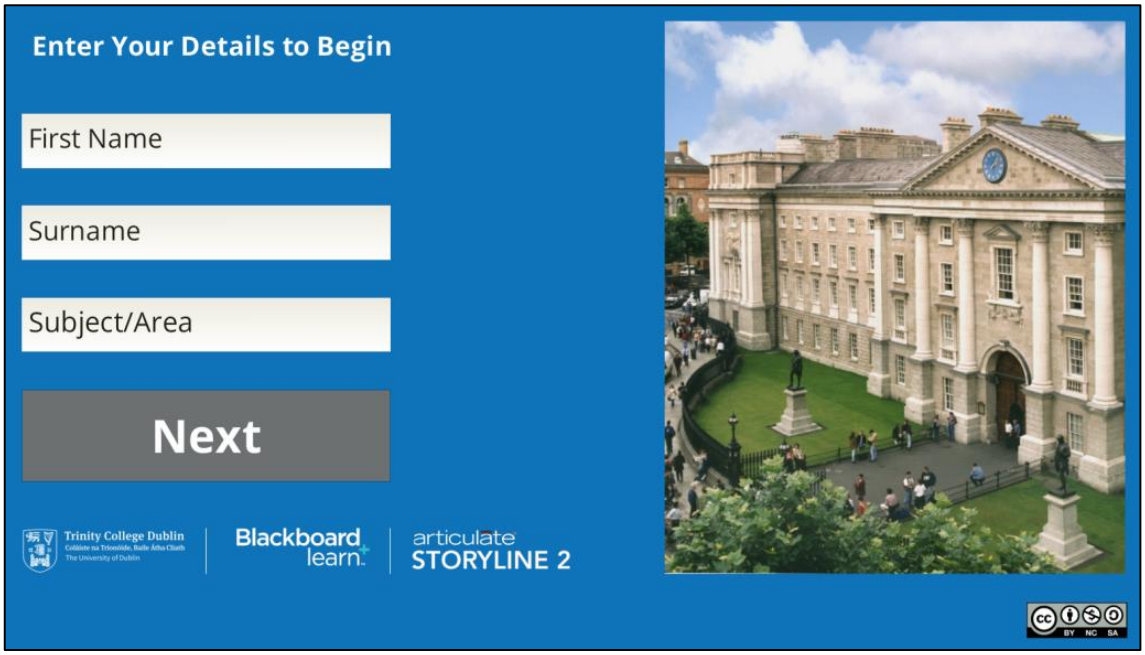


Figure 4. User details screen.

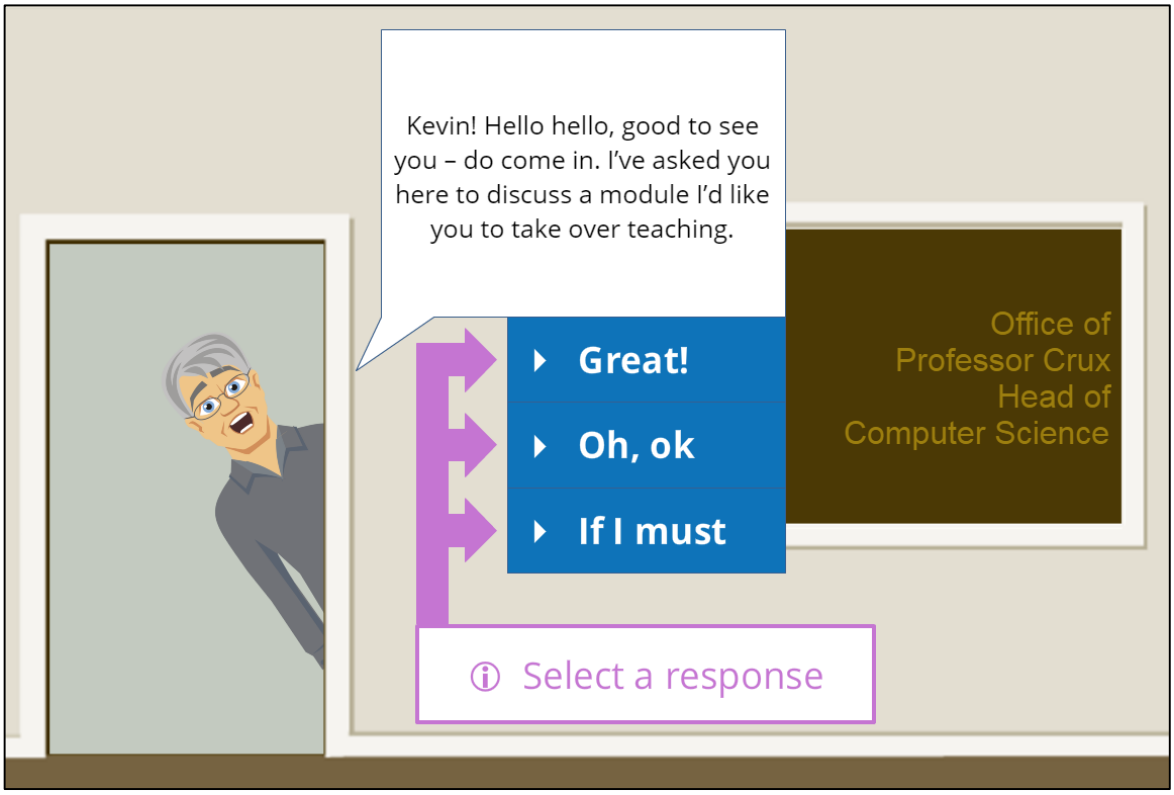


Figure 5. Professor Crux is introduced.

Professor Crux asks the learner to take over the teaching of an existing Blackboard module which currently only contains reading materials. The learner is informed that the module has been changed this year so that in addition to lectures, students will be on work placements for five weeks. As a result of this change, the learner is asked to implement reflective journals, blogs and webinars so that students can engage in active learning while on placement (see figure 6). The learner is then asked to visit Remy, a member of the eLearning team, who will assist with the process of integrating active learning tools into the module (see figure 7). Remy advises the learner that he has used these tools successfully in his own teaching and thus acts as a peer who will work with the learner to implement the active learning tools. Remy then asks the learner to take a closer look at the existing Blackboard module and the scenario transitions to the practice elements (see figure 8).

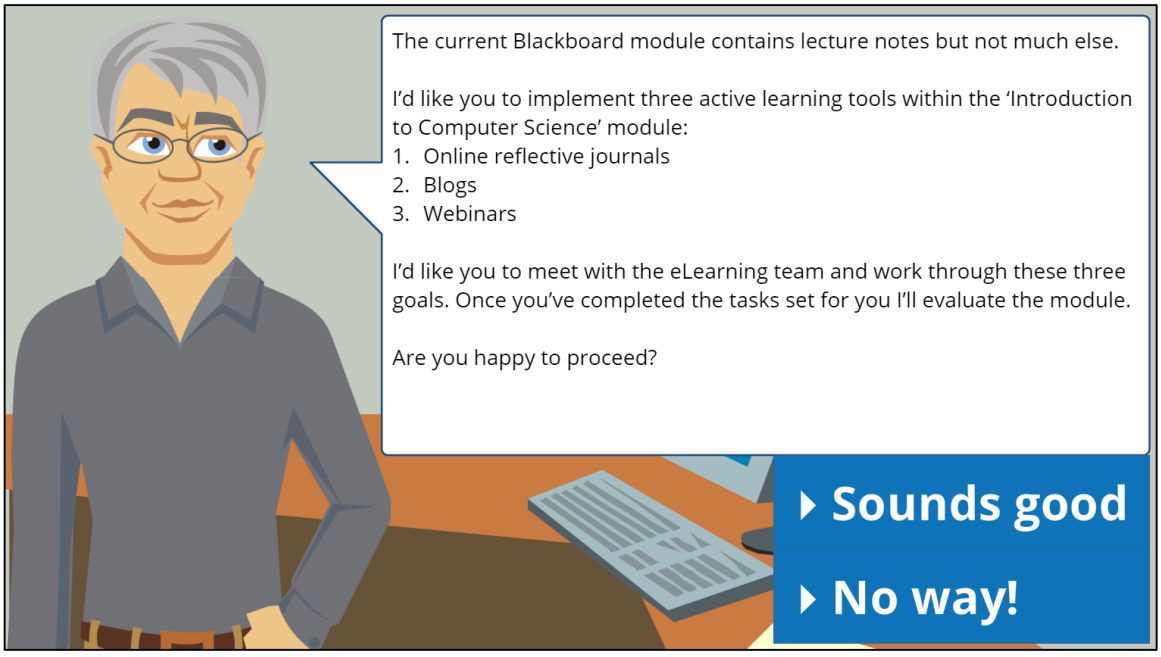


Figure 6. Professor Crux outlines the scenario's goals.

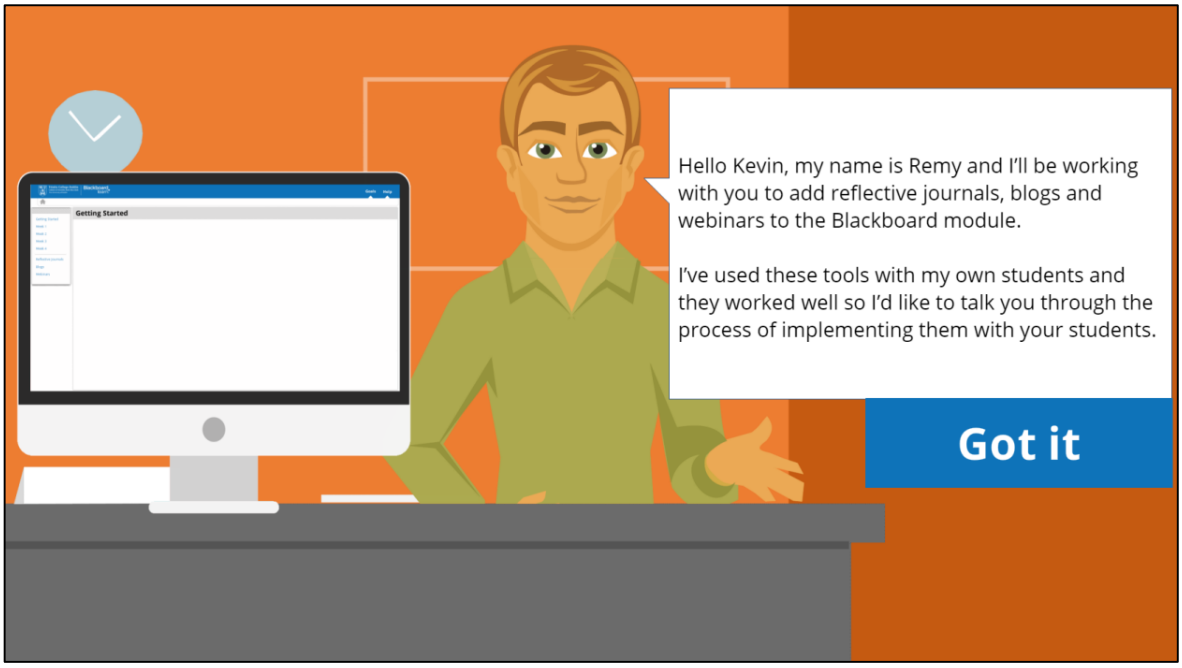


Figure 7. Remy introduces himself to the learner.

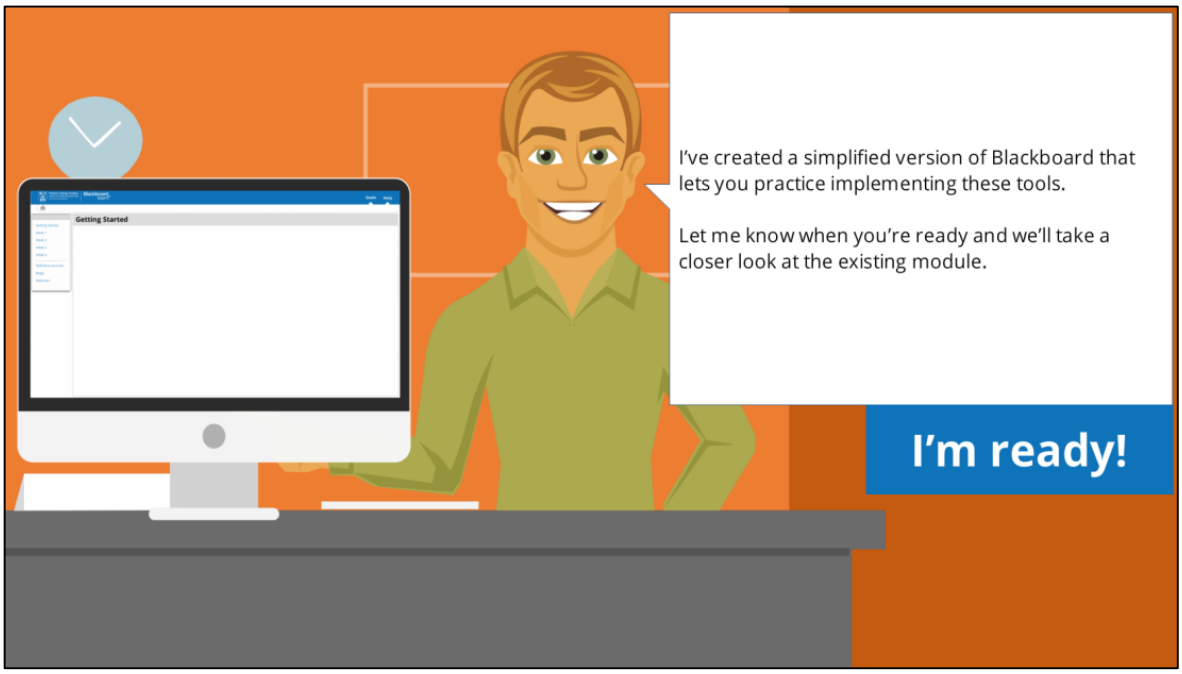


Figure 8. Transitioning to the practice elements.

3.4.2 Centrality of Practicing in an Authentic Context

Situated learning involves providing learners with opportunities to practice within an authentic context (Barab & Duffy, 2000; Lave, 1988; Lave & Wenger, 1991). To meet this

requirement, the learner is introduced to the existing Blackboard module (see figures 9 and 10) and is directed towards a list of tasks for each active learning tool. These tasks are intended to decompose larger goals – such as creating a blog – into smaller components – such as replying to a student's entry – and provide opportunities for practice (see figure 11). The layout of the scenario and the interactive elements approximate the features of Blackboard Learn. Buttons, text entry fields, dropdown menus and other features were added to allow learners to practice implementing the three active learning tools. Contextualised instructions and advice are provided to coach the learner as they practice and complete the different goals. These elements are intended to provide opportunities for authentic practice within the scenario's narrative of facilitating active learning for students on placement.

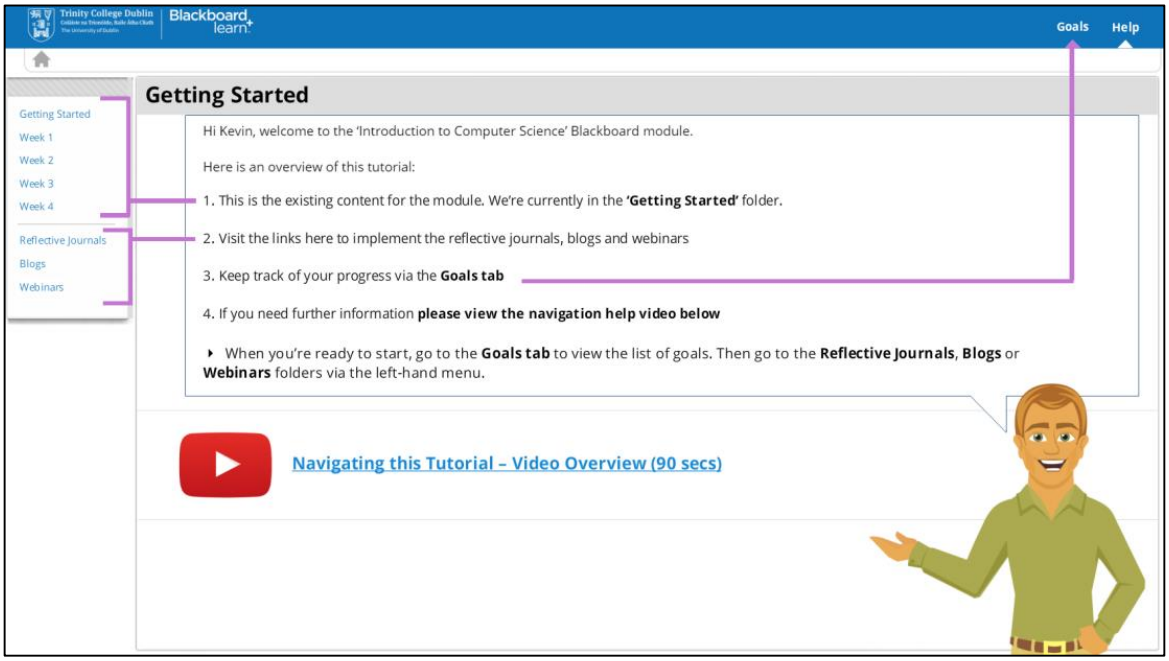


Figure 9. The learner is introduced and orientated to the scenario.

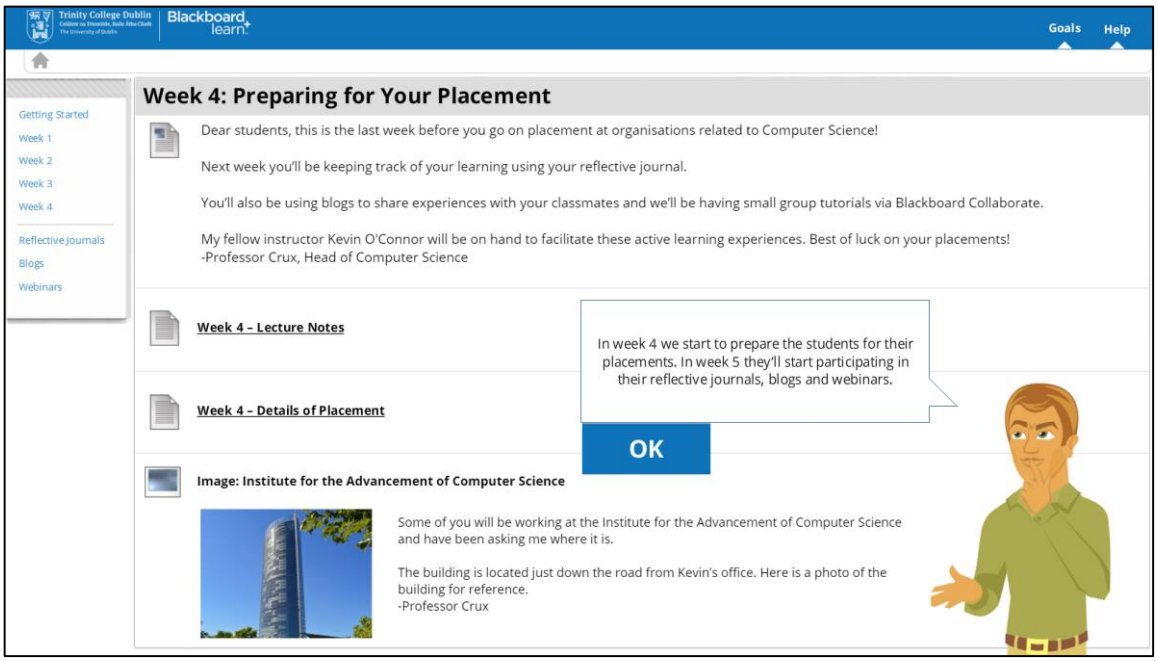


Figure 10. The scenario's existing Blackboard module.

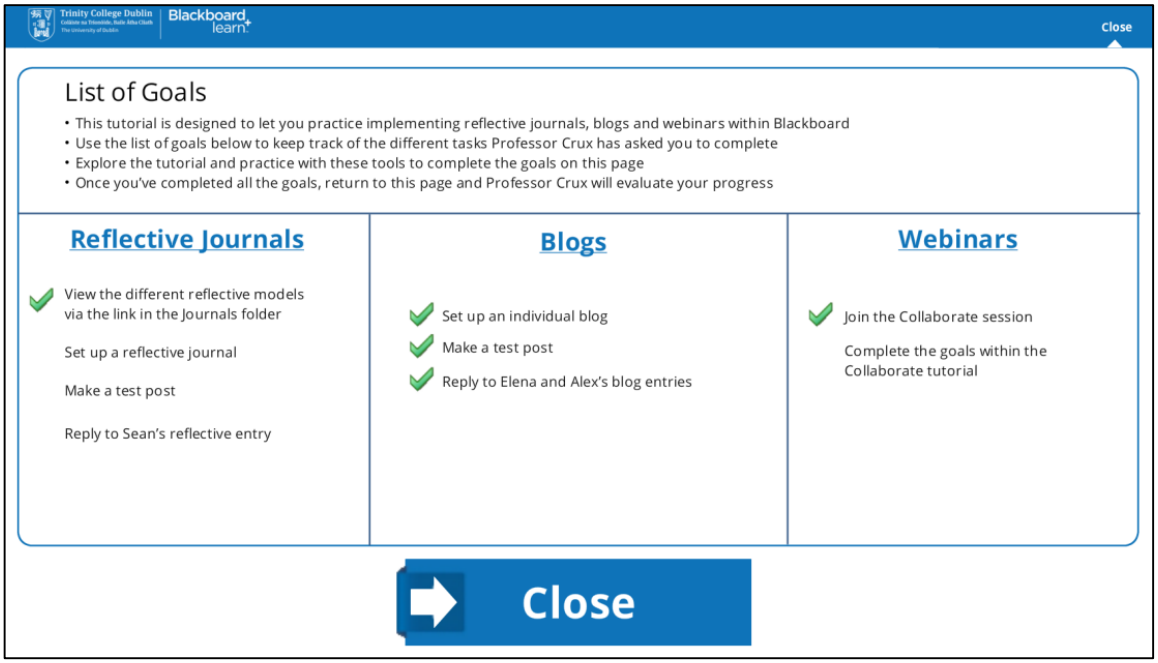


Figure 11. The list of tasks and goals to complete.

In order to complete the assigned goals, the learner is asked to practice implementing the three active learning tools and to communicate with virtual students. For example, in the journals task, the learner is asked to implement a reflective journal (see

figure 12), post a test entry and comment on a student's reflective entry (see figure 13). In the blogs task, the learner is asked to create a blog, select the appropriate settings and then comment on students' blog entries. Virtual student entries and responses were created to provide a social context to this practice (see figure 14). For the webinar component, the learner practices the different aspects required to prepare for an online webinar using Blackboard Collaborate (see figure 15). The webinar section is an enhancement of a previous guide outlined in O'Connor 2016 which was updated in order to match Blackboard's latest version of the Collaborate webinar software. Its instructions and technical specifications were also updated so that it could be integrated into the artefact outlined in this research. Throughout the implementation of these three tools Remy provides support and guidance as described in the next section.

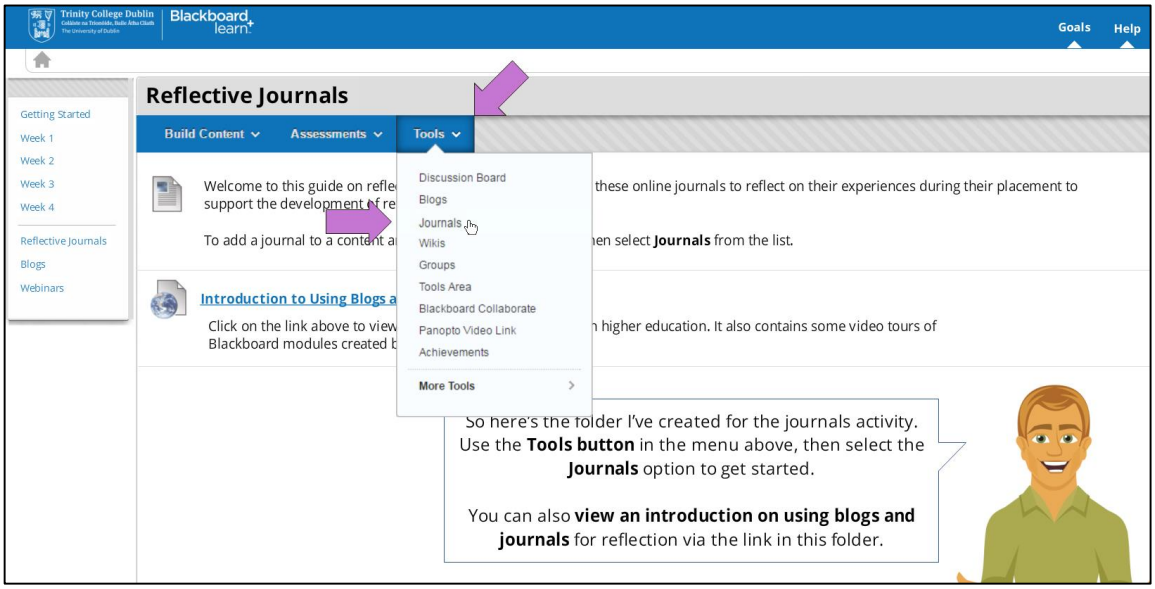


Figure 12. Implementing a reflective journal.

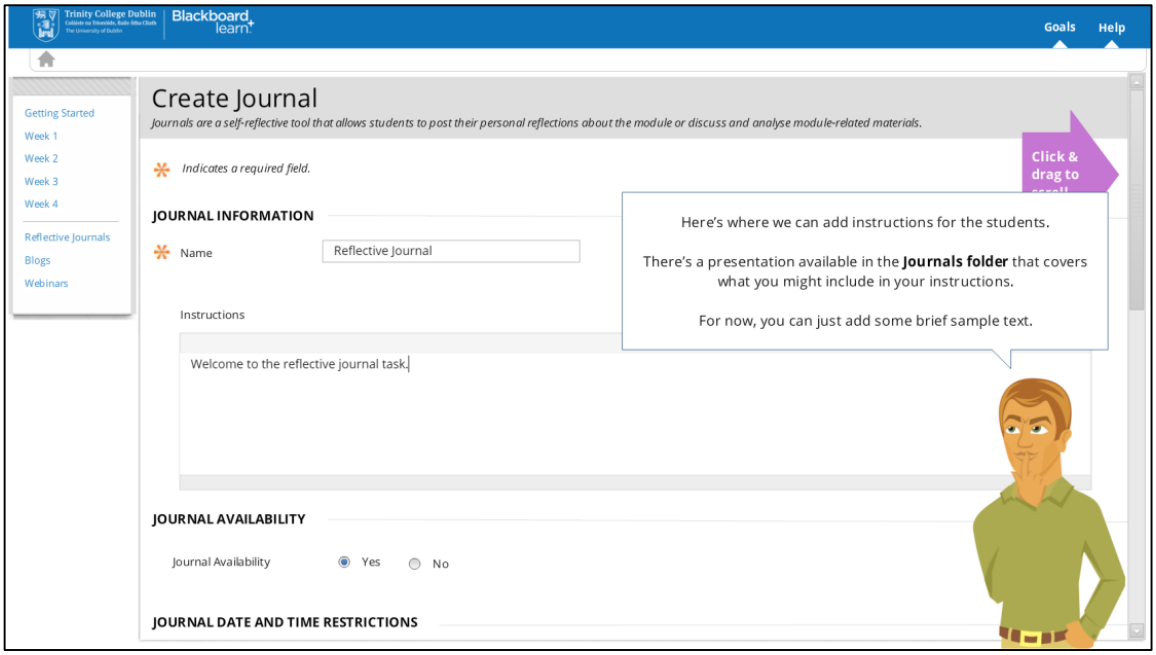


Figure 13. Creating a reflective journal entry.

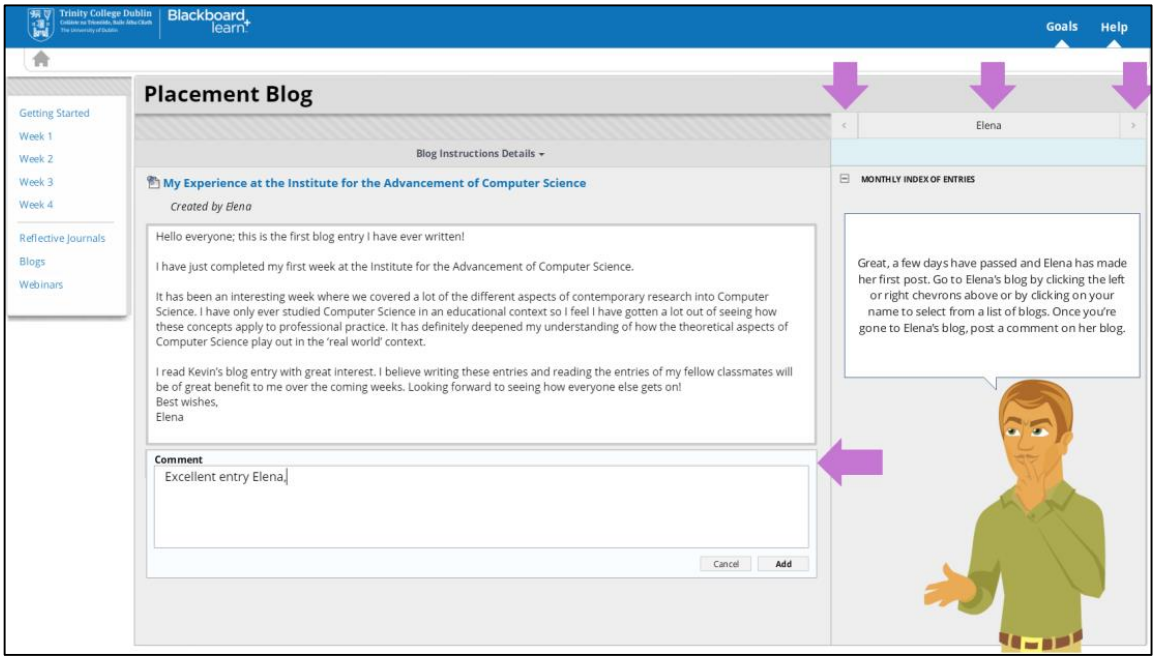


Figure 14. Practicing with virtual students.

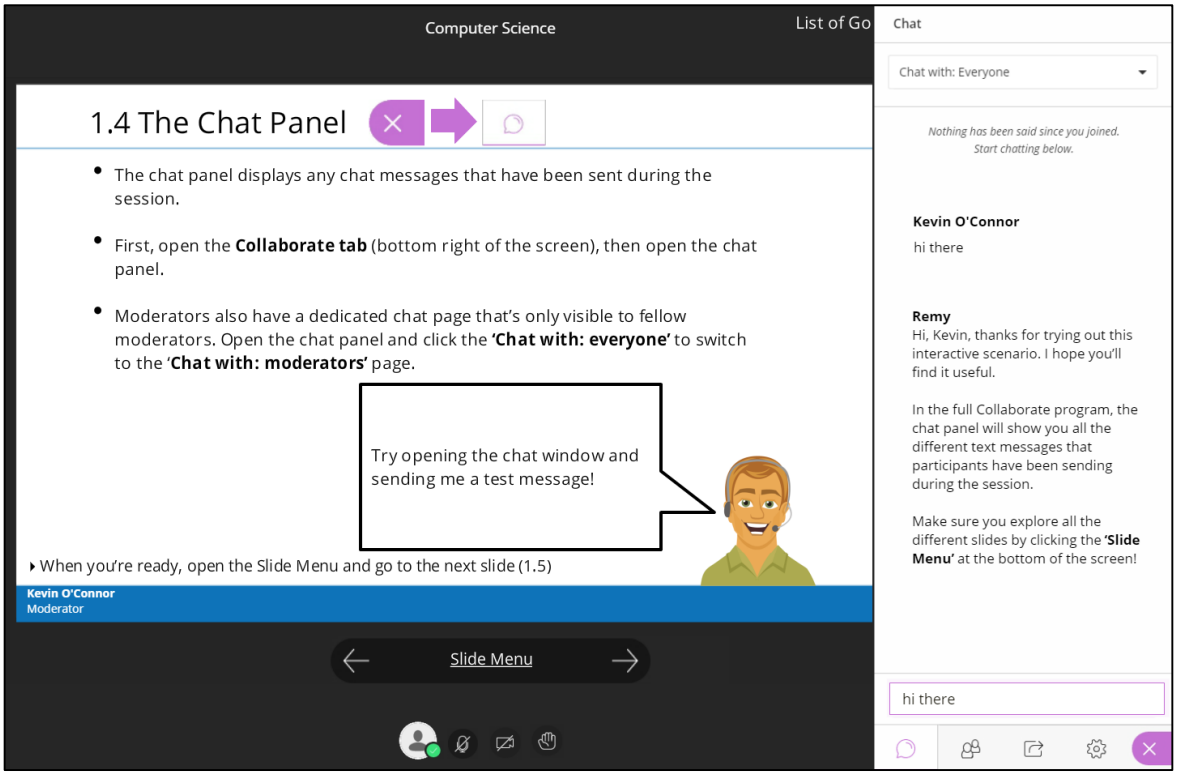


Figure 15. Preparing for a webinar.

3.4.3 Coaching & Cognitive Apprenticeship

Under a situated learning approach, learners participate in cognitive apprenticeship and receive coaching during this process. Cognitive apprenticeship involves practicing in a specific context and gaining knowledge that can be applied in different settings (Collins, 2006, p. 49). Coaching, as Bell notes, is '…a component of all constructivist learning theories, [it] is the way teachers refrain from directly telling students what they need to know. Rather, the teacher provides scaffolding for learning and guides students to a place of understanding and competence' (2013, p. 351). This coaching element was implementing through the use of the Remy character who is introduced as a member of the college's eLearning team. Remy provides contextual advice and guidance to support the learner as they work through the different elements of implementing active learning tools and complete the goals in the scenario. Remy's advice is specific to the scenario (see figure 16

as an example) and is intended to be applied to other situations thus aligning it to the process of cognitive apprenticeship.

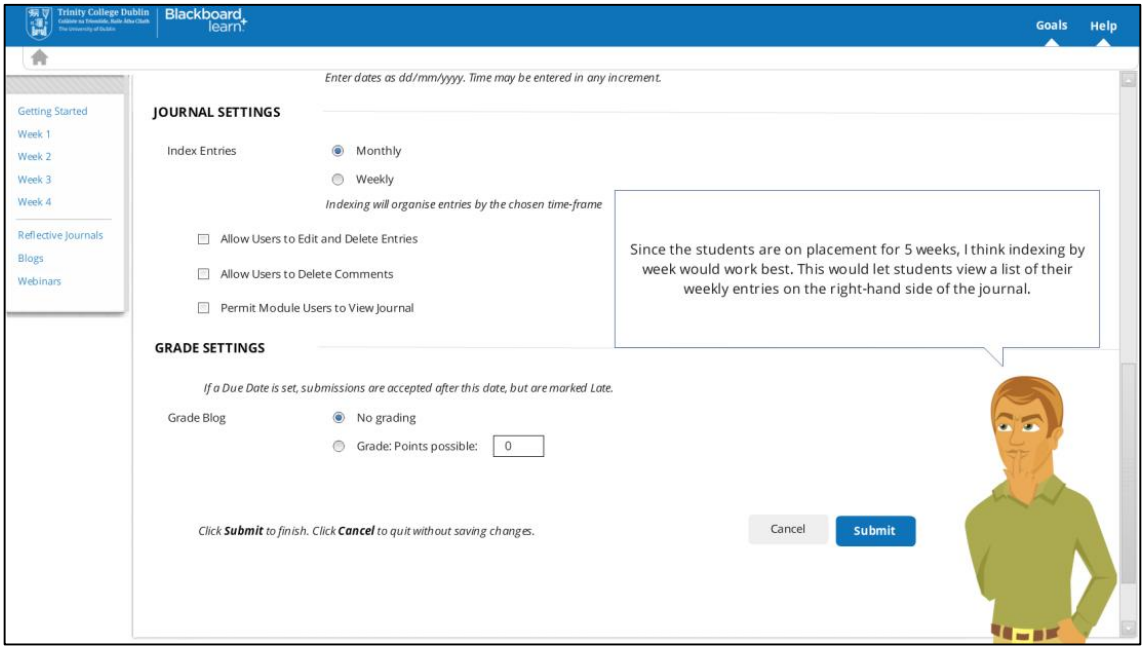


Figure 16. Remy engages the learner in cognitive apprenticeship.

3.5 Opportunities for Collaboration, Discussion and Reflection

A requirement of situated learning is that learners have opportunities for collaboration, discussion and reflection. The scenario is designed so that learners work with Remy to implement the tools and as they complete the different goals, Remy provides suggestions for further practice such as participating in or creating a real journal, blog or webinar within Blackboard (see figure 17). In the artefact, learners are provided with definitions, models and guidelines for reflection as well as three video tours of actual Blackboard modules by other instructors who have incorporated active learning tools (see figures 18 and 19). These videos were from instructors at universities in the United States involved in Blackboard's exemplary course programme. After completing all the goals within the tutorial, learners are presented with a conclusion screen. Here Remy asks learners

to reflect on their experience of using the technologies covered in the scenario and to practice using the tools within Blackboard (see figure 20). These elements were intended to transition the learner from the cognitive apprenticeship process of the scenario to real-world opportunities to practice, reflect and use the tools covered in the artefact.

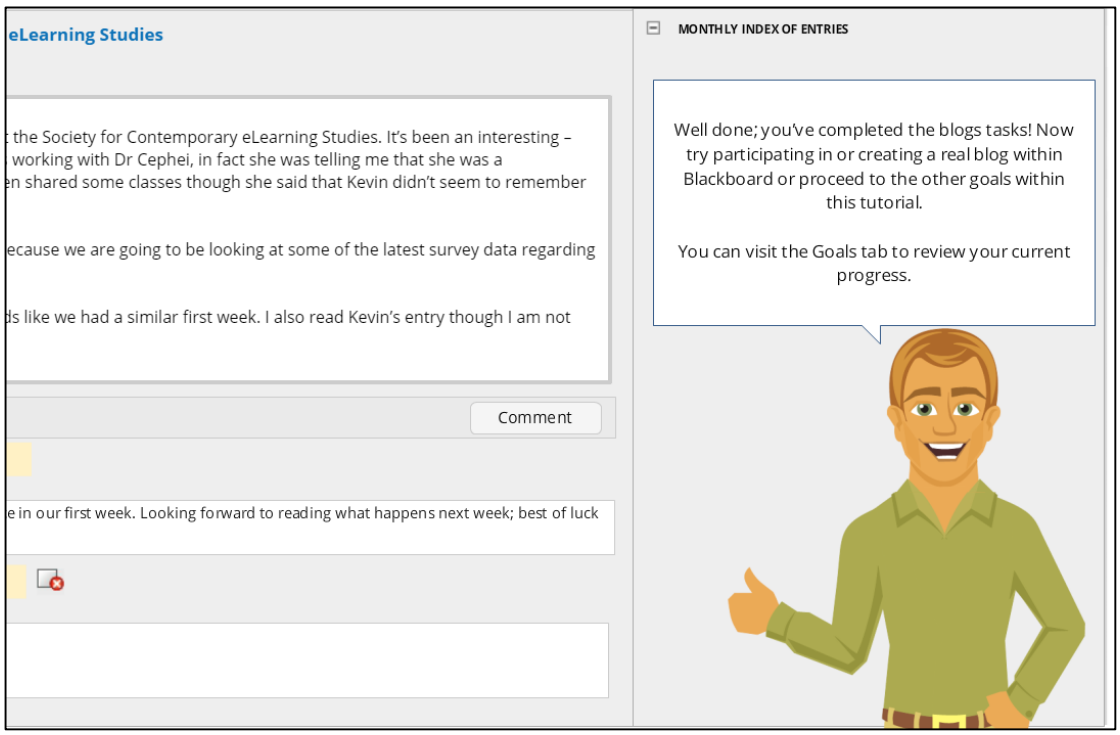


Figure 17. Remy advises the learner to practice using a blog within Blackboard.

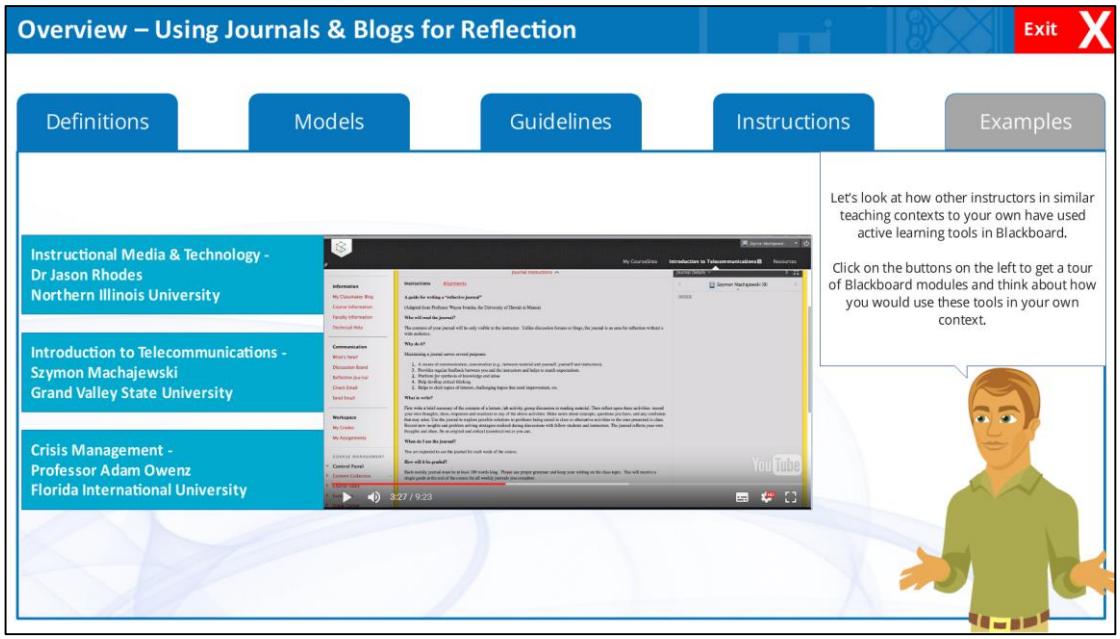


Figure 18. Example uses of active learning tools by other instructors.

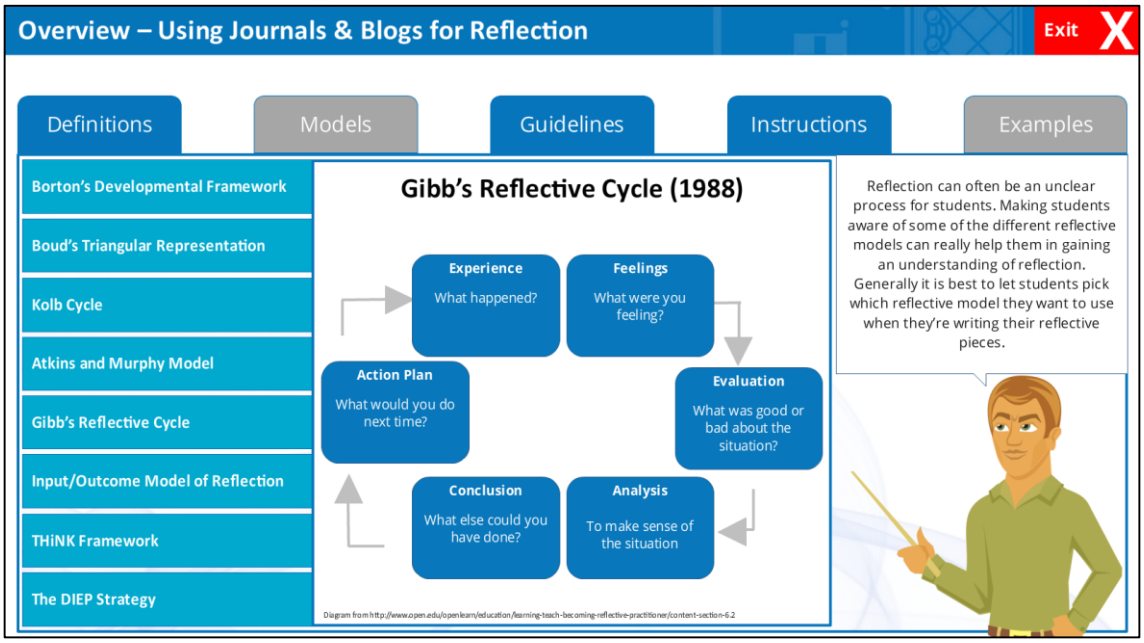


Figure 19. The 'Using Journals & Blogs for Reflection' section.

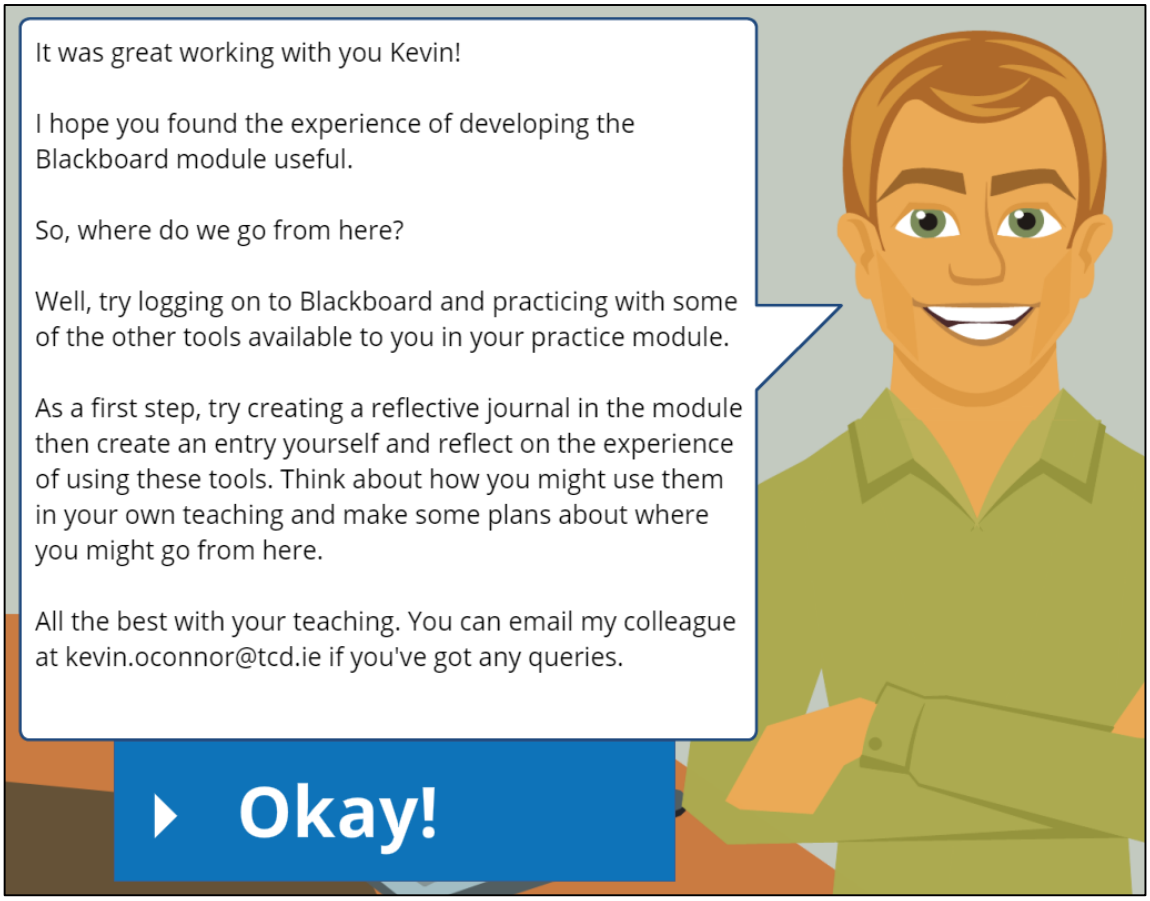


Figure 20. At the conclusion, learners are asked to practice within the VLE.

3.6 Artefact Scope & Technical Details

In order to create this situated learning intervention, the artefact required a number of elements. A large number of variables, triggers, states and events were created using Articulate Storyline 2 to support the practice element (see figure 21 as an example). In terms of the artefact's structure, a central 'VLE1' slide acted as a hub with each active learning tool being assigned to a separate slide in order to manage the different workflows (see figure 22). The design is intended to be modular so additional active learning tools and scenarios can be incorporated in future. In addition to these elements, a brief video guide of approximately 90 seconds was created to orientate learners to the artefact's interface.

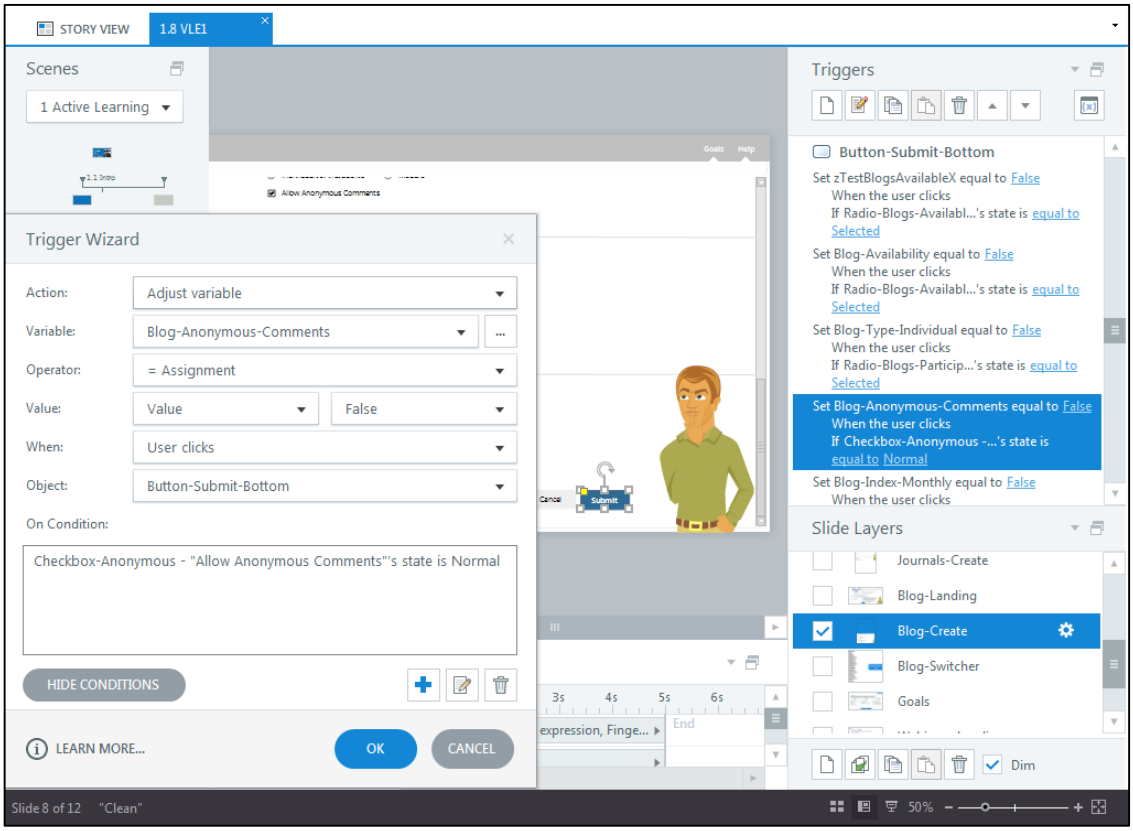


Figure 21. Articulate Storyline 2 development environment.

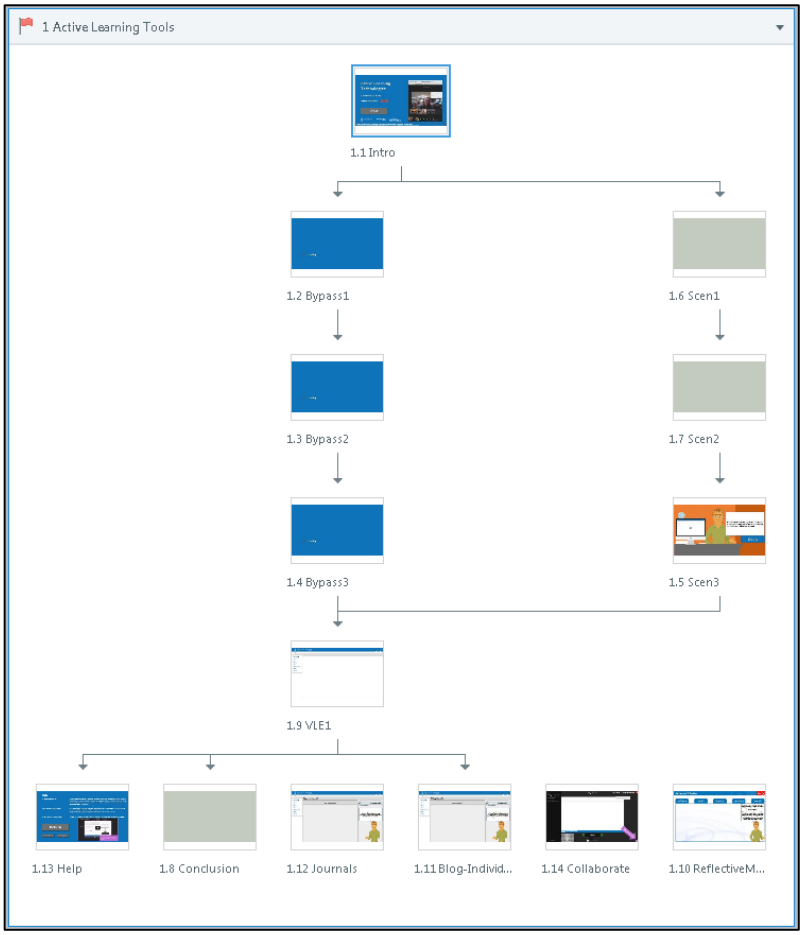


Figure 22. Map of the artefact.

3.7 Conclusion: Purpose of this Research

This chapter described how an artefact was created under the principles of situated learning in order to provide instructors with multiple opportunities to practice implementing a VLE's active learning tools. This process is intended to create an intervention which can be used to research the effectiveness of this situated learning approach to professional development for increasing instructors' TSE.

Thus the purpose of this research is to explore how a situated learning approach to professional development may be effective in increasing instructors' technology self-efficacy in the use of active learning tools within virtual learning environments. As part of this, the research seeks to explore the following questions:

1. How can an artefact designed under the principles of situated learning be used to increase instructors' technology self-efficacy in the use of active learning tools within a VLE?
2. What are the advantages and disadvantages of this approach?
3. What are participants' perceptions of the remaining barriers to adopting active learning tools?

In order to investigate this research purpose, it was necessary to design an appropriate research methodology which is described in the next chapter.

Chapter 4: Methodology & Fieldwork

4.1 Introduction

This chapter describes the methodology used to investigate the research purpose defined in Chapter 3. Before conducting research, Creswell suggests that researchers should address their epistemological perspective, the research methodology informed by this perspective, and the methods that will support this methodology (2013, p. 5). This chapter follows this structure in order to describe why a social constructivist epistemological perspective using an exploratory case study methodology with a combination of qualitative and quantitative methods was selected. The chapter concludes with details of how this exploratory case study was implemented.

4.2 Research Epistemology

Creswell recommends that the philosophical perspective of a research study should be explicitly stated and that it should be informed by the problem being investigated (2013, pp. 2-5). The central problem being investigated in this study is that current professional interventions are not effective at increasing the technology self-efficacy of higher education instructors in the use of active learning tools within virtual learning environments. The research therefore involves implementing a professional development intervention designed under situated learning theory and exploring the efficacy of this approach. The research epistemology would need to address these aspects in order to select an appropriate methodology and methods.

Three elements of the research – self-efficacy, situated learning and instructors in higher education – support a social constructivist epistemology. Firstly, self-efficacy is a concept reliant on an individual's perceptions of their domain-specific abilities (see Shank

& Cotten, 2014, p. 185) and ‘is a cognitively and socially derived construct aligned closely with social constructivist theoretical traditions’ (Fletcher, 2005, p. 308). Secondly, situated learning focuses on how learners construct meaning within a specific social context (Feng et al., 2013, p. 175) – an emphasis that originates in the social constructivist perspective of Vygotsky (see Lave & Wenger, 1991; Mann, 2011; Onda, 2012). Thirdly, educational research investigates complex educational systems where instructors’ practices and beliefs are embedded within organisations (see Clarke & Collins, 2007; Hamilton et al., 2016, p. 4; Opfer & Pedder, 2011). These elements in aggregate strongly indicate a social constructivist epistemology in which the researcher investigates individuals’ subjective beliefs in terms of how they construct meaning and how this process interacts with their social environment (see Creswell, 2013, p. 7; Crotty, 1998). While the pedagogy used in designing the artefact is situated learning, the research itself is conducted under this social constructivist epistemology in order to fulfil the research requirements and to appraise the research methodology selection.

4.3 Research Methodology Selection

A social constructivist approach indicates the use of qualitative methodologies as these allow for an in-depth exploration of participants’ beliefs by a researcher acting as an emic agent. This research is considered to be emic in nature as the researcher works within the participants’ organisation and thus has an ‘insider’ perspective on the social context (Gaber, 2016). This emic, social constructivist approach is strongly aligned to interpretivism as it focuses on interpreting the meanings participants attach to a phenomenon whereas a positivist approach would seek to establish nomothetic knowledge (Hempel, 1965; Schutz, 1970; Tsang, 2014, p. 175). An interpretivist perspective indicates a qualitative methodology in which data collection and analysis occur simultaneously (Merriam, 1998; Yazan, 2015, p. 145). Figure 23 below summarises the differences between the positivist

and interpretivist viewpoints and the methodologies used. However, it is important to note that the use of qualitative and quantitative methodologies exists on a continuum (Creswell, 2013, p. 3; Newman & Benz, 1998) and therefore this research is pragmatic in that it sought to select a primarily qualitative methodology that would be flexible enough to allow the incorporation of quantitative methods when required.

	Positivism	Interpretivism
Ontology	Objective reality with the Humean conception of causality as a constant conjunction of events	Reality socially constructed by humans via subjective meanings; multiple realities possible
Epistemology	Discovering law-like relationships that have predictive power using a hypothetico-deductive approach	Knowledge generated by interpreting the subjective meanings and actions of subjects according to their own frame of reference
Methodology	Tendency towards employing quantitative methods based on large samples such as surveys, experiments, and analysis of archival data	Primarily qualitative methods such as ethnographies and case studies

Figure 23. Comparison of positivism and interpretivism (Tsang 2014, p. 175).

Several qualitative methodologies were considered such as narrative research, grounded theory, ethnography and a case study. Narrative research focuses on individuals' experiences interpreted through stories about their lives (Clandinin & Connelly, 2000; Creswell, 2013, p. 12; Riessman, 2008). Grounded theory involves collecting data on participants' perceptions in multiple stages to derive a general theory of a concept (Charmaz, 2014; Creswell, 2013, p. 14). An ethnography involves longitudinal studies of cultural groups to identify group behaviours (Creswell, 2013, p. 14). These three approaches were considered to be too broad for the purposes of this research as the research focuses on exploring how the individual factor of technology self-efficacy can be increased through situated learning within a specific educational setting. Thus attempting to explore individuals' lives across multiple domains, derive general theoretical principles or initiate

longitudinal studies were deemed inappropriate given the exploratory and narrow boundaries of the inquiry.

A case study methodology was selected as it allows for an exploration of the research purpose by focusing on the subject under investigation while still allowing for due consideration of the wider social context. Yin defines a case study as 'a study that investigates a contemporary phenomenon in depth and in its real-world context' (2013, p. 237). Case studies have seen increasing use over the last 50 years in order to attempt to understand social phenomena in areas such as education, economics and politics (Yin, 2013, p. 4). As Stake notes, a common criticism of case studies is that they are not a suitable basis for generalisation (1978, p. 5) but rather than being concerned about generalisation under a positivist viewpoint, the researcher should instead focus on describing the bounded phenomenon in detail so that the reader can generalise based on their own experiences (Stake, 1978).

An exploratory case study was selected rather than an explanatory or descriptive case study as it allows for the exploration of a new area in which there is limited prior research (see Baxter & Jack, 2008); while there is extensive research into professional development, TSE, VLEs and situated learning, there is limited research combining these elements. A case study approach can also incorporate multiple methods (see Creswell, 2013; Yin, 2013) and is thus valuable in exploring participants' perceptions through an emic, flexible, iterative and bounded research process.

4.4 Case Study Design

Creswell notes that a case study involves analysing an individual, group, activity, process or event in detail (2013, p. 14). This section will describe the design of the case

study in terms of how it is intended to explore the activities and perceptions of individuals. The case study would be inductive in nature as it takes a social phenomenon and through the analysis process seeks to develop themes through an exploratory approach where data analysis occurs continuously throughout but becomes increasingly focused on specific themes as the research progresses (Gilgun, 2001, p. 99; Stake, 1995, p. 49). This research process would thus be iterative in nature (see figure 24 below) – for example, interview questions would be updated in light of data obtained from other methods.

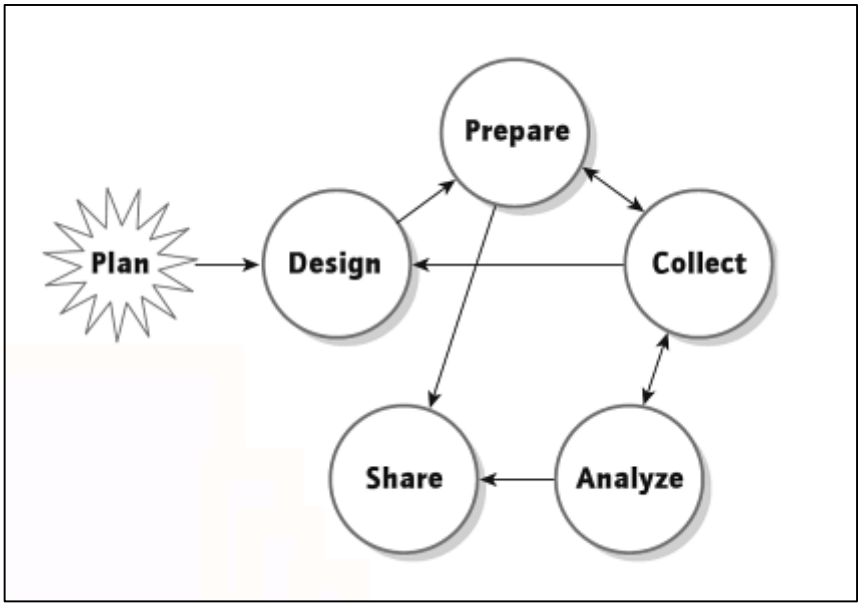


Figure 24. The iterative nature of case study research (Yin 2014, p. 2).

4.4.1 Bounding the Case

It is important to bound a case study in terms of the unit of analysis, setting, activities involved and the research timeframe (Creswell, 2013; Stake, 1978, p. 7; 1995; Yin, 2013). These aspects help to define the limits of the case study and prevent it becoming unrealistic in terms of time and scope. This section will describe how these elements were selected.

4.4.2 Unit of Analysis

As this research relates to an instructor's perception of their ability to perform specific tasks within a VLE, individual instructors were selected as the unit of analysis. The research intended to recruit primarily academic instructors but also a small cohort of administrative staff who also use the VLE thus providing a range of instructors. The case study is designed to give due consideration to an instructor's perceptions of how social and structural factors influence their TSE while at the same time not incorporating these elements into the unit of analysis. Thus, for example, the research does not seek to recruit student participants but may instead report an instructor's perceptions of student behaviours and attitudes.

4.4.3 Research Setting

The research intended to recruit a cohort of instructors within a single higher education institution. Multiple institutions were rejected due to complexity this would involve in terms of negotiating access and mapping the different technologies used by each institution. The research would be conducted within the researcher's university as this had the advantage that the researcher would have a high degree of familiarity with the terminology, structures, technologies and social context.

4.4.4 Activities Involved & Timeframe

Participants would first be asked to complete a scale on their current TSE in using a VLE's active learning tools. They would then engage with the artefact described in Chapter 3 over a two week period and would be provided with a practice module within the VLE to practice the tools covered in the artefact. This would be followed by participants retaking the TSE scale and completing a qualitative survey on their perceptions of the artefact. Finally, a subset of participants would be selected for interview based on their responses to

the survey questions to allow for an in-depth exploration of their responses and context. Due to scope of the research, it would not be possible to conduct longitudinal research into whether instructors actually implemented the tools with their students – this limitation is discussed in the conclusion chapter. Further details on the methods and implementation are provided in sections 4.5 and 4.6.

4.5 Exploratory Case Study Methods

Certain methods are indicated by an exploratory case study methodology but as Creswell also notes, a nuanced view based on the philosophical underpinnings of the research is needed (2013, p. 3). In order to support the exploratory case study methodology, several research methods were selected: a TSE scale, a qualitative survey and one-to-one interviews. While there has been significant debate as to the feasibility of combining multiple methods, this research subscribes to the view that this allows for a fuller exploration of a phenomenon (Venkatesh, Brown, & Bala, 2013, p. 22). This section examines the general principles of the research methods used before section 4.6 describes the case study's implementation.

4.5.1 Technology Self-Efficacy Scale

A unipolar 10-point TSE scale containing 10 items was used in order to quantify participants' TSE in implementing active learning tools within a VLE under a variety of situations (see appendix 5). Participants would complete this scale before and after engaging with the artefact. This scale was used for two reasons. Firstly, Rienties et al. (2013) emphasise that there has been a lack of research with pre and post tests to measure the effectiveness of online professional development. Secondly, the scale would provide a valuable initial data point for the research in terms of gauging the efficacy of the artefact

which would assist with calibrating the subsequent interview questions and sensitise the researcher to the emergent data.

The scale used is a modified version of Laver's (2012) TSE scale which is itself a modification of the original computer self-efficacy scale by Compeau & Higgins (1995). The computer self-efficacy scale was validated by Compeau & Higgins and has been used and adapted over many years (see Holden & Rada, 2011, p. 353). Researchers such as Laver (2012) and Bates and Khasawneh (2007) have adapted the computer self-efficacy scale in order to apply it to the specific technology under investigation. Similarly, in this research modifications were made to align the scale to the context of VLEs. In order to ensure construct validity, the researcher evaluated the scale against Bandura's recommendations for constructing psychometrically valid self-efficacy scales (see Bandura, 2012). The researcher then piloted the scale with five individuals prior to the study and updated it in light of feedback from these pilot users. This ensured that the scale used was unipolar (Bandura, 2012, p. 16), that the tasks involved were clear (Bandura, 2012, p. 27) and that the scale was contextualised to the specific domain under investigation (Bandura, 2012, p. 17).

4.5.2 VLE Practice Environments

As they engaged with the artefact, participants would be requested to practice using their own personal test module within the VLE. This would enable them to apply what they had learnt in the artefact within an actual VLE and provide a space for them to reflect on how they might use the tools in their own teaching context. The researcher would have access to these modules and would be able to view any artefacts created by participants –

such as example journals or blogs – and would thus be able to discuss participants' experiences of implementing the tools in the VLE during the interview stage.

4.5.3 Survey

After using the artefact, participants would be asked to complete a survey containing primarily qualitative, open questions. These questions are designed to explore participants' perceptions of the effectiveness of the artefact (see appendix 6). For example, participants are asked if they plan to implement active learning tools within the VLE as a result of participating in the research and are asked about their perceptions of the advantages and disadvantages of the situated learning artefact under investigation. There would also be some likert scale items which would ask the participants to rate the effectiveness of the artefact. This data would assist with the development of questions for the interview stage and with the development of themes through triangulation with the interview data.

4.5.4 Individual Interviews

Finally, individual interviews would be conducted in order to gain further insights into how the intervention impacted participants' TSE and their teaching context. Given the personal nature of TSE, individual interviews were selected rather than group interviews. The interview questions are intended to explore how the elements of situated learning in the artefact – such as opportunities for multiple practice – affected participants' TSE. Emergent questions would also probe participants' perceptions of the remaining barriers to implementing technology-enhanced learning. The interviews would be standardised semi-structured open-ended interviews (see DiCicco-Bloom & Crabtree, 2006; Turner III, 2010) which would enable the interview questions to be informed by findings from other methods and would assist in the development of research themes. An interview protocol was developed to support this process – see appendix 7.

4.6 Exploratory Case Study Implementation

The exploratory case study was implemented in Trinity College Dublin where the researcher works as a learning technologist within the university's eLearning group. The researcher thus had administrative access to the VLE under investigation, a professional connection to the research participants and a role in the institution in terms of increasing the use of the VLE and developing professional development interventions. The researcher is aware of the possibility of reflexivity resulting from this role but attempted to mitigate this by actively acknowledging that these factors could impact the research and by maintaining an awareness of this throughout all aspects of the research process (see Berger, 2015, p. 229; Horsburgh, 2003, p. 309; Savin-Baden & Major, 2013). To ensure such issues were addressed in the implementation of the case study, Creswell's qualitative research procedure was used (see appendix 9 for the completed procedure used by the researcher).

4.6.1 Artefact Pilot Process

Before the research started, the artefact was piloted with 6 individuals in an iterative manner to ensure construct validity (see Creswell, 2013, p. 160). 3 individuals were observed as they engaged with the artefact in order to document instructional, technical and design issues in a matrix (see appendix 2). The researcher also contacted a mailing list for Blackboard users and received feedback on the artefact from staff members from the College of St Scholastica, Minnesota; Ashland University, Ohio; and the University of Richmond, Virginia. By the end of this process, technical and instructional design flaws were addressed as far as possible and the artefact was ready for use by participants.

4.6.2 Recruitment of Participants

Participants were recruited in Trinity College Dublin via a combination of purposeful and convenience sampling from attendees of a technology-enhanced learning

CPD programme, from a teaching assistant module and from staff who had contacted the researcher previously for support in using the institution's VLE. The research was conducted in March and April 2017 with participant recruitment beginning on 6th March and data collection concluding on 11th April. Each participant engaged with the artefact over a two week period although the starting date differed depending on when a participant's completed ethical consent form was received. 28 participants were recruited initially with 26 completing the initial survey and 25 completing the concluding survey and TSE scale. From this 25, 5 were selected for the individual interviews based on their availability and responses to the survey questions.

4.6.3 Ethical Considerations

The primary ethical consideration in this research was to protect participants by ensuring data anonymity and by taking steps to prevent impropriety and to deal with issues which might arise (see Creswell, 2013, p. 92). Ethical approval was received from the ethics committee within the School of Computer Science & Statistics in the researcher's institution (see appendix 3). Participants were notified of the role of the researcher and the nature of the research on the participant information and consent forms (see appendix 4). The purpose of the research was not misrepresented to participants and participants were debriefed after the research.

4.6.4 Case Study Activities & Proceedings

The proceedings of the case study were intended to give sufficient time for participants to engage with the artefact and proceeded as follows:

1. Participants first completed the TSE scale
2. They then engaged with the artefact over a period of approximately two weeks

3. During this period participants could also practice using their own private testing module within the VLE
4. After this period, participants retook the TSE scale and completed the qualitative survey
5. The researcher then interviewed 5 participants based on their availability and responses to the survey
6. Throughout this process, data was analysed continuously as it was obtained from the different methods
7. After the interview phase was completed, the complete data set was analysed and triangulated to develop the themes presented in chapter 5
8. Participants were debriefed at the conclusion of the research

4.7 Conclusion

This chapter outlined the steps taken to design the methodology and methods for exploring how a situated learning approach to professional development can be used to increase instructors' technology self-efficacy in the use of active learning tools within a VLE. The next chapter will describe the data gained from this process, how it was analysed and the themes that emerged.

Chapter 5: Data Analysis & Findings

5.1 Introduction

This chapter will first describe how the research data was prepared, analysed and validated before presenting the findings of the research through a series of themes. This is followed by a discussion and conceptual ordering of the findings in order to address the purpose of the research. To reiterate, the purpose of this research is to explore how a situated learning approach to professional development may be effective in increasing instructors' technology self-efficacy in the use active learning tools within virtual learning environments. As part of this, the research seeks to explore participants' perceptions of the effect of engaging with the artefact on their TSE, the advantages and disadvantages of this approach and their perceptions of the remaining barriers to using a VLE's active learning tools. These elements guided the research analysis process and development of themes but the researcher remained open to unexpected outcomes and emergent themes throughout.

5.2 Summary of Data Set

The data set is comprised of participants' responses to the qualitative survey, individual interviews and the initial and concluding TSE scales. Table 5 below quantifies the number of participants involved and amount of data obtained from each source.

Source	**Quantity of Data**	**Number of Participants**
Initial TSE Scale	24 fully completed 2 partially completed (missing 1 item each)	26
Concluding TSE Scale	25 fully completed	25
Survey Responses	3353 words	25
Individual Interviews	2hrs 10mins approx.	5

Table 5. Summary of the data set.

5.3 Data Preparation

Data preparation involved importing and collating the quantitative and qualitative data into Microsoft OneNote, a note-taking application (see figure 25). This aligns with recommendations from the literature in terms of removing the boundaries among data sources (see Yazan, 2015, p. 144) and facilitated the development of themes. The quantitative data was also prepared into tables in order to present the results in the findings section. In order to ensure data security and participant anonymity, the data was stored on an encrypted Surface tablet accessible only to the researcher and participants were assigned numerical titles (such as Participant 1, Participant 2 etc. – sometimes shortened to P1, P2 etc.) which are used in the reporting of findings.

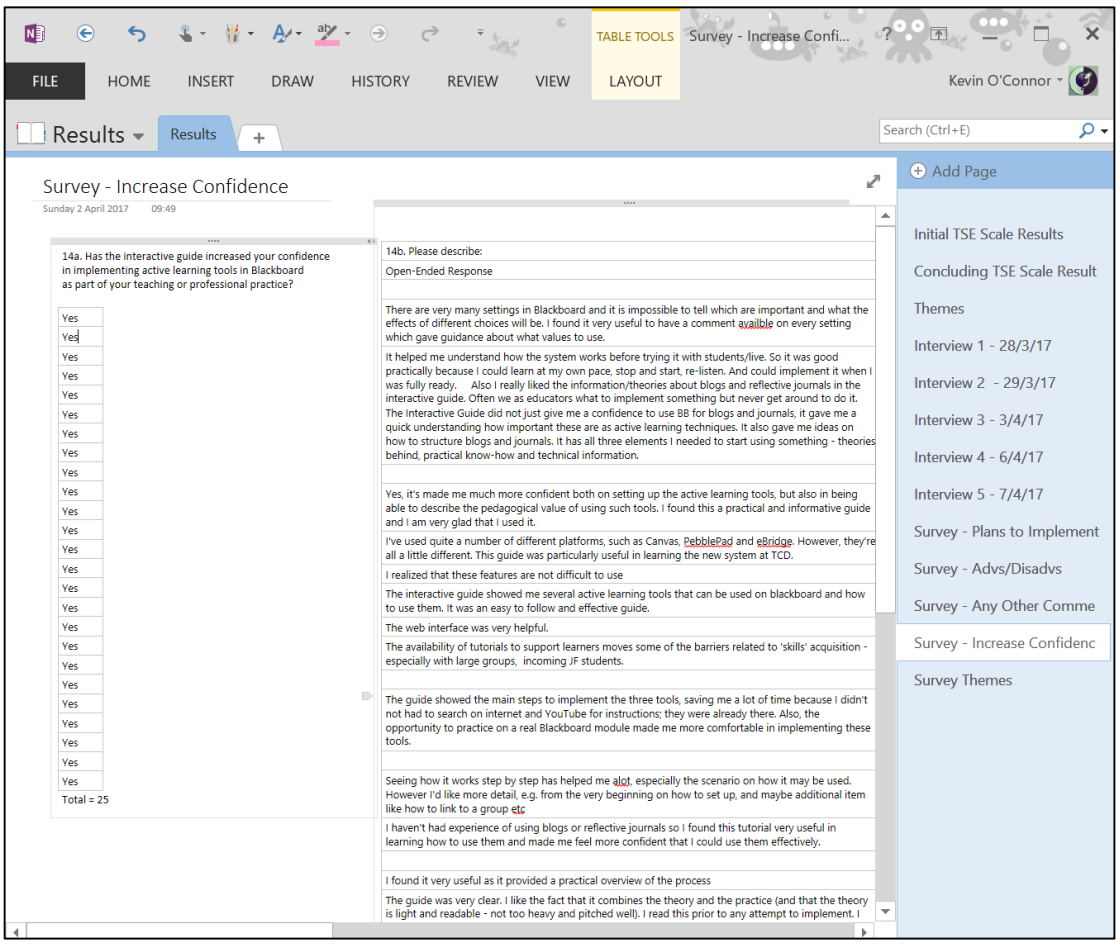


Figure 25. Preparation of the data into tabs in OneNote.

5.4 Process of Analysis

This section will outline the theoretical perspective of the data analysis process before describing the analysis process for each method.

5.4.1 Data Analysis Theoretical Perspective

The data analysis process followed a constructivist approach in order to develop themes which report participants' perceptions in order to address the purpose of the research (Merriam, 1998; Yazan, 2015, p. 145). The data was first examined holistically to develop initial impressions before being coded in an iterative process in order to deconstruct, interpret and consolidate the data into themes (Merriam, 1998; Stake, 1995; Yazan, 2015; Yin, 2013). The data analysis process occurred throughout the research and intensified once data collection was complete as connections could then be made among the data obtained from the different methods through triangulation (see Merriam, 1998, p. 155). The overall process of analysing the data followed Creswell's framework (see figure 26).

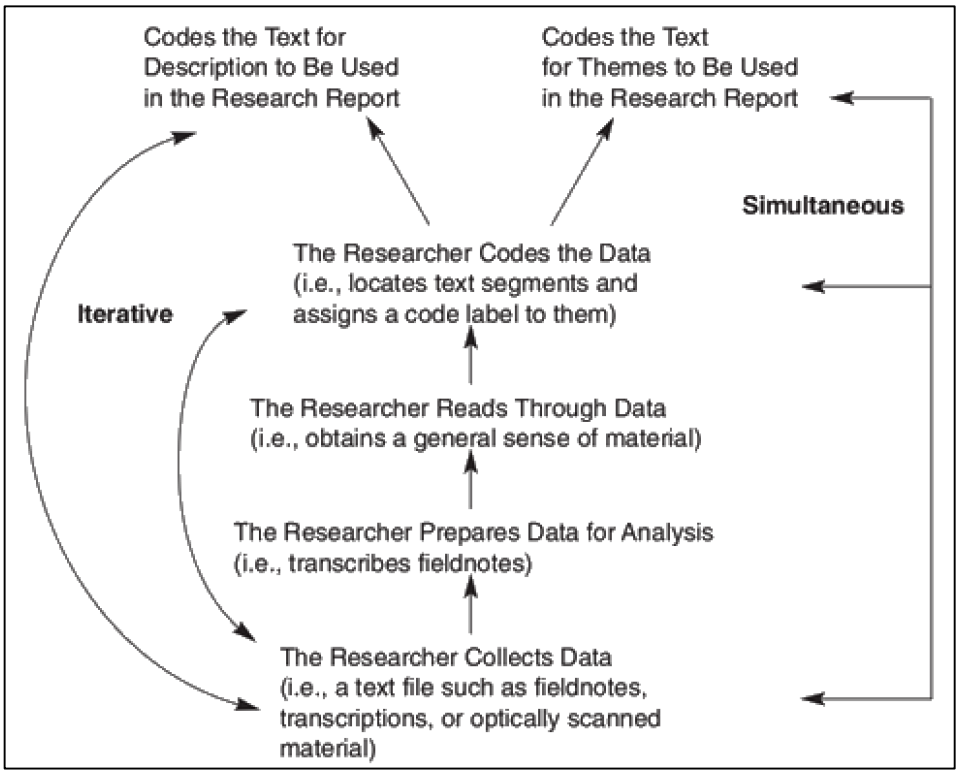


Figure 26. The qualitative process of data analysis (Creswell 2014, p. 261).

5.4.2 TSE Scale Analysis Process

The results from the initial and concluding TSE scale were compared and responses with partial data were identified. Average values for each of the 10 items were obtained from both the initial and concluding scale. These averages were then compared between the initial and concluding TSE scale for each item to identify changes in TSE under different circumstances.

5.4.3 Qualitative Survey Analysis Process

Results from the qualitative survey were imported into OneNote and responses were read to sensitise the researcher to the data and to assist in the formulation of questions for the interviews. This process was also designed to inform the selection of participants for interview through purposeful sampling based on availability and survey responses. For example, one participant was selected for interview as she indicated that she had never implemented active learning tools in a VLE before but planned to use them for a new module and another was selected as he indicated that he found the self-paced nature of the artefact to be useful but cited the lack of social interaction as a possible limitation compared to a workshop. After the interviews were conducted and coded for themes, the survey data was then re-examined in light of the themes generated from the interviews. Directed coding was used to code the survey data based on the themes that emerged from the interviews (see figure 27). The process of triangulating the survey and interview data is summarised in figure 28.

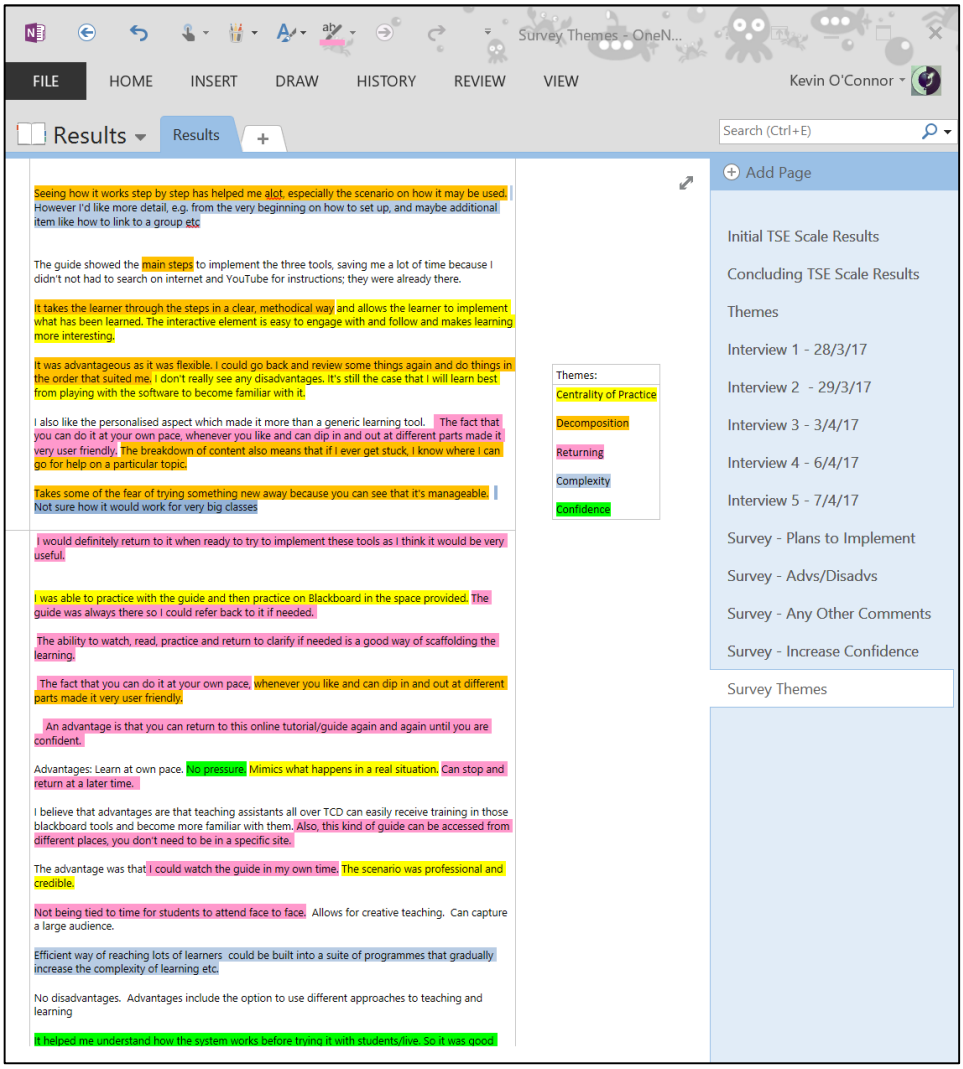


Figure 27. Directed coding of survey responses.

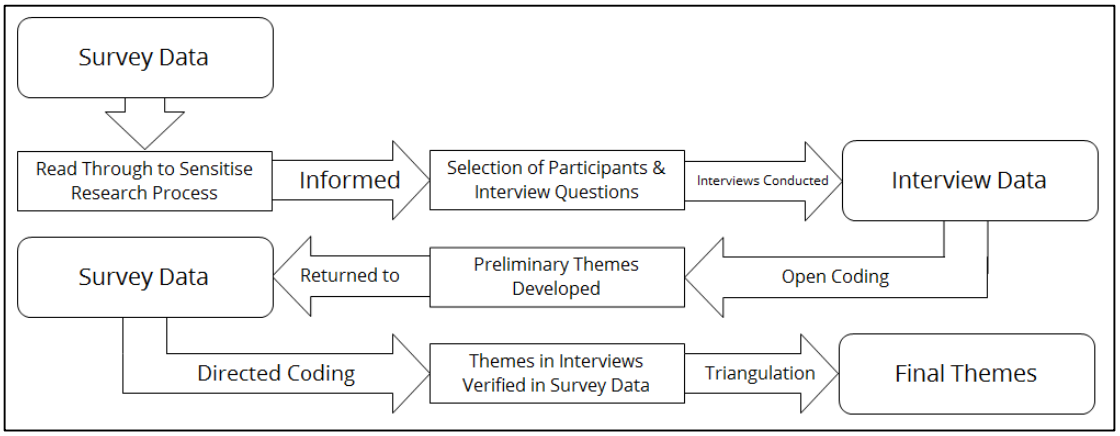


Figure 28. Triangulation of survey and interview data to develop themes.

5.4.4 Interview Data Analysis Process

The goal of the interview analysis process was to develop a conceptual abstraction of the concepts discussed by the 5 participants. The interview data was first segmented using open coding which was then developed into the themes reported in the findings section. Coding followed Creswell's visual model (see figure 29) with the ultimate goal of creating meaning out of the data interpretation process (Stake, 1995, p. 71).

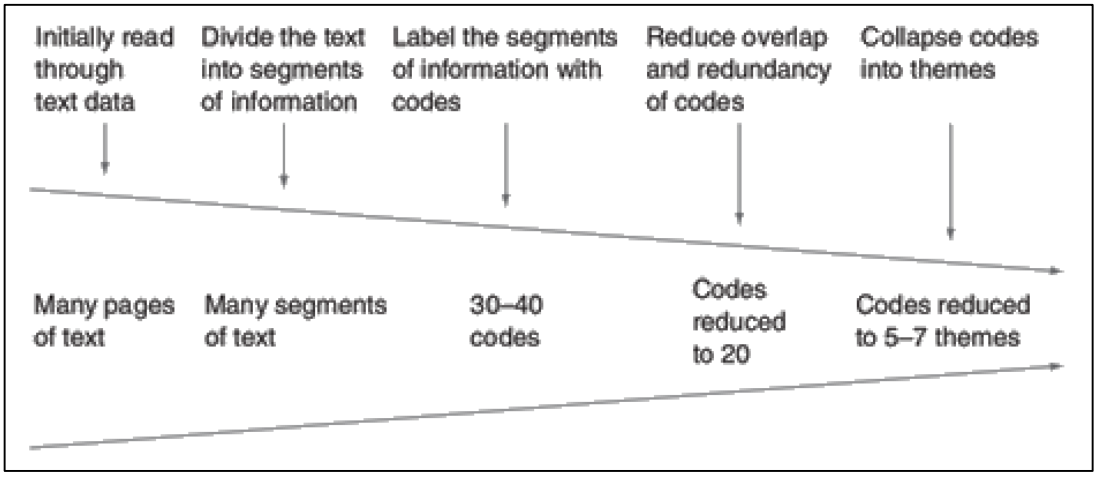


Figure 29. A visual model of the coding process in qualitative research (Creswell, 2014, p.268).

Audio coding was used in lieu of text coding due to the limited timeframe of the research. A limitation of audio coding is that it can feel less tangible compared to text coding and it can be difficult to locate key segments and phrases (Wainwright & Russell, 2010, p. 3). To mitigate these issues, the researcher used a stylus to code the audio waveforms in OneNote in a similar manner to text coding (see figure 30). As audio coding was used, the codes were somewhat longer than standard codes to give sufficient context to the code. Examples of how these codes were used to develop themes are given in table 6, figure 31 and figure 32 below with the themes described in more detail in the findings section.

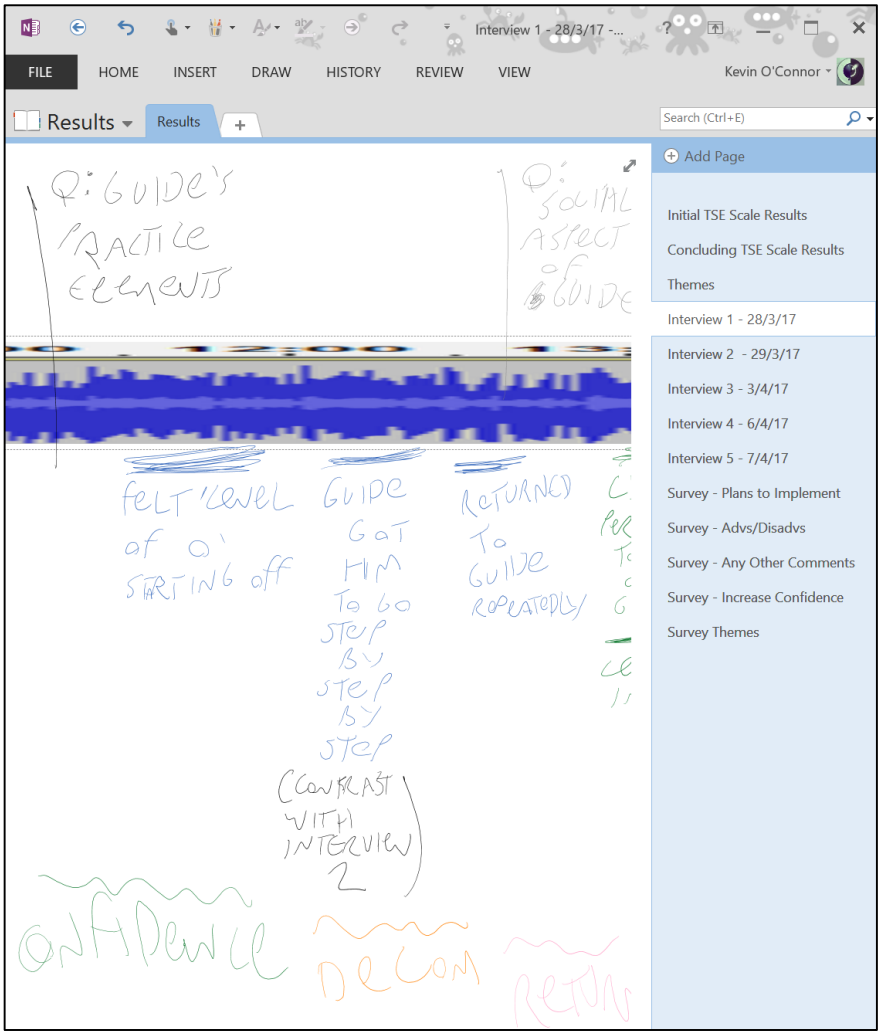


Figure 30. Audio coding in OneNote.

Theme	Shorthand	Examples of Codes
Increased Technology Self-Efficacy	Confidence	• Enhanced confidence (P24) • Feels much surer to use it (P24) • More comfortable (P13) • Addressed "will I be able to do it" (P20)
Opportunities for Authentic Practice	Practice	• Able to apply it (P22) • Whereas workshop you don't apply it you forget (P22) • She put the "real thing": correct name, instructions and dates (P13) • Dynamic is the way to go (P25)
Decomposition of Tasks	Decom	• "step by step by step" (P24) • Goals a good way to make her follow the steps (P13) • Realisation that it was simpler than you thought it would be (P20)
Returning & Repeating	Return	• Could stop and come back (P20) • Could go back on it (P22) • Returned to guide repeatedly (P24)
Complexity & Diversity of Teaching Contexts	Complex	• Always need social support (P25) • Guide assumes she has full autonomy in her teaching (P13) • Constructive alignment (P24)

Table 6. Example codes used to form themes from the audio coding process.

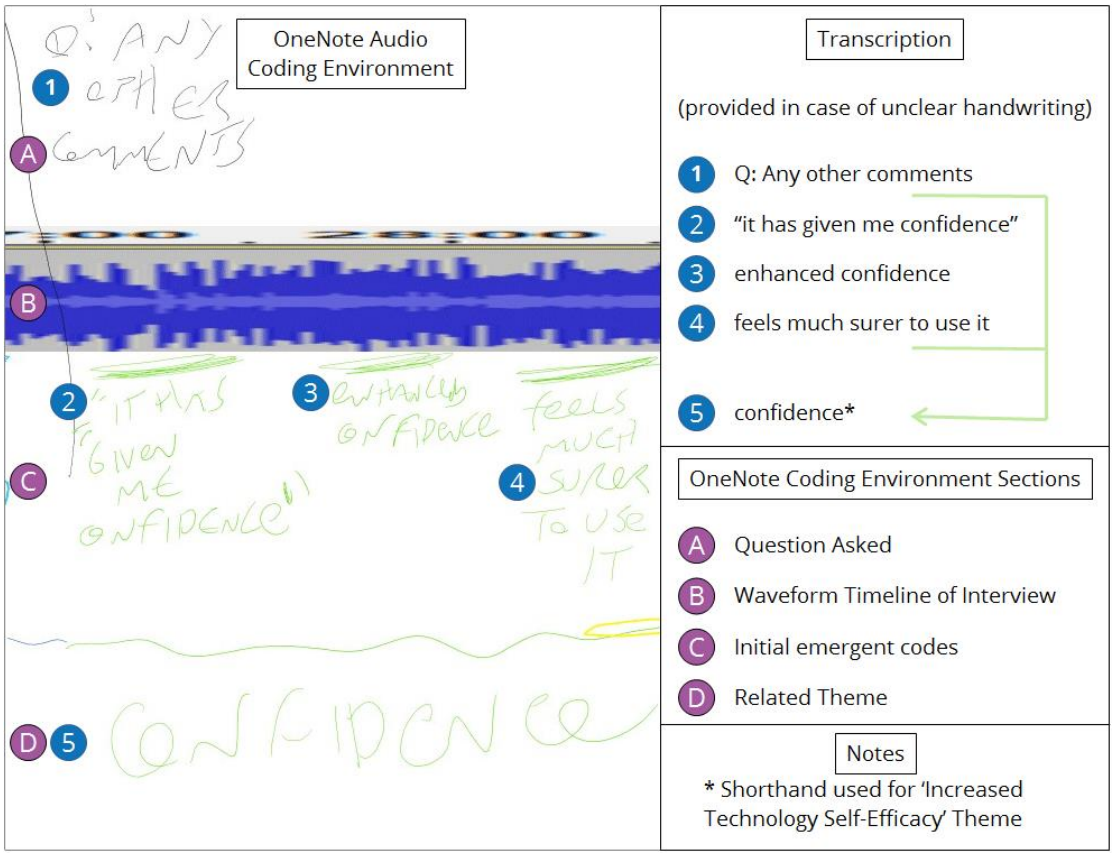


Figure 31. Annotated audio coding example from interview with Participant 24.

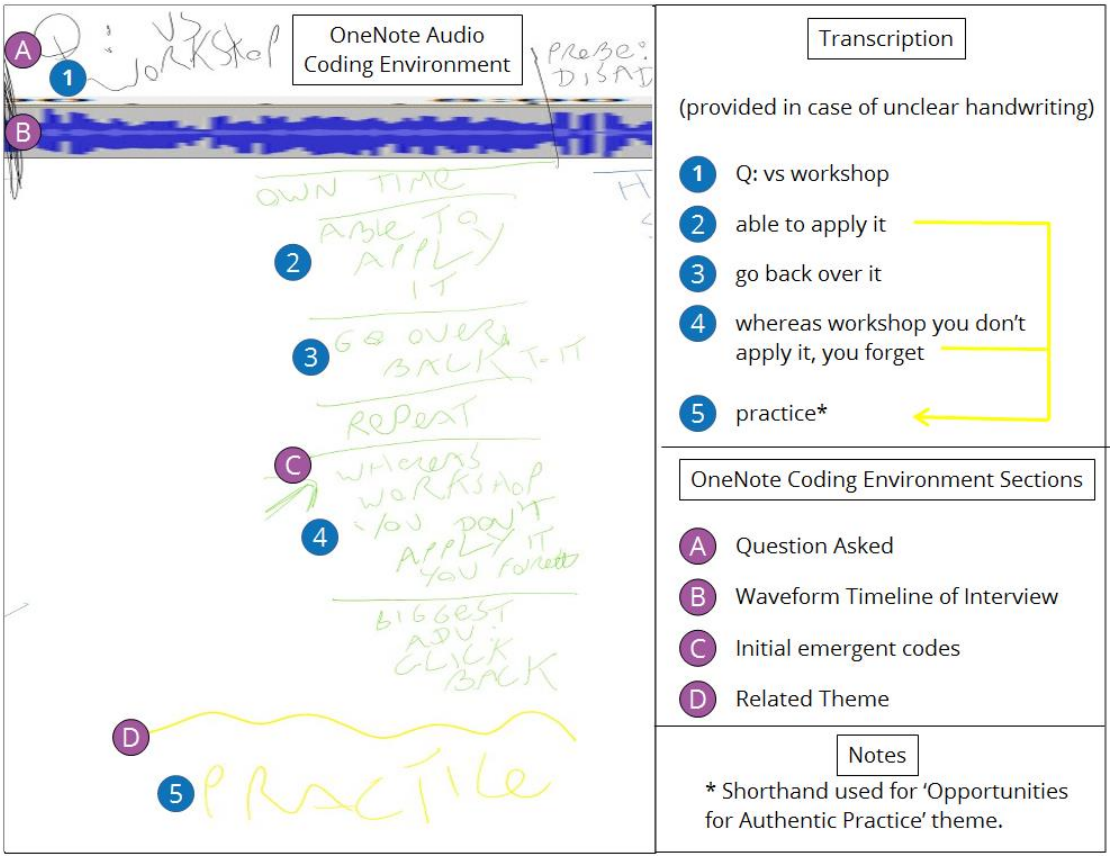


Figure 32. Annotated audio coding example from interview with Participant 22.

5.4.5 Data Validation

Steps were taken to validate the findings reported in this chapter. Firstly, the qualitative and quantitative data sources were triangulated to establish the themes based on the convergence of data across all methods (Creswell, 2013, p. 201). For example, through the triangulation of interview and survey responses the theme of 'Increased Technology Self-Efficacy' was developed which was in turn triangulated with the results of the TSE scale to verify this theme (see 5.6.1). Secondly, member checking was used to verify the accuracy of findings (Creswell, 2013, p. 201). Interview quotations were checked with participants in terms of the accuracy of both the transcription and interpretation. As the majority of interpretations were based on multiple participants' responses, other participants were sent summaries of the findings and asked to verify the accuracy of the conclusions based on their experiences. The research also addresses issues of reflexivity (see 4.6 and 6.2), presents discrepant information and used peer debriefing (see Creswell, 2013, p. 202).

5.5 Participant Demographics

The 28 participants were recruited from a variety of roles. 20 participants were academics within the college, 3 were teaching assistants and 5 had an administrative role in supporting teaching within their school. 25 of these participants completed the final survey and scale. In the survey participants were asked how many times they had previously implemented an active learning tool in Blackboard – see table 7 below.

How many times have you implemented an active learning technology within Blackboard prior to this study? (for example a blog/online journal/wiki/discussion board or other tool that allows students to interact with each other).		
Answer Choices	**Response Number**	**Response Percentage**
0 times	8	32%
1-2 times	8	32%
3-4 times	2	8%
More than 4 times	7	28%
Total	25	100%

Table 7. Participants' previous experiences of implementing active learning tools.

5.6 Findings

Through the analysis and triangulation of the TSE scale, survey and interview responses the following themes emerged:

- Increased Technology Self-Efficacy
- Opportunities for Authentic Practice
- Decomposition of Tasks
- Returning and Repeating
- Complexity and Diversity of Teaching Contexts

This section will present the findings of the research through these themes followed by a discussion which advances a conceptual understanding of the effect of the artefact and in turn addresses the research purpose.

5.6.1 Increased Technology Self-Efficacy

Participants' responses strongly indicated an increase in their TSE with frequent references to 'confidence.' As noted in 2.5, self-efficacy and confidence are not completely analogous but they are used interchangeably in this section as confidence is the colloquial equivalent of self-efficacy. In response to the question 'has the interactive guide increased your confidence in implementing active learning tools in Blackboard as part of your teaching or professional practice?' 100% of the 25 participants answered yes and either agreed or strongly agreed that the artefact and its scenario were an effective means of learning how to implement active learning tools within Blackboard (see table 8 below).

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
The interactive guide was an effective means to learn how to implement active learning tools within Blackboard.	**0%** 0	**0%** 0	**0%** 0	**40%** 10	**60%** 15	25
The scenario-based approach of the guide was an effective method of learning.	**0%** 0	**0%** 0	**0%** 0	**44%** 11	**56%** 14	25

Table 8. Level of agreement on the effectiveness of the artefact.

The pre and post technology self-efficacy scales were then examined and the results were tabulated (see table 9 below). 26 participants completed the initial scale and 25 completed the concluding scale approximately 2 weeks later. 2 of the 10 items in the initial scale were not completed by 2 different participants and it was also not possible to identify the participant who had not completed the concluding scale. Thus the table below provides the average values for each of the 10 items and highlights cases of partial data. Appendix 8 supplies the full results of both the initial and concluding scales for reference.

I could use the new technology…	Initial TSE Scale Average (n = 26)	Concluding TSE Scale Average (n = 25)	Change	Change Percentage
1. If there was no one around to tell me how to implement it in Blackboard	4.77	6.72	+1.95	+40.88%
2. If I had never used an active learning technology like it before	4.32*	6.08	+1.76	+40.74%
3. If I only had a PDF guide for reference	6.19	6.76	+0.57	+9.21%
4. If I had seen a colleague implement the technology in their own Blackboard module before trying it myself	7.00	7.80	+0.80	+11.43%
5. If I could call someone for help if I got stuck	7.92	8.36	+0.44	+5.56%
6. If someone else helped me get started	8.12	8.36	+0.24	+2.96%
7. If I had a lot of time to implement the technology in Blackboard	7.36*	7.76	+0.40	+5.43%
8. If I just had an online tutorial for assistance	7.77	8.33	+0.56	+7.21%
9. If I watched a video that showed me how to do it first	7.96	8.36	+0.40	+5.03%
10. If I had used similar technologies before this one to implement the same activity	8.27	8.04	-0.23	-2.78%
Note: results have been rounded to 2 decimal places. * Completed by 25 of the 26 participants				

Table 9. Average of responses to the technology self-efficacy scale.

While the results of the TSE scale cannot be considered definitive due to the issues described above, it indicated a significant increase in participants' perceptions of their ability to implement new active learning tools (40.74%) independently of social support (40.88%). Other items had smaller increases and there was one decrease; these are likely due to the fact that the starting values for these items were higher initially. These higher values suggest that participants felt more capable of implementing the tools if the correct social and technical support structures were in place. Due to the partial nature of the data obtained, the scale was used primarily to provide an overview of participants' TSE levels which informed the analysis process but was not in itself conclusive.

Responses to the survey and interview questions supported the quantitative data with several references to the perception that the artefact made participants feel more confident in using the active learning tools; for example: ‘I haven't had experience of using blogs or reflective journals so I found this tutorial very useful in learning how to use them and made me feel more confident that I could use them effectively’ (P17). There were no negative comments relating to the artefact’s effect on confidence. The triangulation of qualitative and quantitative data thus provided a strong indication that the artefact had a positive impact on participants’ TSE.

5.6.2 Opportunities for Authentic Practice

It was apparent that the practice elements of the artefact were viewed as being effective with the perception that the artefact ‘mimics what happens in a real situation’ (P14) and that this ‘encouraged participation’ (P1) through a scenario which was perceived as ‘professional and credible’ (P23). These elements were connected to the concept that some participants could practice with the artefact and thus did not feel ‘pressure’ (P14) when learning how to use it.

Several participants suggested that the opportunities for authentic practice provided a way for new learners to begin to practice the elements required to implement the VLE’s tools with their students. Participant 24 cited a lack of practice as a major barrier to using technology and felt that using the artefact had given him the confidence to use the tools and discussed plans to use webinars later in the year. Similarly, Participant 22 valued the fact that she could work through the artefact in her own time and was able to apply what she learnt. She contrasted this to a workshop where she felt that she often does not apply what she has learnt and thus forgets what to do.

There was also some feedback that the artefact did not provide a way to practice more complex situations such as how a webinar's activities could follow on from a blog task. Thus some participants believed that the approach taken in the artefact would be of more help for "neophyte" (P25) learners but not necessarily for more complex implementations. Participant 25 suggested that for more experienced educators there could be content in the artefact that is at a higher level. This suggested that the artefact's practice elements were viewed positively for learners new to the tools – something that 'guides the beginner from knowing nothing of the learning tool to being able to use it in an effective manner' (P16) – but need to be supplemented by other interventions for instructors wishing to explore more pedagogically complex implementations involving multiple technologies in combination.

5.6.3 Decomposition of Tasks

Decomposition of tasks – also referred to as articulation of learning skills – is a concept in situated learning that involves separating a complex task into sub-components to support learning (McLellan, 1996, pp. 8, 48). The inclusion of goals (such as creating a reflective journal) which were comprised of multiple smaller tasks (such as creating instructions for students) was cited as a positive with several references to the "step by step by step" (P24) nature of the artefact involving the 'breakdown of content' (P16) which provided a 'nice sense of achievement' (P1). This indicated that the decomposition of tasks was of benefit in enabling participants to conceptualise the elements required to implement the tools within the VLE.

The decomposition of tasks was in turn connected to a reduction in some participants' perceptions of the difficulty of implementing the tools. Participant 20 felt that

this aspect ‘takes some of the fear of trying something new away because you can see that it's manageable.’ This ‘manageable’ concept was emphasised by Participant 20 in the interview also when she discussed possible plans to implement webinars as part of a peer tutoring programme. She had not previously facilitated a webinar but now planned to do so as she now believed that it was a “much simpler process than I thought it was going to be” (P20).

However, as with the previous theme, the ‘step by step’ nature of the guide had some perceived drawbacks when being used to explore more complex uses. Participant 25 suggested that as learners become more familiar with a technology the focus on steps is less helpful because the learner may wish instead for the instruction to be at a higher level. She suggested that there could be a more advanced version of the artefact for those who were more experienced in the basic steps.

5.6.4 Returning and Repeating

The fact that participants could return to the artefact and repeat steps was frequently cited as being of benefit in terms of increasing confidence. There were two dimensions to this: firstly, that individuals could repeat tasks until they were confident that they knew the steps involved and secondly that individuals could return to the artefact as they got closer to implementing the tools. These two aspects were cited as being particularly advantageous compared to a workshop with the concept that ‘the guide was always there’ (P22) being emphasised.

The opportunity to repeat tasks in the artefact was frequently cited as being advantageous in terms of building confidence. Participant 25 suggested that ‘the ability to watch, read, practice and return to clarify if needed is a good way of scaffolding the

learning' and Participant 19 commented that 'an advantage is that you can return to this online tutorial/guide again and again until you are confident.' The ability to "click back" (P22) through the artefact and repeat tasks was tied to reducing anxiety as some participants felt that it meant they could be prepared before using the tools with students; as Participant 4 noted: 'it helped me understand how the system works before trying it with students/live. So it was good practically because I could learn at my own pace, stop and start, re-listen. And could implement it when I was fully ready.'

There were no perceived disadvantages at a conceptual level of this ability to return and repeat tasks, however there were some comments relating to the artefact's implementation. The artefact tracks progress using a cookie which means it is not possible to resume progress from a different computer which Participant 6 found to be 'a little frustrating.' This limitation is highlighted in the conclusion chapter.

5.6.5 Complexity and Diversity of Teaching Contexts

The artefact included a narrative involving students on placement which was intended to support cognitive apprenticeship whereby participants could practice through this scenario, receive coaching and apply the concepts to their own teaching. This element was viewed positively by many participants in terms of linking practice with theory. However, for some participants there were issues around applying some concepts to their specific teaching context.

The contextualised instructions provided by the coach character (Remy) were emphasised by participants as being beneficial – for example, Participant 5 remarked that 'it has all three elements I needed to start using something - theories behind, practical know-how and technical information.' Participant 22 reported that the contextualised instructions

provided a “rationale” for selecting specific settings which would give her the “confidence” to use those settings in her own teaching. Participant 20 echoed the participant in Jackson’s 2014 study (see 2.8.2) when she contrasted this contextualised instruction to guides which she believed focused too much on technical features: “you’ll have a button with ‘BC’ written on it and the technical guide will say ‘this is the BC button that controls the BC’ and it’s completely useless but I was struck by this that it did anticipate exactly what you would want to know and answered appropriately.”

However, it was apparent that the contextualised instructions and video examples were not relevant for some participants. Some participants did not agree with the pedagogical choices in the videos from other universities or with the advice given by Remy in terms of creating reflective journals. This was due to different factors such as differences in class sizes, level of instructor autonomy, concerns about students’ technical knowledge, pedagogical choices and perceived usefulness of some tools such as reflective journals for some subjects. This suggested that the artefact had a limited effect in terms of social modelling (seeing peers succeed through effort) due to differences between the examples provided and an instructor’s specific teaching context. As the artefact was used in isolation from peers there was no space to discuss these differences or specific requirements.

These findings suggest a disadvantage to the artefact compared to a workshop which would provide a space for instructors to discuss different approaches and strategies with each other and the facilitator. Participants referred to the fact that support would need to be available for instructors to discuss their specific needs after using the guide. These comments support the finding that for some participants more social support will be needed to discuss more specific or complex requirements.

5.7 Discussion

Based on the findings above it is possible to advance a conceptual understanding of the effect of the situated learning artefact and its limitations. A situated learning artefact can provide instructors with multiple opportunities to practice through the repeated completion of tasks and goals. This process can persuade an individual of their ability to use these tools (social persuasion) and provides mastery experiences which in turn increases their TSE and reduces their anxiety towards implementing active learning tools with their students. However, for some instructors the cognitive apprenticeship process may not be fully effective as their teaching context may differ significantly from the artefact's scenario. This cannot be remedied by the artefact alone and thus some instructors may require additional social support. This conceptual understanding is summarised in figure 33 below.

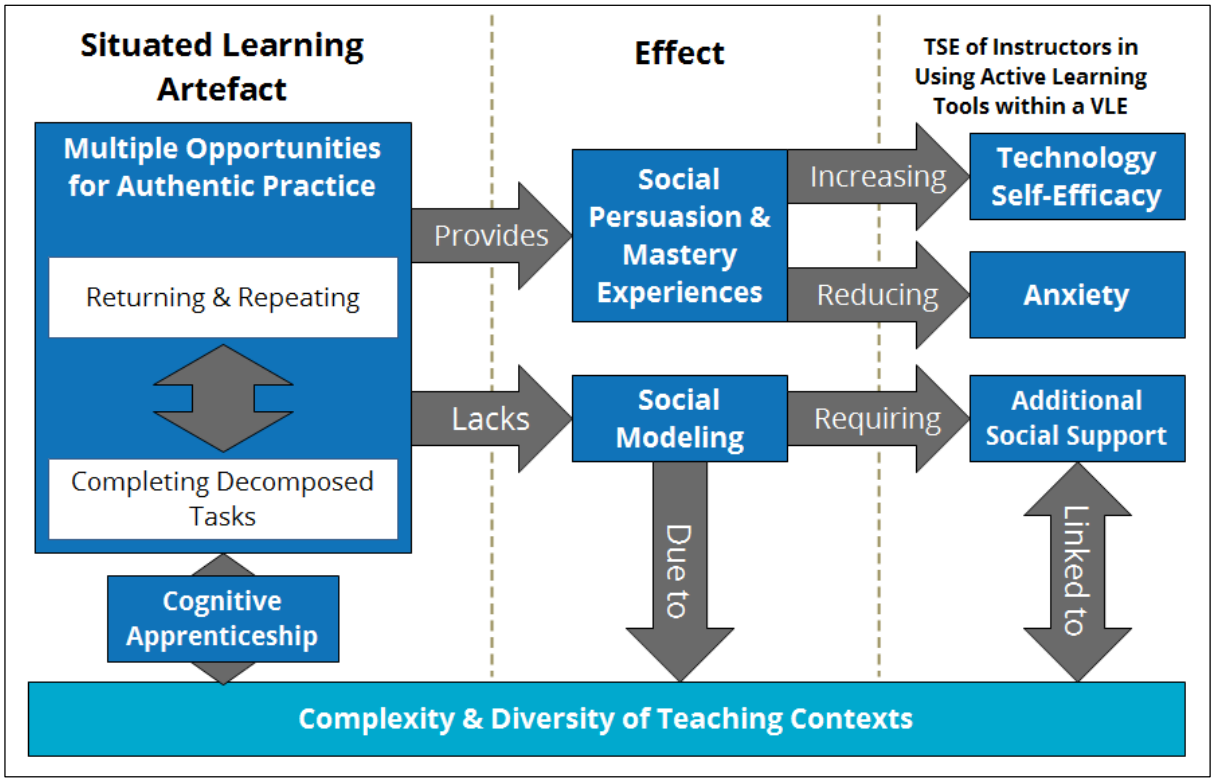


Figure 33. Conceptual understanding of the effect of the artefact on TSE.

The conceptual understanding of the effect of the artefact seen in figure 33 was then synthesised with table 3 in section 2.9.1 (which outlined the principles of situated learning and elements required to increase technology self-efficacy). This process was used to generate a summary of the research findings (see table 10 below) which would be used to assist in addressing the research questions.

Principles of Situated Learning (based on McLellan 1996)	**Findings of this Research Relating to the Artefact Under Investigation**	**Effect of the Artefact on Technology Self-Efficacy**
Opportunities for multiple practice	Frequently cited as beneficial by participants, particularly the ability to return to the artefact repeatedly	Provides mastery experiences
Collaboration and social practice Using narratives to frame the learning process	The coaching character and examples from other instructors provided a degree of social modelling but a further social element is needed to allow instructors to discuss specific requirements with peers and/or support staff	Provides limited social modelling (seeing peers succeed through effort)
Cognitive apprenticeship and coaching whereby instructors feel able to apply what was learnt during professional development to their teaching context	Practicing within the artefact provided an increase in instructors' TSE	Provides social persuasion (persuading an individual of their abilities through self-improvement rather than competition)
Articulation of learning skills which involves separating out the different components of a task into manageable parts Provision of opportunities for reflection	Articulation/decomposition of large tasks into smaller tasks made the process appear 'manageable' The frequent references to plans to use the tools after using the artefact suggests a degree of reflection among participants	Reduces anxiety

Table 10. Summary of findings.

This conceptual understanding and the findings presented in table 10 are supported by 20 of the participants indicating that they planned to implement active learning tools in Blackboard as a result of participating in this study (2 participants skipped this question and 3 responded with no). Participants discussed potential uses of blogs, journals and webinars

such as building online communities for academic skills or hosting webinars for part-time students or to support peer learning. These findings and responses thus make it possible to address the research purpose.

5.8 Addressing the Purpose of the Research

The purpose of this research is to explore how a situated learning approach to professional development may be effective in increasing instructors' technology self-efficacy in the use of active learning tools within virtual learning environments. This section will address the research questions related to this purpose in light of the findings above.

How can an artefact designed under the principles of situated learning be used to increase instructors' technology self-efficacy in the use of active learning tools within a VLE?

A situated learning artefact can provide multiple opportunities for authentic practice through a narrative situated in a realistic context. These elements can persuade instructors of their ability to implement a VLE's tools through completing authentic tasks and goals which reflect their teaching context. This increases their TSE towards using the tools in their own teaching and reduces anxiety as they practice and gain experience of the tools.

What are the advantages and disadvantages of this approach?

The primary advantage is that it provides instructors with multiple opportunities to practice by repeating decomposed tasks which can provide social persuasion and mastery experiences and in turn increase TSE. Contextualised instructions and narratives also assist in cognitive apprenticeship as they provide an authentic context to the practice elements.

The disadvantage is that while the artefact allows for cognitive apprenticeship, its content is not be applicable to some instructors' specific teaching context. Instructors with specific pedagogical requirements cannot explore these through an artefact alone and thus may need additional social support from peers and/or support staff.

What are participants' perceptions of the remaining barriers to adopting active learning tools?

The perceived remaining barriers to adopting active learning tools related to an instructor's specific teaching context such as their autonomy in curriculum delivery, the technical knowledge of their students, issues around class size and perceptions of the efficacy of some tools in some subject areas. Given the diversity of teaching contexts it is not possible to capture all the specific issues expressed by individual instructors but this aspect does point to the need for additional social support.

5.9 Conclusion

As outlined in 2.9, this study focused on creating an artefact under the psychological perspective of situated learning which focuses on individual cognition. It is apparent that this approach was considered by participants to be an effective way of increasing TSE in using a VLE's active learning tools, particularly for those new to using the tools. However, for some instructors, additional social supports are required. The next chapter will discuss these findings with reference to findings from other research studies before discussing the limitations of this study and highlighting possibilities for future research.

Chapter 6: Conclusion

6.1 Research Findings

This research explored the potential of a situated learning intervention to increase the technology self-efficacy of instructors in the use of active learning tools within virtual learning environments. The research findings suggest that a situated learning artefact has significant potential to increase the TSE of instructors in using a VLE's active learning tools by providing multiple opportunities for authentic practice which in turn provides social persuasion and mastery experiences. These findings support Bell's conclusion that CPD which incorporates elements of situated learning may be more effective than traditional CPD interventions (2013, pp. 369-375). The findings also supports Falconer's conclusion that artefacts designed under the principles of situated learning can support learners in making the connection between theory and practice by providing an authentic environment in which to practice (2013, p. 13).

6.2 Research Limitations

Lack of a Social Dimension

The main limitation of this research is that it lacked the social aspects of Bell's face-to-face and Falconer's virtual world interventions. Participants engaged with the artefact in isolation and thus did not have a space to discuss experiences or their teaching contexts with others. Despite this, the research contributes to the debate on how the efficacy of CPD can be enhanced through interventions which focus on providing participants with multiple opportunities for authentic practice through the use of an online artefact. It also highlights the potential of situated learning interventions for increasing the technology self-efficacy of instructors in higher education.

Time Span

Another key limitation of the research is the time span in which it was conducted. This research attempted to address the criticism of decontextualized, one-off events which do not provide opportunities for authentic practice (Lawless & Pellegrino, 2007, p. 594). However, it was not possible to follow up with participants in terms of whether the intervention's impact on participants' TSE increased the extent of their actual technology use. This was because the research was conducted in the midst of the teaching term and thus participants were unlikely to change their module within this timeframe or before the start of the next academic year.

Focus

An additional limitation of the research is its narrow focus on the external variable of TSE. As seen in some of the responses, in an educational context, technology acceptance will also be contingent on instructors' pedagogical choices, context, beliefs and motivations for using technology in teaching (see Hamilton et al., 2016). While these complexities are inherent in conducting educational research (see Berliner, 2002, p. 18), this research recognises that the focus on individuals' perceptions omits the full picture of institutional and structural factors that ultimately influence actual VLE use in addition to TSE.

Methods

It was not possible to obtain some quantitative data due to limitations in the implementation of the artefact and TSE scale. Articulate Online, the hosting platform used in this research, is primarily designed for linear presentations where progression through a package's slides constitutes completion. However, the artefact used in this research is non-linear in nature and the triggers and variables used to track goal completion are not reported by the Articulate Online platform. To overcome this limitation, the artefact would need to be redesigned to incorporate aspects such as the Sharable Content Object Reference Model

(SCORM) standard which allows for more detailed reporting and tracking of participants' progress. The lack of SCORM support also meant that participants could only save their progress via a cookie and thus could not resume the artefact on another computer. Similarly, the implementation of the technology self-efficacy scale could be further improved, particularly in terms of tracking the change in TSE of individual participants.

Reflexivity

There is an element of reflexivity in some of the findings given the emic nature of the research. This is due to the fact that the researcher has a professional relationship with participants, many of whom were aware that the researcher had constructed the artefact under investigation. The researcher attempted to mitigate this by remaining alert to his role and by attempting to develop a rapport with participants so that they would feel free to report their perceptions as openly as possible (DiCicco-Bloom & Crabtree, 2006, p. 316). However, it is still likely that the researcher's role may have influenced some of the participants' responses and also the data analysis process.

6.3 Recommendations for Future Study

Based on the findings and limitations of this study, several directions for future research are indicated. Firstly, a longer-term comparative study in which one cohort attends workshops and another practices using the artefact would be of value in comparing outcomes in terms of TSE levels and actual VLE use among instructors. The research also indicates the possibility of exploring situated learning approaches with reference to other aspects of the Technology Acceptance Model. There is also a need for further ethnographic research into the structural and managerial factors that can promote or inhibit the extent of VLE use – such as the value key stakeholders place on technology-enhanced teaching approaches and the associated incentives for instructors (see Jackson 2014).

6.4 Conclusion

In their 1992 article on situated learning, Brown and Duguid pointed to an apparent discrepancy in how individuals learn to use technology. They noted that individuals could operate an incredibly complex and potentially dangerous technology – a car – yet often struggled to operate simpler technologies such as video recorders. To explain this, they pointed to the fact that learning to drive was an inherently social experience; even when practicing in isolation an individual is aware of the social context in which they will be driving. Conversely, learning to use other technologies was often difficult because the learning process is decontextualized and abstracted from an authentic context (see 'Stolen Knowledge' by Brown and Duguid in McLellan, 1996).

Using Brown and Duguid's example, we can conceptualise the same issues in terms professional development for instructors. Institutions thus need to recognise that professional development which simply imparts abstract information – what each button does – is unlikely to increase instructors' technology self-efficacy. Situated learning offers a potential theoretical framework to address this problem through its focus on authentic practice where, even when practicing in isolation, individuals are aware of the wider social context. This can be achieved either through artefacts such as the one used in this study – analogous to driving simulators in that they provide individuals with multiple opportunities to practice in as authentic a manner as possible – or face-to-face interventions which have a greater focus on the context in which individuals use technology – analogous to a driving instructor who coaches the learner within an authentic social milieu. Through a situated learning approach to professional development we can potentially provide instructors with the self-efficacy to 'take the wheel' and use technology to improve student outcomes on their educational journey.

Appendices

Appendix 1: Artefact Details

Articulate Online was originally used to host the artefact but this was discontinued after the research was complete due to the cost of hosting. The intention is to host the artefact on Trinity College Dublin's Academic Practice & eLearning site from summer 2017 onwards. However, as of the time of writing, the site's URL is due to change in mid-May so for the purposes of evaluating the artefact used in this study, the artefact has been uploaded to the following mirrors below.

Mirror #1: http://tinyurl.com/tcd-dissertation
(Hosted via TCD's Blackboard system. Click on the 'Active Learning Technologies in Blackboard' link to access the artefact)

Mirror #2: http://www.oldenglishcorpus.com/dissertation/story.html
(Hosted via a personal website)

Mirror #3: https://dl.dropboxusercontent.com/u/24472155/dissertation/story.html
(Hosted via Dropbox. Note: loading times may be longer in this Dropbox mirror)

Note: it is possible to resume your progress if the artefact is accessed using the same link and web browser.

Browser Compatibility

The artefact is designed to run using Google Chrome or Firefox using Flash. Other browsers such as Safari, Internet Explorer and Edge were tested without issue but Chrome and Firefox were recommended to participants to reduce the potential support issue of variations across browsers.

Mobile and HTML5 versions of the artefact were created but only the Flash version was deployed to reduce the amount of testing required in piloting the artefact and conducting the research. The intention is for these versions to be available at a future date.

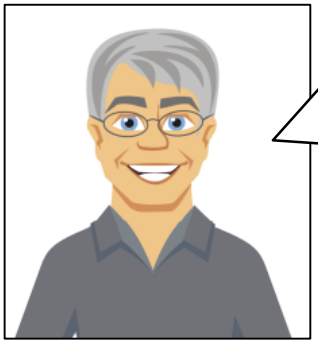
Blackboard Learn Details

The artefact is designed to replicate Trinity College Dublin's Blackboard Learn Q2 2016 environment as of April 2017. The address for Trinity's Blackboard system is mymodule.tcd.ie

Reference Sheet

A reference sheet was also provided to participants which summarised the elements of the study (see page below). Please note some of the links in the reference sheet may no longer be available as they point to the Articulate Online platform.

Research Study Reference Sheet



Hello! My name is Professor Crux. I'd like your help with implementing reflective journals, blogs and webinars for students on placement. Read on to find out how to get started. Then come and see me in my office in the interactive guide.

Summary

1. First, complete the brief (3-4 minutes) **survey** on your confidence in using Blackboard's tools
2. Then, try to complete the goals within the **interactive guide**
3. Use the Blackboard practice module if you'd like to test any of the tools covered in the guide
4. Practice with the guide over the next two weeks
5. At the end of the two weeks I'll send you a link to the final survey

1. Survey Details

Address: https://surveymonkey.com/r/activelearningtools

(Complete this brief survey first)

2. Interactive Guide Details

Address: http://tinyurl.com/tcdactivelearningtools

(Try to complete the different goals within the guide)

3. Module Details

Name: ActiveLearningTools (access via https://mymodule.tcd.ie)

(Use this module to practice further with the Blackboard technologies covered in the guide)

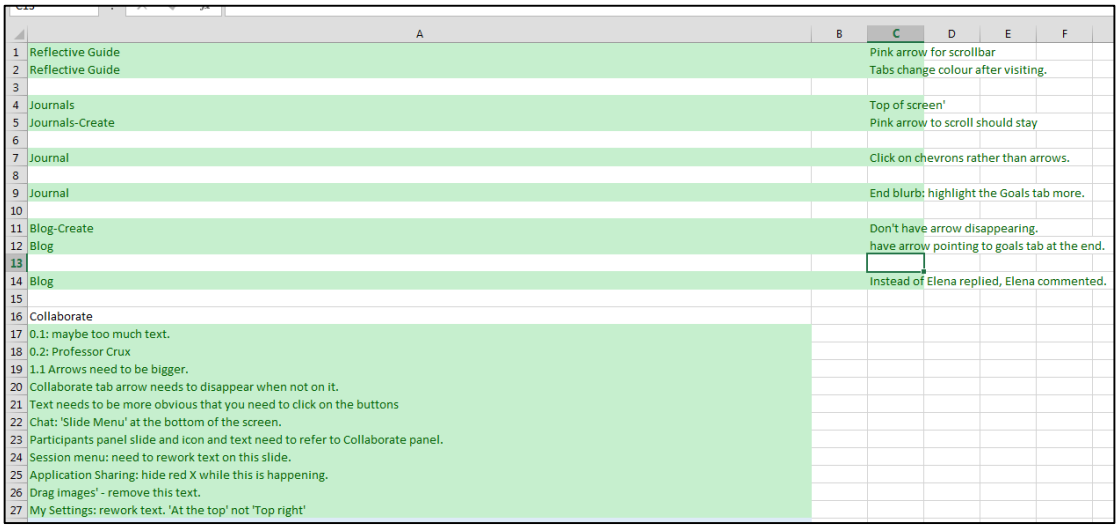
4. Help & Support

- Google Chrome or Firefox are recommended for using the guide
- If you have any issues or queries please email me (kevin.oconnor@tcd.ie)

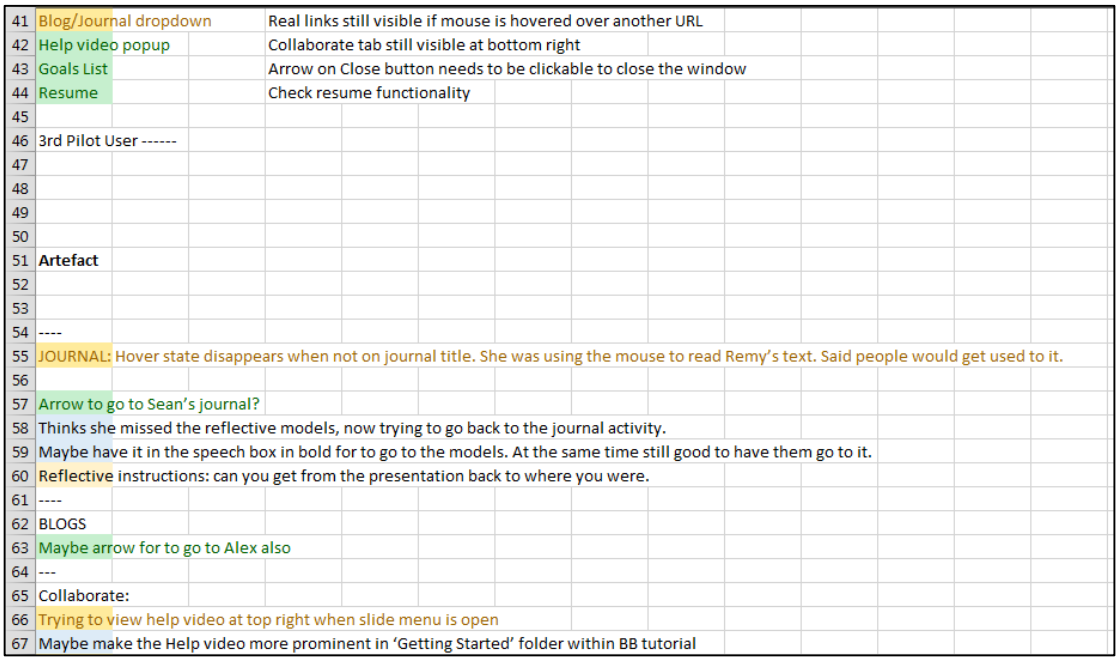
Appendix 2: Testing Matrix

Illustrative screenshots of the testing matrix used to track and resolve technical and instructional issues with the artefact during the pilot process. Three pilot users were observed as they engaged with the artefact and the researcher noted issues in an Excel spreadsheet. Issues were then updated with colours based on their status:

- Green indicates that the issue has been resolved
- Blue indicates that the user encountered a temporary issue with navigating the guide/deciding where to go next but was able to continue
- Yellow indicates a 'known shippable' issue – i.e. a minor bug which cannot be amended due to limitations of the Articulate software



	A	B	C	D	E	F
1	Reflective Guide		Pink arrow for scrollbar			
2	Reflective Guide		Tabs change colour after visiting.			
3						
4	Journals		Top of screen'			
5	Journals-Create		Pink arrow to scroll should stay			
6						
7	Journal		Click on chevrons rather than arrows.			
8						
9	Journal		End blurb: highlight the Goals tab more.			
10						
11	Blog-Create		Don't have arrow disappearing.			
12	Blog		have arrow pointing to goals tab at the end.			
13						
14	Blog		Instead of Elena replied, Elena commented.			
15						
16	Collaborate					
17	0.1: maybe too much text.					
18	0.2: Professor Crux					
19	1.1 Arrows need to be bigger.					
20	Collaborate tab arrow needs to disappear when not on it.					
21	Text needs to be more obvious that you need to click on the buttons					
22	Chat: 'Slide Menu' at the bottom of the screen.					
23	Participants panel slide and icon and text need to refer to Collaborate panel.					
24	Session menu: need to rework text on this slide.					
25	Application Sharing: hide red X while this is happening.					
26	Drag images' - remove this text.					
27	My Settings: rework text. 'At the top' not 'Top right'					



41	Blog/Journal dropdown	Real links still visible if mouse is hovered over another URL
42	Help video popup	Collaborate tab still visible at bottom right
43	Goals List	Arrow on Close button needs to be clickable to close the window
44	Resume	Check resume functionality
45		
46	3rd Pilot User ------	
47		
48		
49		
50		
51	**Artefact**	
52		
53		
54	----	
55	JOURNAL: Hover state disappears when not on journal title. She was using the mouse to read Remy's text. Said people would get used to it.	
56		
57	Arrow to go to Sean's journal?	
58	Thinks she missed the reflective models, now trying to go back to the journal activity.	
59	Maybe have it in the speech box in bold for to go to the models. At the same time still good to have them go to it.	
60	Reflective instructions: can you get from the presentation back to where you were.	
61	----	
62	BLOGS	
63	Maybe arrow for to go to Alex also	
64	---	
65	Collaborate:	
66	Trying to view help video at top right when slide menu is open	
67	Maybe make the Help video more prominent in 'Getting Started' folder within BB tutorial	

Appendix 3: Ethical Approval Communication

Copy of the email communication from the School of Computer Science & Statistics Research Ethics Committee granting permission to conduct the study.

Kevin O'Connor <oconnk17@tcd.ie>

TCD REC WebApp: The status of 'An Exploration of a Situated Learning Approach to Increasing Instructors' Technology Self-Efficacy in the Use of Active Learning Tools within Virtual Learning Environments' (183) has been updated by the Committee

2 messages

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rec-app-help@tchpc.tcd.ie <rec-app-help@tchpc.tcd.ie> 1 March 2017 at 14:05
To: oconnk17@tcd.ie

The status of 'An Exploration of a Situated Learning Approach to Increasing Instructors' Technology Self-Efficacy in the Use of Active Learning Tools within Virtual Learning Environments' has been updated by the Committee.

Title: 'An Exploration of a Situated Learning Approach to Increasing Instructors' Technology Self-Efficacy in the Use of Active Learning Tools within Virtual Learning Environments'
Applicant Name: Kevin O'Connor
Submitted by: Kevin O'Connor
Academic Supervisor: Tim Savage
Application Number: 20161205

Result of the REC Meeting: Approved

The Feedback from the Committee is as follows:
This proposal can proceed all requirements have been satisfied.

Appendix 4: Participant Information & Consent Forms

Copies of the information sheet and consent form provided to participants. Note: the researcher's personal phone number has been obscured in section A.

INFORMATION SHEET FOR PROSPECTIVE PARTICIPANTS

Project Title: **An Exploration of a Situated Learning Approach to Increasing Instructors' Technology Self-Efficacy in the Use of Active Learning Tools within Virtual Learning Environments**

LEAD RESEARCHERS: Kevin O'Connor (Student on MSc Technology & Learning (Year 2) and Learning Technologist at eLearning (CAPSL), Trinity College Dublin)

BACKGROUND OF RESEARCH: *(explain the background, context and relevance of the research)*

The context of this research relates to how instructors use active learning tools (such as blogs, journals and webinars) in Blackboard as part of their teaching practice. The purpose of this case study is to examine how professional development material can utilise interactive online scenarios to potentially increase instructors' self-efficacy in implementing these active learning tools.

Typically, professional development materials for Blackboard consist of PDFs and videos which do not provide opportunities for practice. For this research an interactive online scenario was created using a program called Articulate Storyline 2. This scenario allows you to learn and practice implementing online journals, blogs and webinars at your own pace and explores how you might use these tools to promote active learning. The research is relevant to seeing how provision of professional development materials can be improved through this interactive approach.

The work is being undertaken by the researcher towards the fulfilment of a requirement for the M.Sc. in Technology and Learning in Trinity College Dublin.

PROCEDURES OF THIS STUDY: (*explain what will happen in this particular study, including duration and risks to the participant)*

Participation in the research is completely optional and voluntary. You may withdraw at any time. If you choose to participate, the research will proceed as follows:
1. You will be asked to complete a brief survey about your current confidence in implementing active learning tools
2. You will then be sent details of the professional development materials along with supporting documentation and activities
3. You will have approximately 3 weeks to engage with the interactive tutorials and related activities (requiring approximately 2-3 hours of use over these 3 weeks)
4. After this period you will be asked to retake the survey with some additional questions.
5. Participants who have elected to be contacted will then be emailed to request a brief 30 minute one-to-one interview based on the feedback from the survey.

Benefits/compensation: You will receive a €10 National Book Token in June in appreciation for participating in the research. This can be delivered in the internal TCD mail to you or you can contact the researcher to arrange collection.

PUBLICATION: (*explain the intended publication and presentation venues for the research)*

The research will be published in the researcher's dissertation for the M.Sc. in Technology and Learning in Trinity College Dublin. The results of this research may also be submitted for publication for conferences and journals. The final article may be shared with other educators also. Individual results will be aggregated anonymously and research reported on aggregate results. Descriptions of actions and messages in the journals, blogs and webinars will be fully anonymous. No personally identifiable information will be included in the final report.

Conflicts of Interest:

I, the researcher, work in the eLearning team in Trinity College Dublin. Part of my current role involves producing materials to help staff utilise the different tools within Blackboard. I am completing this research as part of my studies for the MSc in Technology and Learning, also in Trinity College Dublin and I am therefore using my existing role and relationships in order to make progress in this research. I am receiving no financial benefit or other remuneration or promotion as part of this research and it is not funded by Blackboard Inc. or its affiliates.

How You Were Selected:
You were selected based on your affiliation to Trinity College Dublin as a staff or student, previous contact with the researcher or via a college circular email. The research study aims to recruit between 20-30 participants.

Nature of Participation & Requirements:

You will need a PC/Mac or laptop with the Google Chrome or Firefox web browser installed. Other Flash-compatible browsers such as Internet Explorer, Edge or Safari may also be compatible but Chrome or Firefox are recommended.

Participation in this research is wholly voluntary. You have the right to withdraw and have your individual responses to the survey or interview removed and destroyed without any penalty. Participants may be asked to verify that direct quotations have been transcribed correctly from recordings. All data and feedback in the final report will be anonymous. Participants can withdraw their data until such time as their data are anonymised. No audio or video recordings will be made available to anyone other than the research/research team, nor will any such recordings be replayed in any public forum or presentation of the research. Such information will only be disclosed in the case of discovery of illicit/criminal activities which would be reported to the appropriate authorities.

The research is not connected to any assessment or course and is wholly voluntary.

PRIVACY:
The interactive professional development material is hosted on a secure web server. The web server tracks overall usage but individual users are not personally identifiable. A cookie saves your progress locally on your computer to allow you to resume at a later date.

During the study you will have the opportunity to contribute to reflective journals and blogs and use the webinar software. Any information entered into these tools is stored securely. Your connection to Blackboard Learn and Blackboard Collaborate are encrypted. You can choose to delete any posts or videos you create using the blogs, journals or virtual classroom tools. Please see http://www.blackboard.com/legal/cookies-privacy-learn.aspx and http://www.blackboard.com/legal/cookies-privacy-web-conferencing.aspx for further information on Blackboard's privacy policies.

The interviews will be recorded to assist with the research process. The researcher will store these recordings on an encrypted device during the research. The researcher will not share or allow access to this recording to others and it will be deleted once the research is complete. You will not be personally identifiable in the final research article.

RISKS AND BENEFITS
The benefits of participating are that you will have an opportunity to learn how to implement active learning tools such as journals, blogs and webinars within Blackboard.

Technical risks: as participation only requires you to use or install Chrome or Firefox (or another Flash-compatible browser) and optional microphone the risk to your PC is low. However, as with all software, there is always a potential for issues but the software has been tested extensively across a range of devices.

Individual risks: during the study, you will have an opportunity to use tools such as blogs, journals and webinars. There is the potential that you might disclose information which you later wish to remove. It is possible to delete or edit any blog, journal or webinar entry at any time. You may skip these activities if you wish. If for whatever reason you encounter issues with deleting a post, please contact the researcher.

In the extremely unlikely event that illicit activity is reported or discovered (whether on the survey, journals, blogs, webinars, online materials or other source) I will be obliged to report it to appropriate authorities.

As use of a computer is required to participate in this research, people with epilepsy or a family history of epilepsy are proceeding at their own risk.

Debriefing:
At the end of the research, participants will be given a copy of the final research paper upon request and given details of how the research will inform future professional development initiatives in Trinity College Dublin.

Participation:
To participate in the research please complete the Informed Consent Form and return it to the researcher.

Part A

Project Title: **An Exploration of a Situated Learning Approach to Increasing Instructors' Technology Self-Efficacy in the Use of Active Learning Tools within Virtual Learning Environments**

Name of Lead Researcher (student in case of project work): **Kevin O'Connor**

Name of Supervisor: **Dr Timothy Savage (Associate Dean for Online Education)**

TCD E-mail: **oconnk17@tcd.ie** Contact Tel No.: **Mob: 087** [redacted] **Ext: 896 3723**

Course Name and Code (if applicable): **MSc Technology and Learning (DPTCS-TLEA-1P09)**

Estimated start date of survey/research: **February 2017**

I confirm that I will (where relevant):

- Familiarize myself with the Data Protection Act and the College Good Research Practice guidelines http://www.tcd.ie/info_compliance/dp/legislation.php;
- Tell participants that any recordings, e.g. audio/video/photographs, will not be identifiable unless prior written permission has been given. I will obtain permission for specific reuse (in papers, talks, etc.)
- Provide participants with an information sheet (or web-page for web-based experiments) that describes the main procedures (a copy of the information sheet must be included with this application)
- Obtain informed consent for participation (a copy of the informed consent form must be included with this application)
- Should the research be observational, ask participants for their consent to be observed
- Tell participants that their participation is voluntary
- Tell participants that they may withdraw at any time and for any reason without penalty
- Give participants the option of omitting questions they do not wish to answer if a questionnaire is used
- Tell participants that their data will be treated with full confidentiality and that, if published, it will not be identified as theirs
- On request, debrief participants at the end of their participation (i.e. give them a brief explanation of the study)
- Verify that participants are 18 years or older and competent to supply consent.
- If the study involves participants viewing video displays then I will verify that they understand that if they or anyone in their family has a history of epilepsy then the participant is proceeding at their own risk
- Declare any potential conflict of interest to participants.
- Inform participants that in the extremely unlikely event that illicit activity is reported to me during the study I will be obliged to report it to appropriate authorities.
- Act in accordance with the information provided (i.e. if I tell participants I will not do something, then I will not do it).

Signed: Kevin O'Connor ..... Date: 29/11/16 .....
Lead Researcher/student in case of project work

TRINITY COLLEGE DUBLIN
INFORMED CONSENT FORM

ProjectTitle: **An Exploration of a Situated Learning Approach to Increasing Instructors' Technology Self-Efficacy in the Use of Active Learning Tools within Virtual Learning Environments**

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The work is being undertaken by the researcher towards the fulfilment of a requirement for the M.Sc. in Technology and Learning in Trinity College Dublin.

PROCEDURES OF THIS STUDY: (*explain what will happen in this particular study, including duration and risks to the participant)*

Participation in the research is completely optional and voluntary. You may withdraw at any time. If you choose to participate, the research will proceed as follows:
1. You will be asked to complete a brief survey about your current confidence in implementing active learning tools
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3. You will have approximately 3 weeks to engage with the interactive tutorials and related activities (requiring approximately 2-3 hours of use over these 3 weeks)
4. After this period you will be asked to retake the survey with some additional questions.
5. Participants who have elected to be contacted will then be emailed to request a brief 30 minute one-to-one interview based on the feedback from the survey.

Benefits/compensation: You will receive a €10 National Book Token in June in appreciation for participating in the research. This can be delivered in the internal TCD mail to you or you can contact the researcher to arrange collection.

PUBLICATION: (*explain the intended publication and presentation venues for the research)*

The research will be published in the researcher's dissertation for the M.Sc. in Technology and Learning in Trinity College Dublin. The results of this research may also be submitted for publication for conferences and journals. The final article may be shared with other educators also. Individual results will be aggregated anonymously and research reported on aggregate results. Descriptions of actions and messages in the journals, blogs and webinars will be fully anonymous. No personally identifiable information will be included in the final report.

PRIVACY:
The interactive professional development material is hosted on a secure web server. The web server tracks overall usage but individual users are not personally identifiable. A cookie saves your progress locally on your computer to allow you to resume at a later date.

During the study you will have the opportunity to contribute to reflective journals and blogs and use the webinar software. Any information entered into these tools is stored securely. Your connection to Blackboard Learn and Blackboard Collaborate are encrypted. You can choose to delete any posts or videos you create using the blogs, journals or webinar tools. Please see http://www.blackboard.com/legal/cookies-privacy-learn.aspx and http://www.blackboard.com/legal/cookies-privacy-web-conferencing.aspx for further information on Blackboard's privacy policies.

If permitted, the interviews will be recorded to assist with the research process. Interviews may be either face-to-face or conducted through the webinar software. The researcher will store these recordings on an encrypted device during the research. The researcher will not share or allow access to this recording to others and it will be deleted once the research is complete. You will not be personally identifiable in the final research article.

DECLARATION:

- I am 18 years or older and am competent to provide consent.
- I have read, or had read to me, a document providing information about this research and this consent form. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.
- I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.
- I understand that if I make illicit activities known, these will be reported to appropriate authorities.
- I understand that I may stop electronic recordings at any time, and that I may at any time, even subsequent to my participation have such recordings destroyed (except in situations such as above).
- I understand that, subject to the constraints above, no recordings will be replayed in any public forum or made available to any audience other than the current researchers/research team.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- I understand that if I or anyone in my family has a history of epilepsy then I am proceeding at my own risk.
- I have received a copy of this agreement.

PARTICIPANT'S NAME:

PARTICIPANT'S SIGNATURE:
Date:

Statement of investigator's responsibility: I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

RESEARCHER'S CONTACT DETAILS:

Kevin O'Connor
eLearning CAPSL
Room 3.06. 3-4 Foster Place, Trinity College Dublin.
Phone: 896 3723
Email: kevin.oconnor@tcd.ie

INVESTIGATOR'S SIGNATURE:

Date:

Please scan the completed form and email it to me, or send this form in the internal TCD post to my address above, or email me at kevin.oconnor@tcd.ie **to arrange collection. Once I have received the completed form I will email you with the details.**

Part A

Project Title: **An Exploration of a Situated Learning Approach to Increasing Instructors' Technology Self-Efficacy in the Use of Active Learning Tools within Virtual Learning Environments**

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Name of Supervisor: **Dr Timothy Savage (Associate Dean for Online Education)**

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Course Name and Code (if applicable): **MSc Technology and Learning (DPTCS-TLEA-1P09)**

Estimated start date of survey/research: **February 2017**

I confirm that I will (where relevant):

- Familiarize myself with the Data Protection Act and the College Good Research Practice guidelines http://www.tcd.ie/info_compliance/dp/legislation.php;
- Tell participants that any recordings, e.g. audio/video/photographs, will not be identifiable unless prior written permission has been given. I will obtain permission for specific reuse (in papers, talks, etc.)
- Provide participants with an information sheet (or web-page for web-based experiments) that describes the main procedures (a copy of the information sheet must be included with this application)
- Obtain informed consent for participation (a copy of the informed consent form must be included with this application)
- Should the research be observational, ask participants for their consent to be observed
- Tell participants that their participation is voluntary
- Tell participants that they may withdraw at any time and for any reason without penalty
- Give participants the option of omitting questions they do not wish to answer if a questionnaire is used
- Tell participants that their data will be treated with full confidentiality and that, if published, it will not be identified as theirs
- On request, debrief participants at the end of their participation (i.e. give them a brief explanation of the study)
- Verify that participants are 18 years or older and competent to supply consent.
- If the study involves participants viewing video displays then I will verify that they understand that if they or anyone in their family has a history of epilepsy then the participant is proceeding at their own risk
- Declare any potential conflict of interest to participants.
- Inform participants that in the extremely unlikely event that illicit activity is reported to me during the study I will be obliged to report it to appropriate authorities.
- Act in accordance with the information provided (i.e. if I tell participants I will not do something, then I will not do it).

Signed: ..... Date: 29/11/16

Lead Researcher/student in case of project work

Appendix 5: Technology Self-Efficacy Scale

Participants were asked to complete the scale below before engaging with the artefact and again approximately 2 weeks later. The scale is adapted from Compeau & Higgins (1995) and Laver (2012). Below is how the scale appeared to participants on SurveyMonkey. Note: the first question in the survey asked participants to confirm they had returned the consent form to the researcher. Hence, the first item in the scale is listed as number 2.

Confidence Scales

Imagine that you have gained the option to implement a new active learning technology within Blackboard (for example a blog/online journal/wiki/discussion board or other tool that allows students to interact with each other).

It doesn't matter specifically what this technology does, only that implementing it would lead to improved student outcomes and that you have never used it before. The following questions ask you to indicate whether you could implement this unfamiliar technology under a variety of conditions.

For each of the conditions, please rate your confidence about using the new technology on the scale of 1−10 (click and drag the sliders below or type the number in the right-hand box).

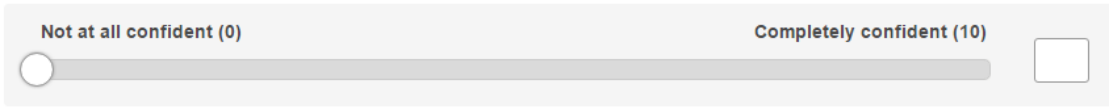
I could use the new technology...

2. If there was no one around to tell me how to implement it in Blackboard

3. If I had never used an active learning technology like it before

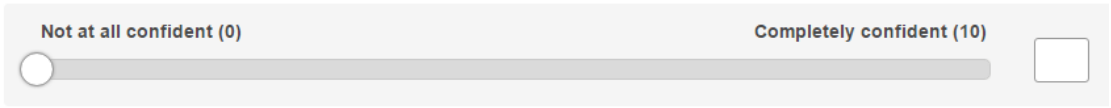
4. If I only had a PDF guide for reference

5. If I had seen a colleague implement the technology in their own Blackboard module before trying it myself



6. If I could call someone for help if I got stuck

7. If someone else helped me get started



[continued on next page]

8. If I had a lot of time to implement the technology in Blackboard

Not at all confident (0) Completely confident (10)

9. If I just had an online tutorial for assistance

Not at all confident (0) Completely confident (10)

10. If I watched a video that showed me how to do it first

Not at all confident (0) Completely confident (10)

11. If I had used similar technologies before this one to implement the same activity

Not at all confident (0) Completely confident (10)

Appendix 6: Survey

Participants were asked to complete the survey below after engaging with the artefact after approximately 2 weeks.

12. How many times have you implemented an active learning technology within Blackboard prior to this study? (for example a blog/online journal/wiki/discussion board or other tool that allows students to interact with each other).

- ◯ 0 times
- ◯ 1-2 times
- ◯ 3-4 times
- ◯ More than 4 times

13. Please rate your level of agreement with the following statements:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The interactive guide was an effective means to learn how to implement active learning tools within Blackboard.	◯	◯	◯	◯	◯
The scenario-based approach of the guide was an effective method of learning.	◯	◯	◯	◯	◯

14a. Has the interactive guide increased your confidence in implementing active learning tools in Blackboard as part of your teaching or professional practice?

- ◯ Yes
- ◯ No

14b. Please describe:

15a. Do you plan to implement active learning tools in Blackboard as a result of participating in this study?

- ◯ Yes
- ◯ No

15b. If Yes, please give an example of an active learning activity you might implement as a result of this study. If No, please give details on why.

16. What were the advantages/disadvantages of this approach to professional development?

17. Do you have any further comments about your experience with the interactive guide?

18. If you would be happy for the researcher to contact you for a short 30 minute interview related to your above comments please enter your email address.

Appendix 7: Interview Protocol

Interview Protocol Sheet – Kevin O'Connor, MSc Technology & Learning Dissertation

Note: this document is a modified version of the protocol used in the Capstone project (O'Connor 2016).

Protocol and observation sheet for one-to-one participant interviews.
Note: respondent details to be anonymised for final paper. To be stored securely and fully anonymised in reporting.

Institution: Trinity College Dublin
Interviewer: Kevin O'Connor
Interviewee (initialised):
Date:
Location:

Interview Protocol

Researcher Checklist	1. Date & time agreed 2. Location agreed 3. Confirmation email sent a day prior 4. Sony Digital Voice Recorder (if in person) a. Check Battery Levels 5. Blackboard Collaborate session setup (if via webinar) a. Confirm participant has microphone 6. Move recording to Surface tablet after interview 7. Encrypted Surface tablet and encrypted back up drive
Introductory Protocol	Firstly, many thanks for participating in this research and for agreeing to this interview. Before we start, to facilitate the interview, with your permission, I will record the interview but only I will have access to this recording. Is it ok for me to record this interview? YES/NO: So just to confirm, your participation is voluntary so you have the right to withdraw at any time and your individual data can be removed. Participants will be fully anonymised in the final paper. The interview is intended to last for 30 minutes and will be focusing on how you use technology as part of your teaching and the guide as a means of increasing confidence in using Blackboard. Are there any questions before we begin and I start recording?

Ready	Okay, thanks, we'll start now **[begin recording]**
Q1	**I just want to get a general sense of how you use some of the technologies covered in the guide (such as blogs/journals/webinars) as part of your teaching.**
Probes	[Refer to comments made on survey] Are there any tools you hope to use?
Notes	
Q2	**Moving on to the guide…** **The guide contained practice elements and goals to complete – were those elements helpful in terms of increasing your confidence in using Blackboard?**
Probes	How so? [Refer to comments made on survey]
Notes	
Q3	**The guide also contained social elements – the examples from other instructors, characters, the opportunities to practice with virtual students. Were these elements helpful in terms of increasing your confidence in using Blackboard?**
Probes	How so? [Refer to comments made on survey]
Notes	
Q4	**Did you find the advice and encouragement as you completed goals from the Remy (eLearning) character helpful in terms of increasing your confidence in using Blackboard?**
Probes	How so? [Refer to comments made on survey]
Notes	
Q5	**Did the experience of interacting with the guide reduce any anxiety you might have had about using Blackboard?**
Probes	How so? [Refer to comments made on survey]
Notes	

Q6	**Did the guide address any of the barriers to using Blackboard's active learning tools for you?**
Probes	What barriers still remain? [Refer to comments made on survey]
Notes	
Interview Question 7	[Emergent Question]
Notes	
Interview Question 8	[Emergent Question]
Notes	
Interview Question 9	[Emergent Question]
Notes	
Interview Question 10	[Probe their comments made on survey relating to advantages/disadvantages of the approach]
Probes	[Refer to comments made on survey]
Notes	
Concluding question	**Do you have any other comments on your experience of using the guide or participating in the project?**
Notes	

Conclusion Protocol	We've come to the end of the interview. Thanks very much for agreeing to this and for taking part in the research. I'm going to stop the recording now and if you have any queries or concerns please contact me, kevin.oconnor@tcd.ie or on 3723. -STOP RECORDING- -END-
Final observations	[Use this space immediately after the interview to capture any other aspects such as body language, tone, atmosphere, general observations etc.]

Appendix 8: Technology Self-Efficacy Scale Results

Results of both pre- and post- TSE scales are provided below. Each row of data represents a respondent but as responses were anonymous, the ordering of responses are not equivalent (i.e. response #1 in the initial TSE scale does not correspond to response #1 in the concluding scale). Average values are provided on the last row.

Initial TSE Scale Results:

Respondent	If there was no one around to tell me how to implement it in Blackboard	If I had never used an active learning technology like it before	If I only had a PDF guide for reference	If I had seen a colleague implement the technology in their own Blackboard module before trying it myself	If I could call someone for help if I got stuck	If someone else helped me get started	If I had a lot of time to implement the technology in Blackboard	If I just had an online tutorial for assistance	If I watched a video that showed me how to do it first	If I had used similar technologies before this one to implement the same activity
1	8	6	10	8	10	8	9	9	9	9
2	3	3	4	10	10	10	7	7	9	8
3	5	5	7	7	8	8	8	7	7	10
4	5	5	5	9	9	5	9	9	9	9
5	5	5	5	8	10	8	8	8	8	8
6	5	8	8	10	10	8	5	8	8	5
7	7	7	8	9	9	9	9	9	9	9
8	5	2	5	7	8	8	8	8	8	8
9	5	7	6	5	8	7	7	8	8	9
10	6	2	4	8	8	9	6	9	8	8
11	6		7	7	10	10	5	10	10	9
12	7	6	7	8	8	9	8	9	9	9
13	6	6	6	8	4	10	10	8	8	7
14	3	1	6	7	8	10	9	10	10	10
15	9	8	9	9	8	9	9	9	9	9
16	8	5	6	8	10	5		5	6	6
17	5	4	6	3	6	5	5	6	7	7
18	5	5	6	6	9	10	8	8	8	9
19	5	6	8	6	7	9	10	8	10	10
20	5	4	7	8	8	9	8	9	8	10
21	0	0	4	4	5	6	3	4	4	5
22	0	0	2	5	5	8	5	4	4	8
23	0	0	4	4	7	7	7	5	7	8
24	1	5	9	5	7	9	6	8	8	9
25	3	3	4	5	5	6	6	7	7	7
26	7	5	8	8	9	9	9	10	9	9
Average:	4.769231	4.32	6.192308	7	7.923077	8.115385	7.36	7.769231	7.961538	8.269231

Concluding TSE Scale Results:

Respondent	2. If there was no one around to tell me how to implement it in Blackboard	3. If I had never used an active learning technology like it before	4. If I only had a PDF guide for reference	5. If I had seen a colleague implement the technology in their own Blackboard module before trying it myself	6. If I could call someone for help if I got stuck	7. If someone else helped me get started	8. If I had a lot of time to implement the technology in Blackboard	9. If I just had an online tutorial for assistance	10. If I watched a video that showed me how to do it first	11. If I had used similar technologies before this one to implement the same activity
1	7	7	8	8	10	9	9		10	10
2	8	2	5	7	8	8	5	7	7	7
3	5	5	7	10	9	9	5	8	9	2
4	3	3	5	9	8	10	8	8	8	7
5	8	5	5	7	8	8	6	7	8	8
6	9	9	10	10	10	10	10	10	10	10
7	10	9	10	10	10	9	10	10	10	9
8	4	2	3	5	4	8	5	7	5	5
9	2	2	3	6	10	10	8	10	10	8
10	9	10	5	9	5	1	1	4	1	1
11	10	9	7	7	7	8	8	8	10	9
12	2	2	7	8	10	10	10	8	8	10
13	5	5	7	7	7	8	6	9	9	9
14	9	8	9	8	8	9	9	9	9	9
15	3	5	5	9	9	9	9	9	9	9
16	8	6	6	9	10	9	9	9	10	9
17	6	6	7	8	10	8	8	10	9	8
18	8	8	8	8	9	8	9	8	8	9
19	9	9	7	6	9	9	8	7	7	7
20	5	4	5	5	5	5	5	8	8	8
21	5	5	5	5	6	6	8	6	7	8
22	6	6	6	7	8	9	9	9	9	9
23	9	9	10	9	10	10	10	10	9	10
24	10	8	10	9	10	10	10	10	10	10
25	8	8	9	9	9	9	9	9	9	10
Average:	6.72	6.08	6.76	7.8	8.36	8.36	7.76	8.333333	8.36	8.04

Appendix 9: Qualitative Design Procedure Checklist

Checklist from Creswell (2013, p. 183) used to ensure the research had the required elements for a qualitative research study.

A Checklist of Questions for Designing a Qualitative Procedure	
✓ SECTION 4.3 FOCUS ON INTERPRETATIONS	Are the basic characteristics of qualitative studies mentioned?
✓ SECTION 4.3 EXPLORATORY CASE STUDY ✓ HISTORY ✓ DEFINITION ✓ APPLICATIONS	Is the specific type of qualitative design to be used in the study mentioned? Is the history of, a definition of, and applications for the design mentioned?
✓ SECTIONS 4.6 + 6.2 ✓ POSITIONALITY STATED ALONGSIDE ATTEMPTS TO MITIGATE	Does the reader gain an understanding of the researcher's role in the study (past historical, social, cultural experiences, personal connections to sites and people, steps in gaining entry, and sensitive ethical issues) and how they may shape interpretations made in the study?
✓ SECTION 4.6.2 PURPOSEFUL + CONVENIENCE SAMPLING	Is the purposeful sampling strategy for sites and individuals identified?
✓ SECTION 4.5 ✓ USE SCALE ✓ SURVEY ✓ INTERVIEWS	Are the specific forms of data collection mentioned and a rationale given for their use?
✓ SECTION 4.5.4 ✓ INTERVIEW PROTOCOL	Are the procedures for recording information during the data collection detailed (such as protocols)?
✓ SECTION 5.4 FOR EACH METHOD	Are the data analysis steps identified?
✓ SECTION 5.3 DATA PREP ✓ ONENOTE USED	Is there evidence that the researcher has organized the data for analysis?
✓ SECTION 5.4.1 ✓ ALL DATA FROM METHODS EXAMINED HOLISTICALLY FIRST BEFORE CODING	Has the researcher reviewed the data generally to obtain a sense of the information?
✓ SECTION 5.4	Has the researcher coded the data?
✓ SECTION 5.6 ✓ OUTLINED IN 5.4 PROCESS	Have the codes been developed to form a description and/or to identify themes?
✓ SECTION 5.7 ✓ CONCEPTUAL UNDERSTANDING ADVANCED	Are the themes interrelated to show a higher level of analysis and abstraction?
✓ SECTION 5.3 ✓ QUANTITATIVE DATA WILL BE REPRESENTED USING TABLES	Are the ways that the data will be represented mentioned—such as in tables, graphs, and figures?
✓ SECTION 5.1, 5.4.1 ✓ GUIDED BY RESEARCH PURPOSE + CONSTRUCTIVISM FOCUSED ON PERCEPTIONS	Have the bases for interpreting the analysis been specified (personal experiences, the literature, questions, action agenda)?
✓ SECTIONS 5.7, 5.8 ✓ CONCEPTUAL UNDERSTANDING ADVANCED ✓ FINDINGS + THEMES REPORTED	Has the researcher mentioned the outcome of the study (developed a theory, provided a complex picture of themes)?
✓ SECTION 5.4.5 ✓ TRIANGULATION, MEMBER CHECKING, POST DEBRIEF	Have multiple strategies been cited for validating the findings?

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