Learning Technologies for Challenging Times

One Size Fits All

Fionnghuala Kelly
DIT

Short Practitioner Paper

Abstract: This paper reviews an online learning object that addresses the common challenge where student cohorts have varying levels of knowledge of a subject area. Reusable online learning objects can provide a resource for learners to engage in at their preferred pace and that meets their specific learning needs.

Learning theories provide an insight into the techniques that can be used by the facilitator to enable the learner. These include the use of zone of proximal development (Vygotsky 1962), scaffolding (Bruner 1976), chunking information (Miller 1956), reinforcement, and feedback (Skinner, 1953). Interactive Excel Spreadsheet (Lehman *et al.* 2003) were developed and extended to encompass short movies and made available online.

The learning object was a "learning through practice" exercise that addressed accountancy skills required for Financial Accounting. A pdf was provided containing the scenario and accounting details. A tutorial practice contained short movies demonstrating the task with voiceover explanation (**scaffolding).** Each cell in a spreadsheet that required data entry contained a comments box which, if selected, provided the learner with a tip to help complete the cell (**scaffolding**).). Movies served to explain and provide understanding. On entering data into a cell it appeared in either green or red font, with green indicating correct answer and red indicating incorrect answer (**feedback**)
The task was **chunked** as each row could be completed individually if preferred. The practice exercises for each topic were also available with a reduction in scaffolding **(reinforcement)**. The second exercise contained the comment boxes but without movies and the final exercises contained no assistance so learner established they had accomplished the learning process. (Raymond, 2000, p. 176, Chang, Sung, & Chen, 2002, p. 7) The learning object was piloted with students some with dyslexia and feedback was extremely positive.

Keywords: Practice, Learning, Interactive, Excel, Feedback, Scaffolding, Demonstrations, Chunking, RLO, Reusable Learning Object

Introduction

Learning is a complex melting pot comprising the learner, the learning environment and the learning. The learning experience can be solitary, didactic, socially constructed, face to face, blended or online. The learner's understanding of a subject can range from one of competence to total confusion.

This paper discusses a situation that arose when teaching Financial Accounting in Higher Education and how that situation was addressed using an online learning object. It demonstrates how reusable online learning objects have the potential to provide a resource for learners to engage in at their preferred pace and that meets their specific learning needs.

The Situation

Students entering the Financial Accounting Module in first year possess a varying range of knowledge and understanding of the subject area. Some students have completed honours level accountancy in the leaving certificate while others have never studied accountancies. Thus while some are highly competent in the subject area others required extra practice to master some of the more difficult concepts. It is also recognised that some students are intimated by numbers and need to build up their confidence when dealing with numerical tasks. A "learning through practice" experience needed to be designed in a way that could engage all students regardless of the level of competency, and support students in difficulty with guidance and demonstration.

The Theory underpinning the Development of the Reusable Learning Object

A learning experience is underpinned by theories of learning that have been developed from the different perspectives associated with learning. The behaviourist perspective includes the work of BF Skinner (1974). His theory is underpinned by the principle that any response that is followed by a reinforcing stimulus tends to increase the probability of that response being repeated. A reinforcer may take the form of praise, a high grade, or a sense of achievement.

The work of Piaget and Miller also underpin this learning experience. Both come from a cognitive perspective. Piaget (1929) suggests that the learner acts on the environment and constructs mental representations or schemas of the world around him. This theory views the learner in a solitary role exploring the world around him. Miller (1956) also contributed greatly to our understanding of how we learn when he wrote his famous paper *The Magical Number Seven – Plus or Minus Two: Some Limits on our capacity for Processing Information.* This theory highlights the limitations of our short term memory and suggests that therefore learning needs to be chunked into manageable amounts.

Vygotsky (1978) viewed learning from a socially constructed perspective suggesting that learning is an experience that occurs between a more knowledgeable other and the learner if the learning takes place within the zone of proximal development. He

defined the zone of proximal development as the distance between the learner's ability to perform a task under the more knowledgeable other's guidance and the learner's ability to solve the problem independently. Vygotsky viewed learning as a social event suggesting a learner needs others who are more knowledgeable to direct and scaffold the learning experience. Work by Bruner (1960) a cognitive psychologist, in the area of scaffolding parallels Vygotsky's work. Scaffolding represents the helpful interactions between learner and the teacher that enable the learner to do something beyond his or her independent efforts. A scaffold is a temporary framework that is put up for support and access to meaning and taken away as needed when the learner secures control of success with a task. Cazden (1983) defined a scaffold as "a temporary framework for construction in progress" (p. 6).

The Reusable Learning Object – Its Development and Implementation

Recent implications for programmes and policy within higher education suggest that a blended approach is the 'preferred approach' (Childs, 2005, p30). The benefits of an online reusable learning object are well documented including the fact that they can be accessed at any place and at any time (Koppi et al 2005, Leeder et al 2004). They can also be interacted with in a solitary capacity or with others. Reusable learning objects are now being seen as the fundamental components and building blocks of online learning courses. (Oliver p454) A learning object is any entity, be it digital or non-digital that may be

used for education and training (IEEE, 2001) that may take the form of Web pages, pdf documents, database applications, animations, Java applets, PowerPoint presentations, movies etc.

The reusable learning object developed to address the need of this study was based on a paper by Lehman and Herring (2003). This excellent paper highlights and demonstrates the use of interactive spreadsheets for producing immediate feedback to students. This project extended their work to include movie clips that demonstrate the completion of the practice exercises with voiceover.

The reusable learning object is embedded in a website and each topic within the financial accounting module is included. For each module, a tutorial and a number of learning through practice exercises are provided. The tutorials and learning through practice exercises are built using interactive spreadsheets in Excel (2007). The tutorial is built using both the interactive spreadsheets and screen captures for demonstration. The learner is also provided with the task in pdf, downloadable and printable format for each tutorial and practice exercise.

The spreadsheets are structured in a way that is learner centred, the student can choose the order of content to address, the pace, and the level of help they need. The tutorial and practice exercises are designed so that the cells that require data entry are bordered in red and data when entered correctly appears in green and incorrectly appears in red, thus providing immediate feedback. Comment boxes within the cells provide assistance to the learner should they require it. The tutorial for each topic contains all these interactive features plus short movie clips within the spreadsheet that demonstrate both visually and audibly the completion of the task. These movie clips are short in order to chunk the information and to aid retention.

As the learner progresses through the practice exercises for each topic the help provided reduces by the removal of comment boxes, and red borders so that in the

final practice no assistance is provided. The purpose of this is to allow the learner to establish that they have accomplished the learning process. (Raymond, 2000, p. 176, Chang, Sung, & Chen, 2002, p. 7)

Pilot

The interactive practice exercises were piloted with a number of Financial Accounting students within DIT. The lecturer implementing the pilot explained to students that the learning object was designed for students starting out and having difficulty with accounting and as an additional tool to their learning. Working within the lab environment, students accessed the "learning through practice" reusable learning object. The lecturer was available within the lab in the event of assistance being required. Students completed the tasks online and then provided feedback regarding the experience. The feedback proved very positive and included the following statements:

"Simple and easy to use"

"Good the way it points out the columns in the Statement of movement in equity"

"Good additional tool for studying"

"Liked the display and the prompts"

"Liked the fact you knew when you were right and wrong immediately"

They all agreed it was very useful and could every chapter have similar questions.

Recommendations for change

"Would like more examples getting gradually harder"

"Felt there were too many prompts and too simplified"

"Window did not always open on full screen"

"Not enough excel functionality"

These recommendations were taken into account and the site was modified.

Conclusion

The benefit of interactive spreadsheets as a tool for providing immediate feedback to students has been appreciated for many years. Its extension in this paper provides a practice experience that equips students, through movie demonstrations, to learn aspects of the task that they may not have understood even with the comment box tips. Students regardless of their level of competency can gain from the practice to learning experience as its flexibility provides the student with the opportunity to tailor the practice experience to their personal needs.

The reusable learning object has proved very successful among the piloted students and it is thus envisaged that all topics within the Financial Accounting Module will be supported through this "practice through learning" reusable learning object.

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