

**USING BLENDED LEARNING TO AID LAW AND BUSINESS STUDENTS' UNDERSTANDING OF TAXATION  
LAW PROBLEMS**

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**ABSTRACT**

This article analyses how the principles and processes of an adaptive e-learning (computer-based) system can be used in a blended learning environment (for example, face-to-face teaching with additional online resources and activities) to assist the teaching of complicated taxation law issues. The system was used to create modules as part of three Australian taxation law courses at a major Australian university. Students were taught face-to-face, and the modules were demonstrated in class and made available to the students throughout the semester, so that they could access them at any time. The first course involved postgraduate students studying taxation law as part of a Master of Professional Accounting; the second involved students studying taxation law as part of a law degree; and the third involved students studying taxation law as part of an undergraduate business degree. Students who used the learning modules were surveyed in 2015 and 2016 in order to gain their insights into their perceived learning outcomes. The results demonstrated that the majority of students perceived that working through the modules was a good way to learn about the area of taxation law and that receiving feedback on their incorrect answers made them rethink their learning.

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## I BACKGROUND TO THE DEVELOPMENT OF ADAPTIVE E-LEARNING

Far-reaching changes have been occurring in universities throughout Australia, including fiscal constraints and increasing numbers of students in many courses. Around the world there is a reduction in government funding for higher education, which is mirrored in Australia.<sup>1</sup> This is putting pressure on existing staff, both academic and administrative, who are often working long hours in environments where budgets are reduced.<sup>2</sup> There is additional pressure on Australian universities to admit more students, as some government caps on student numbers have been reduced,<sup>3</sup> together with an increasingly diverse student body, especially in business schools.<sup>4</sup> While this diversity considerably enriches university communities, it also necessitates that increased support structures are put in place by academic and administrative staff for those students who have diverse English language abilities, cultural backgrounds and academic ability.<sup>5</sup> This latter issue is particularly problematic in courses where international student numbers have been increased in order to raise additional university funds. A 2013 report states that international students comprise 29 per cent of the total higher education student load in Australia, having increased to 320 000 from just over 18 000 in 1988, with the international students coming from more than 180 countries.<sup>6</sup>

These developments mean that university lecturers need to be proactive in developing new strategies that will meet changing and diverse demands without conflicting with established academic values.<sup>7</sup> Laurillard suggests that where there are large, diverse classes, and therefore limited scope for individual responses to students, a possible

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<sup>1</sup> See, eg, Organisation for Economic Co-operation and Development, *Education at a Glance* (OECD Publishing, 2014) 227, 240; Susan R Hermer, 'Finding Time for Quality Teaching: An Ethnographic Study of Academic Workloads in the Social Sciences and Their Impact on Teaching Practices' (2014) 33(3) *Higher Education Research & Development* 483, 483–4; David Boud and Elizabeth Molloy, 'Rethinking Models of Feedback for Learning: The Challenge of Design' (2013) 38(6) *Assessment & Evaluation in Higher Education* 698, 699; Douglas Belkin, 'How to Get College Tuition under Control', *The Wall Street Journal* (online), 8 October 2013, <<https://www.wsj.com/articles/how-to-fix-the-crisis-of-college-tuition-why-does-college-cost-so-much-1380319623>>.

<sup>2</sup> Hermer, above n 1; Robert Allan and Steve Bentley, 'Feedback Mechanisms: Efficient and Effective Use of Technology or a Waste of Time and Effort?' (Paper presented at STEM Annual Conference, Imperial College, 12–13 April 2012); Tom Lunt and John Curran, 'Are You Listening Please? The Advantages of Electronic Audio Feedback Compared to Written Feedback' (2010) 35(7) *Assessment & Evaluation in Higher Education* 759.

<sup>3</sup> Emma Griffith, 'Coalition Denies Change in Position over Caps on University Places', ABC News, 25 September 2013, <<http://www.abc.net.au/news/2013-09-25/pyne-education-university-fees-student-unions/4979282>>.

<sup>4</sup> Universities Australia, 'An Agenda for Australian Higher Education 2013–2016' (2013) 26.

<sup>5</sup> Hermer, above n 1, 483.

<sup>6</sup> Universities Australia, above n 4, 26.

<sup>7</sup> Diana Laurillard, *Rethinking University Teaching: A Conversational Framework for the Effective Use of Learning Technologies* (Routledge, 2002). Academic values are often stated to be: 'Institutional autonomy; Collegiality and shared governance; The intellectual and academic authority of faculty; The degree (whether associate, baccalaureate, professional, master's, or doctorate); General education; and Site-based education and a community of learning,' see Judith S Eaton, *Core Academic Values, Quality, and Regional Accreditation: The Challenge of Distance Learning* (2016) Council for Higher Education Accreditation <<http://www.chea.org/default.asp>>.

solution is to use technology.<sup>8</sup> Ferguson and Lee argue that 'to remain viable in a business sense (at the very least), online learning as an option [in higher education] is unavoidable'.<sup>9</sup>

When discussing Canadian Law Schools, Hermida stated 'Law School curricular, with its teaching philosophy built during an exclusively print-centered era, has not yet opened its doors to audio-visual teaching methodologies or to media literacy'.<sup>10</sup> This, he observes is detrimental to student learning and he argues that law students should be engaged in more visual approaches to enhance their learning.<sup>11</sup>

Modern use of technology at universities is dominated by learning management systems (LMSs) such as Blackboard and Moodle.<sup>12</sup> A 2011–12 study of Australian law schools found that the use of LMSs by law schools was widespread, with 27 law schools advising that 100 per cent of their staff used such technology.<sup>13</sup>

LMSs are powerful integrated systems that support academics and students in performing learning tasks. The teaching activities include web-based course notes and quizzes, communication with students, and monitoring students' grades and progress. Students use them for learning, communication and collaboration. They are mainly used asynchronously, in other words, students access the materials and attempt online assessment tasks in their own time. The use of such online learning resources results in courses that may be characterised as 'blended delivery', which can be described as a combination of face-to-face teaching and online delivery methods.<sup>14</sup>

There are a number of advantages in using a technology- or web-based approach to teaching. Whilst computer-based approaches to learning and teaching have not been the traditional method of instruction,<sup>15</sup> they are being increasingly used to offer learning opportunities that are compatible with existing practices and to support other teaching strategies.<sup>16</sup> One recent study of the use of e-learning and blended learning in Australian

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<sup>8</sup> Laurillard above n 7, 268.

<sup>9</sup> Anneka Ferguson and Elizabeth Lee, 'Desperately Seeking...Relevant Assessment? A Case Study on the Potential for Using Online Simulated Group Based Learning to Create Sustainable Assessment Practices' (2012) 22(1) *Legal Education Review* 121, 123.

<sup>10</sup> Julian Hermida, 'Teaching Criminal Law in a Visually and Technology Oriented Culture: A Visual Pedagogy Approach' (2006) 16(1&2) *Legal Education Review* 153, 153.

<sup>11</sup> *Ibid.*

<sup>12</sup> Peter Brusilovsky, 'Knowledge Tree: A Distributed Architecture for Adaptive e-Learning' (Paper presented at the 13<sup>th</sup> International World Wide Web conference on Alternate Track Papers & Posters, New York, 17–22 May 2004) 104.

<sup>13</sup> Stephen Colbran and Anthony Gilding, 'E-Learning in Australian Law Schools' (2013) 23(1) *Legal Education Review* 201.

<sup>14</sup> Helen Partridge, Deborah Ponting and Meryl McCay, *Good Practice Report: Blended Learning* (Australian Learning and Teaching Council Ltd, 2011) 2.

<sup>15</sup> Colbran and Gilding, above n 13.

<sup>16</sup> Rita Shackel, 'Beyond the Whiteboard: E-Learning in the Law Curriculum' (2012) 12(1) *Queensland University of Technology Law and Justice Journal* 105; T Smyth, 'Response Evaluation in Computer Based Tutorials' (1987) 3 *Journal of Computer Assisted Learning* 99; E Howard, 'Use of a Computer Simulation for the Continuing Education of Registered Nurses' (1987) 5 *Computers in Nursing* 208.

law schools suggests that 'e-learning, especially as part of a blended learning approach, may be better than pure face-to-face teaching'.<sup>17</sup>

Whilst they offer many advantages, LMSs tend to offer a 'one size fits all' approach, which is not always the most appropriate way for students to learn. All learners taking an LMS-based course, irrespective of their prior learning, abilities and interests, receive access to the same educational material and set of tools. The LMS Moodle is used at the authors' university, the University of New South Wales, to provide access, outside of face-to-face classes, to course notes and lecture slides, as a communication tool, to record grades and, if the course coordinator decides, to offer quizzes and other forms of activities and assessment. It is very effective at facilitating this. However, its limitation is that students are treated as a homogenous mass and not as individuals. Nor is it a suitable medium for students to develop their problem-solving skills relating to complex legal issues.

The advantages of using technology to help law and business students develop their problem-solving and higher-order thinking skills in the context of learning about capital gains tax challenged the authors to broaden their current learning and teaching approach and to explore the potential that a particular form of online learning known as adaptive e-learning could help students to extend their own repertoire of learning strategies.<sup>18</sup>

## II LITERATURE REVIEW OF BLENDED LEARNING APPROACHES AND ADAPTIVE E-LEARNING

As adaptive e-learning is a relatively new phenomenon there is not a large body of literature available about it. A review of literature that exists relating to computer-mediated learning demonstrates a number of potential advantages that the use of an e-learning teaching tool as part of a blended learning approach could bring to the teaching of tax issues. One advantage of an adaptive e-learning system (AES) is that it 'attempts to fight the "one size fits all" approach to e-learning'.<sup>19</sup> Research indicates that AESs can provide more supportive, personalised and effective learning opportunities for students. For example, students can use the modules in their own homes or other private spaces and can work through the modules at their own pace. Furthermore, adaptive class-monitoring systems give academics a much better chance to notice when students are falling behind.<sup>20</sup> AESs can also enhance collaborative student learning as students can undertake activities together both inside and outside the classroom.<sup>21</sup>

From a pedagogical point of view, online lessons expand the learning environment beyond the facilitator and the traditional classroom, so that students' experiences and interactions with the learning materials are enhanced.<sup>22</sup> A blended learning approach is

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<sup>17</sup> Colbran and Gilding, above n 13, 220.

<sup>18</sup> Subject to the caveat that online learning should not be used to merely open up access to new information and experiences. See, eg, Laurillard, above n 7; Marina Nehme, 'E-Learning and Students' Motivation' (2010) 20(1&2) *Legal Education Review* 223.

<sup>19</sup> Laurillard, above n 7, 104.

<sup>20</sup> Ibid.

<sup>21</sup> Ibid; Shackel, above n 16.

<sup>22</sup> M Dreher and L Capputti, 'The Integration of Theoretical Constructs into the Design of Computer Assisted Instruction' (1992) 10 *Computers in Nursing* 219.

also suitable for a variety of different learning styles, as opposed to the traditional classroom interaction that tends to suit students who learn best from face-to-face teaching.<sup>23</sup> By providing students with the ability to self-pace their learning, differences in background and levels of experience with decision-making are recognised. Time taken to complete modules is within the student's control, not that of university timetables.<sup>24</sup>

Further advantages are that AESs can foster computer literacy and a positive approach to new technology, thereby expanding students' skills beyond the content of the programs themselves. The interactive nature of AES modules also supports pedagogies based on active learning.<sup>25</sup> Students are required to interact with the scenarios and answer questions, so that they are more than just passive receptors of information. Furthermore, immediate feedback can be provided on how the students have answered a question, which is reported to be appreciated by students,<sup>26</sup> and which researchers argue is an essential component of high-quality feedback.<sup>27</sup> After all, an important way that students learn is through making mistakes.<sup>28</sup> AESs allow students to work through the material at their own pace and to make mistakes in the privacy of their own work area, thus allowing them to learn from their mistakes without any outside pressure or scrutiny. AESs combined with face-to-face learning is flexible and encourages student reflection and motivation.<sup>29</sup>

AESs also offer certain advantages with regard to the diversity of the student body. For example, students from backgrounds where English is not their first language often struggle with the spoken word and the accents of academics. As a result, they can often read and write more easily than understand spoken English.<sup>30</sup> AESs provide for diversity and disability by supporting the principles of Universal Design for Learning through its multiple representations of subject content.<sup>31</sup> AESs provide flexible access with regard to

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<sup>23</sup> William Birch, 'Towards a Model for Problem Based Learning' (1985) 11 *Studies in Higher Education* 73; University of Washington, 'Exploring the Pros and Cons of Online, Hybrid, and Face-to-face Class Formats' (Provost Report Series, Leading Change in Public Higher Education, January 2013) 1, 4.

<sup>24</sup> Jennifer Ireland, 'Blended Learning in Intellectual Property: The Best of Both Worlds' (2008) 18(1&2) *Legal Education Review* 139, 153-4.

<sup>25</sup> Rodney Carr and Stuart Palmer, 'Active Learning: The Importance of Developing a Comprehensive Measure' (2015) 16(3) *Active Learning in Higher Education* 173.

<sup>26</sup> National Union of Students, 'The Great NUS Feedback Amnesty' (United Kingdom, 2008) 11; David J Nicol and Debra Macfarlane-Dick, 'Formative Assessment and Self-regulated Learning: A Model and Seven Principles of Good Feedback Practice' (2006) 31 *Studies in Higher Education* 199; Fiona Martin and Kayleen Manwaring, 'Online Feedback to Students Studying Taxation and Business Law - How Does it Rate?' (2015) *Journal of Australasian Tax Teachers Association* 1.

<sup>27</sup> Nicol and Macfarlane-Dick, above n 26.

<sup>28</sup> J Hattie and H Timperley, 'The Power of Feedback' (2007) *Review of Educational Research* 81.

<sup>29</sup> D Randy Garrison and Heather Kanuka, 'Blended Learning: Uncovering its Transformative Potential in Higher Education' (2004) 7 *Internet and Higher Education* 95, 98.

<sup>30</sup> Debra Bath and John Bourke, *Getting Started with Blended Learning* (Griffith Institute for Higher Education, 2010).

<sup>31</sup> National Center on Universal Design for Learning, *UDL Guidelines - Version 2.0: Principle 1 Provide Multiple Means of Representation* (2011) <<http://www.udlcenter.org/aboutudl/udlguidelines/principle1>>.

student availability and workloads,<sup>32</sup> as the mobility of the system benefits part-time students and staff as well as students studying off-campus.<sup>33</sup>

Evidence from Australian research also supports the idea that the use of online materials enhances student understanding. A 2013 study, undertaken at the University of Western Australia estimated the impact of using web-based materials on students' final marks in a first-year economics course.<sup>34</sup> The study excluded other factors, such as prior academic ability. The research looked at the impact of the students' usage of voluntary online quizzes, voluntary online homework questions, a voluntary online discussion board and the course webpage on their final mark for the course. The course results for 1012 students were analysed and showed that there was a positive relationship between the students' marks in the course and their use of the online materials, an indication that this improvement in performance could not be explained by other factors such as their university entrance scores.<sup>35</sup>

As with any approach to learning and teaching the authors of the present study faced a number of challenges. The decision to use the chosen product (Smart Sparrow) was based on the relationship between the authors' institution and the product developer. The budget to develop the modules was small (\$5000) and the authors were not experienced in using the particular software. Additionally, the software of choice had been used primarily in science-related disciplines. To our knowledge, this project is the first use of Smart Sparrow in Australia for teaching tax law, which meant that a significant amount of time was spent in learning how to draft the modules using the Smart Sparrow system and to adapt them to a new discipline. These challenges are not unusual when working with new technology but could have been a disincentive.<sup>36</sup>

This project used the AES developed by Smart Sparrow.<sup>37</sup> Smart Sparrow is 'an Australian ed-tech start-up pioneering adaptive and personalized learning technology'.<sup>38</sup> The organisation was founded by Dr Dror Ben-Naim, who led a research group in the field of Intelligent Tutoring Systems and Educational Data Mining at the University of New South Wales, that resulted in the Smart Sparrow AES.<sup>39</sup> At the time of this project, Smart Sparrow had been primarily used to develop adaptive e-learning modules within the science, technology, engineering and mathematics (STEM) disciplines. This project is the first in the discipline of taxation law. This, however, was not seen to be an issue, as the skill of problem-solving is also one that is relevant to the STEM disciplines. Nevertheless, it did provide the authors with all of the challenges that go along with the pioneering of a new product, for example, lack of discipline-based research and exemplars.

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<sup>32</sup> Colbran and Gilding, above n 13, 214–16; Ireland, above n 24, 153–4; University of Washington, above n 23, 4.

<sup>33</sup> Colbran and Gilding, above n 13.

<sup>34</sup> Elisa Birch and Andrew Williams, 'The Impact of Supplementary On-line Resources on Academic Performance: A Study of First-Year University Students Studying Economics' (2013) 6(1) *International Education Studies* 95.

<sup>35</sup> *Ibid* 102.

<sup>36</sup> Colbran and Gilding, above n 13, 209–10.

<sup>37</sup> Smart Sparrow, *About Smart Sparrow* (2017) <<https://www.smartsparrow.com/about>>.

<sup>38</sup> *Ibid*.

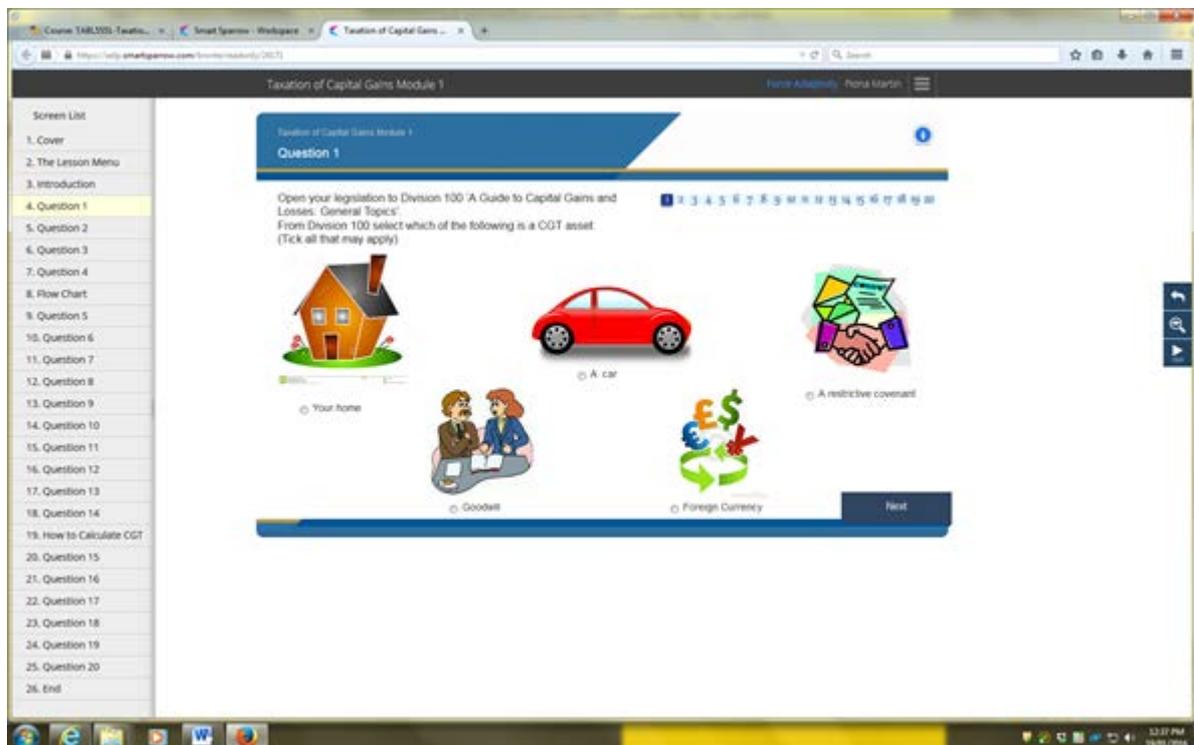
<sup>39</sup> *Ibid*.

### III DESIGN OF THE MODULES

The authors designed two modules using Smart Sparrow. The first module is aimed at reinforcing the principles of Australian Capital Gains Tax (CGT) and providing students with the opportunity to revise what they have already learned about this subject matter in lectures and seminars. Initially, module 1 consists of a number of multiple-choice questions. Every time a student interacts with the webpage on which a particular multiple-choice question appears, the answers display in a different order. Thus, the module allows the student to use it as a way of revising, but without being able to memorise the order of the answers.

Figure 1 below is a screen shot of one of the multiple-choice questions.

**Figure 1**



The modules also use colourful graphics and cartoons that pictorially represent answers to many of the questions. For example, Figure 1 above shows a screen shot of one of the pages viewed by a student: a picture of a red car represents the CGT asset 'motor vehicle'; a cartoon of a house represents the 'main residence'. The design also features cartoons of the case-study subjects and their situations. In this way, the experience is fun and interesting, visual learners are catered for, cognitive load is reduced and long-term memory is enhanced. The learning system design therefore acts as a major factor in the learner's perception, satisfaction and results.<sup>40</sup>

<sup>40</sup> Fanny Klett, 'Visual Communication in Web-Based Learning Environments' (2002) 5(4) *Educational Technology & Society* 38.

The AES modules attempt to move beyond the linear learning approach of traditional learning methods, such as reading textbooks or course materials. The AES structure allows for feedback loops, variable pathways, and what are termed 'trapped states' (that is, the student is unable to move on from a webpage until the question or task is completed, or a specified number of attempts are made). This ensures that the student experience is one in which they interact with information, gain feedback on both correct and incorrect responses, and move through lessons according to what they need. So, for example, a student who answers a question incorrectly will be directed to relevant information to read on the screen and then asked to answer the question again, rather than just being told they are incorrect and provided with the correct answer. This non-linear approach fosters reflection and critical thinking, and also means that students are given feedback on their choices. Both reflection and critical thinking are important components of effective learning.<sup>41</sup>

The Smart Sparrow AES used in this project<sup>42</sup> provides two very different types of feedback. First, students are given guidance and feedback based on their interaction with the onscreen information, and second, academics can also receive feedback on their own authoring choices. The academic can run a report that shows which questions students answered correctly the first time and which questions they had difficulty with. This ability is a significant benefit of AESs.<sup>43</sup> This function enables the academic to reflect on the content of the material and to adapt it to suit student needs. If students are quickly mastering an area, the academic can delete further questions on that topic and concentrate on areas where students are having difficulty. If students are making too many incorrect attempts at a particular question, the academic knows that this is an area that needs further teaching intervention. One group of researchers states: 'The use of ATs [Adaptive Tutorials] in teaching engineering design has resulted in improvements to the way educators are able to analyse student needs'.<sup>44</sup> In addition, student feedback can be adapted to their individual circumstances and can vary from being technical clarification to remedial work on concepts that have not been mastered.<sup>45</sup>

Modules 1 and 2 also reinforce an approach to legal problem-solving. Figure 2 below demonstrates the use of feedback to students on the suggested approach to legal problem-solving. Each step in the process is represented by an icon and students are required to click on the icon to find out what that step is actually about in the context of CGT. The 'Try again' icon appears because the student has not completed clicking on each icon to reveal the information behind the acronym that suggests an effective problem-

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<sup>41</sup> Sarah Quinton and Teresa Smallbone, 'Feeding Forward: Using Feedback to Promote Student Reflection and Learning – A Teaching Model' (2010) 47(1) *Innovations in Education and Teaching* 125; David Lefevre and Benita Cox, 'Feedback in Technology-Based Instruction: Learner Preferences' (2016) 47(2) *British Journal of Educational Technology* 248.

<sup>42</sup> Dror Ben-Naim, N Marcus and D Bain, 'Visualization and Analysis of Student Interaction in an Adaptive Exploratory Learning Environment' (Paper presented at 1<sup>st</sup> International Workshop in Intelligent Support for Exploratory Environments, The European Conference on Technology Enhanced Learning (EC-TEL'08), Maastricht, 17–19 September 2008).

<sup>43</sup> Alexandra Vassara et al, 'The Adaptive Virtual Workshop: Maintaining Student Engagement through an On-line Adaptive Resource for Engineering Design Education' (Paper presented at the Australasian Conference for Engineering Education, Wellington, 8 December 2014).

<sup>44</sup> Ibid.

<sup>45</sup> Ben-Naim, Marcus and Bain, above n 42.

solving approach. There is a link in the top right-hand corner to the online site for the taxation law legislation. This ensures that students do not have to interrupt the activity to find important source material.

**Figure 2**

Taxation of Capital Gains Module 2  
Approaches to legal problem solving

Income Tax Assessment Act 1997 (Cth)

A useful acronym to introduce you to the stages of legal problem solving is **MIRAT**.

Click each letter to reveal what the acronym, MIRAT, represents:

**M** **Material facts, either present or absent.**  
This equates to analysis of the problem and determination of whether or not sufficient information has been provided;

**I** **Issues of law and “policy”.**  
This can be viewed as equivalent to identifying the information required for solution. Think what is the question?

**R**

**A**

**T**

Please click on each letter icon to reveal the meaning of MIRAT then click Next.  
(Do not close the information in each box).

Try again

REFERENCES: J. Wade, 'Meet MIRAT: Legal Reasoning Fragmented into Learnable Chunks' (1990-91) 2 *Legal Educ Review* 283.

The authors argue that the use of this software platform supports an educational design process in which the academics can author and adapt lessons and feedback to suit their own classes, without having to reprogram the underlying simulations and software.<sup>46</sup> The academic author can examine the feedback ‘analytics’ and then amend the online questions to ensure students are challenged in a way that stimulates their learning.

Also, important in each module’s design is the graphic presentation of the hypothetical situation. Visual metaphor in education can improve audience engagement, attention, memory and comprehension.<sup>47</sup> It has been shown to be an effective way of reducing the cognitive load of working memory and of helping the flow of information from working memory into long-term memory. It is critical to achieve optimal screen presentation in AES approaches<sup>48</sup> as the screen is the primary interface between the user and the computer.<sup>49</sup>

<sup>46</sup> Gangadhara B Prusty et al, ‘Adaptive Tutorials to Target Threshold Concepts in Mechanics – A Community of Practice Approach’ (Paper presented at Australasian Association of Engineering Education Conference, Freemantle, 5–7 December 2011).

<sup>47</sup> Rani Kanthan and Sheryl Mills, ‘Using Metaphors, Analogies and Similes as Aids in Teaching Pathology to Medical Students’ (2004) 16(1) *Medical Science Educator* 1.

<sup>48</sup> Klett, above n 40.

<sup>49</sup> Dreher and Capputti, above n 22.

### ***A A Modified Problem-Based Learning Approach to Learning and Teaching Problem- Solving and Capital Gains Tax***

The Australian Qualification Framework (AQF) is the national policy for regulated qualifications in Australian education and training.<sup>50</sup> Australian law and business faculties are required to comply with the regulatory policy of the AQF. The AQF describes its organising framework as a 'taxonomic structure of levels and qualification types each of which is defined by a taxonomy of learning outcomes'.<sup>51</sup> Within this framework there are four broad categories of generic learning outcomes, the third of which is thinking skills, which includes decision-making and problem-solving.<sup>52</sup>

Identifying and solving both routine and complex problems is a requirement of the 'skills' learning outcome of the AQF taxonomy.<sup>53</sup> Graduates of a bachelor degree are expected to have 'cognitive and creative skills to exercise critical thinking and judgement in identifying and solving problems with intellectual independence'. The requirement for graduates of coursework master degrees is similar, although there is more emphasis on analysis and synthesis in dealing with problems.<sup>54</sup>

The authors have used a pedagogical approach based on a modified version of problem-based learning (PBL) as the educational framework within which they have developed the modules. This approach was chosen in order to improve problem-solving skills in the student cohort, as such skills are an integral aspect of the graduate learning outcomes of University of New South Wales law and business students,<sup>55</sup> and are also part of the AQF.

PBL was developed in the 1950s as a way of improving teaching medicine, as there were criticisms that medical graduates were not able to understand, analyse and solve 'real world' problems in a clinical setting.<sup>56</sup> PBL is now widely used in a variety of disciplines, although it is more commonly used in science-based courses.<sup>57</sup> The general characteristics of PBL are similar to the approach used in law and business schools with respect to legal problem-solving, with some exceptions that will be highlighted in the discussion below. PBL is difficult to define, however, the following statement from Boud and Feletti is a useful starting point:

While there are different versions of what constitutes PBL, it does not, as is sometimes erroneously assumed, involve the addition of problem-solving activities to otherwise

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<sup>50</sup> Australian Government, Department of Education and Training, *Australian Qualifications Framework* <<http://www.aqf.edu.au>>.

<sup>51</sup> Australian Qualifications Framework Council, *Australian Qualifications Framework* (2<sup>nd</sup> ed, 2013) 11.

<sup>52</sup> *Ibid*.

<sup>53</sup> *Ibid* 16.

<sup>54</sup> *Ibid* 17.

<sup>55</sup> University of New South Wales Business School, *Program Learning Goals and Outcomes* <<https://www.business.unsw.edu.au/students/student-experience/studying-at-university/program-learning-goals-and-outcomes>>.

<sup>56</sup> Woei Hung, David H Jonassen and Rude Liu, 'Problem-Based-Learning' in J Michael Spector et al (eds), *Handbook of Research on Educational Communications and Technology* (Lawrence Erlbaum Associates, 3<sup>rd</sup> ed, 2008) 486-7; H S Barrows, 'A Taxonomy of Problem-Based Learning Methods' (1986) 20 *Medical Education* 481.

<sup>57</sup> Hung, Jonassen and Liu, above n 56, 487-8.

discipline-centred curricula. It is a way of conceiving of the curriculum as being centred upon key problems in professional practice.<sup>58</sup>

The characteristics of PBL are, first, that it is a problem-focused approach to learning and teaching so that knowledge building is stimulated by and applied back to the problem. Second, it is student-centred, meaning that students take responsibility for their learning and are self-directed; in other words, students individually and collaboratively assume responsibility for generating their learning. Students are required to be self-reflective, so that they understand and learn to adjust their strategies for learning. Finally, tutors are facilitators who support and model reasoning processes and facilitate group processes. They are not knowledge providers and do not generally answer student questions.<sup>59</sup> With respect to students studying law, PBL is said to have two main benefits: first, it develops basic knowledge and skills that help to equip students for legal practice; second, it enables students to take responsibility for learning and allows them to evaluate their own levels of learning.<sup>60</sup>

Law and business students are often introduced to the stages of legal problem-solving through the use of a framework called, MIRAT, developed by Wade in his article analysing legal problem-solving.<sup>61</sup> This approach to solving complex, professional-type legal problems is used in the authors' university and many other universities in Australia.

The acronym MIRAT represents:

- M – material facts, either present or absent. This equates to analysis of the problem and determination of whether or not sufficient information has been provided;
- I – issues of law and 'policy'. This can be viewed as equivalent to identifying the information required for solution;
- R – rules, research and resources. Law students need to ask themselves relevant questions in order to research the appropriate legal rules and resources and then study their research to form their conclusion;
- A – arguments or application. This is where law students apply the legal rules that they have researched, and is equivalent in a PBL process to formulating answers; and
- T – tentative conclusion. This aspect of legal problem-solving equates to Engel's final step in PBL of applying newly acquired knowledge to the problem.<sup>62</sup>

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<sup>58</sup> David Boud and Grahame Feletti, 'Changing Problem-based Learning. Introduction to the Second Edition' in David Boud and Grahame E Feletti (eds), *The Challenge of Problem-Based Learning* (Routledge, 2<sup>nd</sup> ed, 1997) 19.

<sup>59</sup> Hung, Jonassen and Liu, above n 56, 489.

<sup>60</sup> Vijaya Nagarajan, 'Designing Learning Strategies for Competition Law – Finding a Place for Context and Problem Based Learning' (2002) 13 *Legal Education Review* 1, 12.

<sup>61</sup> John Wade, 'Meet MIRAT: Legal Reasoning Fragmented into Learnable Chunks' (1990–91) 2 *Legal Education Review* 283. Variations of this approach are also used: for example, Kelley Burton, "'Think Like a Lawyer": Using a Legal Reasoning Grid and Criterion-Referenced Assessment Rubric on IRAC (Issue, Rule, Application, Conclusion)' (2017) 10(2) *Journal of Learning Design* 57, 58.

<sup>62</sup> Charles Engel, 'Not Just a Method but a Way of Learning' in David Boud and Grahame E Feletti (eds), *The Challenge of Problem-Based Learning* (Routledge, 2<sup>nd</sup> ed, 1997) 44, 50-51.

The first author considered that the articulation and use of this process throughout the modules would enhance the students' learning experience, develop and improve their problem-solving skills, and allow for the incorporation of 'real world' case studies.<sup>63</sup> Figures 2 and 3 are screen shots of module pages that guide the students using the MIRAT acronym and process.

There are a number of benefits to using the MIRAT framework integrated with a modified PBL approach. The main one is that problem-solving puts learning into context. 'Real life' problems become tools for learning through which students are exposed to the various stages of problem-solving, and can practise their problem-solving skills whilst they acquire substantive contextualised knowledge. In addition, these 'real world' scenarios assist students in the development of decision-making skills. Educational research argues that students need to become familiar with the complex skills used in making and implementing decisions.<sup>64</sup> Many consider that decision-making skills in professional problems are an essential aspect of professional practice,<sup>65</sup> particularly if practitioners are to meet their clients' goals.

The use of case studies or scenarios is also considered to be relevant in developing student responsibility and independence. The ability to direct and evaluate one's own learning allows students to become aware of their personal learning needs and strategies, and to locate and utilise appropriate information sources effectively.<sup>66</sup> This enhances their present studies but also paves the way for continuous learning, which is an essential prerequisite for dealing with the modern environment in which 'the shelf-life' of discipline knowledge is considerably shorter than a graduate's period of professional practice.<sup>67</sup> The ability to learn quickly, effectively and independently rather than simply to assimilate current knowledge has become an essential criterion for university graduates.<sup>68</sup>

The CGT modules make extensive use of case studies and 'real world' scenarios (such as video resources produced by the Australian Taxation Office) that put the learning into context. Use of 'real world' scenarios is the first characteristic of the PBL approach as discussed earlier in this article. Although, due to technology constraints, these case studies are not able to replicate real client interviews or true legal scenarios, the problems nonetheless stimulate learning through the feedback loops that are embedded in the modules. The modules are student-centred and self-directed (also characteristics of a PBL approach), as it is the student's responsibility to work through the modules in

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<sup>63</sup> Hung, Jonassen and Liu, above n 56, 488; Paula Gerber, 'The Teaching of Construction Law and the Practice of Construction Law: Never the Twain Shall Meet?' (2010) 20(1&2) *Legal Education Review* 59; Yewonde Idowu, Elizabeth Muir and Graham Easton, 'Problem-Based Learning Case Writing by Students based on Early Years Clinical Attachments: A Focus Group Evaluation' (2016) 7(3) *Journal of the Royal Society of Medicine Open* 1.

<sup>64</sup> See David W Johnson and Frank P Johnson, *Joining Together: Group Theory and Group Skills* (Pearson, 11<sup>th</sup> ed, 2013).

<sup>65</sup> Paul Ramsden, *Learning to Teach in Higher Education* (Routledge, 1992) 50; Gerber, above n 63.

<sup>66</sup> Barrows, above n 56, 482.

<sup>67</sup> Michael Fullan, *Change Forces: Probing the Depths of Educational Reform* (Falmer Press, 2000) 3-4.

<sup>68</sup> Barrows, above n 56, 482.

their own time and at their own pace, and they choose how much or little information they input into the case-study answers.

An important aspect of the PBL approach is the development of reflective learning practices.<sup>69</sup> Reflection, as an aspect of learning, requires the metacognitive analysis of the educational processes that the student has experienced, and is potentially a key to transfer of learning. Laurillard argues that this is an important goal of academic teaching that must help 'students reflect on their experience of the world in a way that produces the intended way of representing it'.<sup>70</sup> The design of the modules encourages reflection in learning, particularly when students input an incorrect answer, as, instead of then being presented with the correct answer they are given a hint and asked to attempt the question again. Inputting information into the text boxes that are presented to the students after a case study also encourages reflection in learning as students are required to rethink the scenario that they have been shown and analyse which parts of the information are essential to which legal issue. They are then shown a model answer and asked to compare their own responses to this model. Again, this encourages them to reflect on how they have approached solving the legal problem.

The MIRAT and modified PBL approach assists students in their awareness of how to approach legal problems or situations. By identifying material facts and issues of law and policy they are undertaking the first part of Engel's PBL process of 'identifying facts and formulating an understanding of the problem'. By researching and examining legal rules they are 'seeking information and synthesising the facts in light of the situation to identify possible options', and by looking at all the arguments both for and against their client and coming to a tentative conclusion they are 'reassessing possible options through consideration of the tangible and personal aspects of the problem to achieve a best-fit'.<sup>71</sup> Integrating the MIRAT approach with the case studies in the modules, the modules provide students with feedback on correct and incorrect answers, giving them the opportunity to reflect, in a safe and private environment, on what they know and don't know.

The major difference between the approach used in the modules and PBL is that the module problems are not central to the learning situation with everything designed around them. Furthermore, the modules give correct answers to the students after only one or perhaps two to three attempts. The taxation law students are all in their final or penultimate year of their degrees. Their courses are situated within faculties that do not use a true PBL approach, which is characterised by students engaging with case studies to find their own answers and where tutors are not necessarily content experts. The

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<sup>69</sup> David A Kolb, *Experiential Learning: Experience as the Source of Learning and Development*, (Englewood Cliffs, Prentice Hall, 1984); Engel, above n 62, 50-519; David Boud and Grahame Feletti, 'Changing Problem-Based Learning. Introduction to the Second Edition' in David Boud and Grahame E Feletti (eds), *The Challenge of Problem-Based Learning* (Routledge, 2<sup>nd</sup> ed, 1997) 9-13.

<sup>70</sup> Diana Laurillard, *Teaching as a Design Science: Building Pedagogical Patterns for Learning and Teaching* (Routledge, 2012) 24.

<sup>71</sup> Engel, above n 62, 19.

authors therefore decided that a modified PBL approach would be more appropriate to suit these student learning needs.<sup>72</sup>

### ***B The Structure and Layout of the Modules***

Two AES online learning modules were developed. The first dealt with introductory and core aspects of CGT, and the second used problems or case studies to enhance student learning. CGT, as part of the taxation law course, was used as the subject area, as it is complex and very rule oriented. The first author's experience is that students find this area of taxation law challenging, due to the large amount of detailed legislation with a vast array of provisos and exceptions. It was considered that this type of rule-based area would be more readily translated to an AES, as opposed to other legal areas that require in-depth engagement with legislation and case law. Both modules were optional and not linked to summative assessment.

Each learning module consists of a number of key ingredients that aim to improve the student's learning experience and make the webpages easy to navigate and work with. Icons and navigation methods were consistent between both of the learning modules and students are only ever 'trapped' for a specific number of attempts at one answer.

On first entering a learning module, students are introduced to the different icons and navigational instructions including directions on the use of the program and how, for example, to move between screens. A number of icons were created to guide students where needed, in particular the information ('i') icon and the help ('?') icon. Use of visual icons allowed relevant information to be embedded within the AES page for the student to call upon if and when needed, for example, the section of the legislation that is required to be understood in order to answer the question. Links to legal information sites available on the internet were also made available. In this way, the two learning modules can stand alone as self-paced tutorials with students able to tackle them without any external advice or assistance, although the instructions advise them that they should have their text and legislation with them. Each learning module was designed to take the average student between 40 minutes and one hour to complete.

The first module reinforces lower-order thinking skills such as remembering information and reading text. The second module develops legal problem-solving skills and high-level comprehension and analysis. Module 1 primarily contains multiple-choice and short-answer questions, with the order of answers changing after every attempt. Students are also required to complete a flowchart of the steps required to solve a simple CGT problem. This flowchart is taken directly from the legislation, and working through the steps is designed to engage the students with the process at an early stage. There are two cases studies at the end of module 1.

Figure 1 is a screen shot of question 1 from module 1. It shows the pictorial representations of the choices of answers for the question. The tool bar at the top of the

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<sup>72</sup> That PBL does not accommodate all objectives of legal education has been recognised by other authors: see Nagarajan, above n 60, 14.

page indicates where the student is in their progress through the module. The student clicks on the button for each picture that they consider is a CGT asset within the definition in the legislation. They then click the 'next' icon and will be advised if they are correct or if they need to try again. If their answer is incorrect they are provided with feedback such as an extract of the relevant section of the legislation for them to read. They cannot proceed to the next question without either a correct answer or at least two attempts. Every time the screen appears the answers are in a different order.

At several stages in the modules, students are asked to answer questions about the interaction between general taxation principles, such as the deductibility of expenses, and capital gains tax. Short videos explaining this (produced by the Australian Taxation Office) were embedded into the AES so that students could watch them and then answer the questions.

### ***C The MIRAT Approach and Using Case Studies***

Module 2 progresses from module 1 and uses some of the principles of problem-based learning to help students understand and learn legal problem-solving. Students are first introduced to the MIRAT approach, which is explained in some detail, and given the opportunity to practise the format before proceeding to the case-study problems. The AES requires students to enter their answers into separate boxes that correspond with the MIRAT approach, breaking their response down in accordance with the MIRAT steps.

The AES then provides a summary of possible solutions along with the solution's rationale with which students can compare their own responses. Students thus move from the decision-maker to the learner role and receive advice and feedback from the onscreen 'mentor', whose role is to ensure that they identify proper alternative courses of action and sufficiently analyse and evaluate options before eliminating them.<sup>73</sup>

Figure 3 demonstrates the use of MIRAT icons. Students will have read through a case study on the preceding screen and then need to type into the boxes the material facts, issues, rules and so on that they think are relevant. They can click on the green information icon in order to reread the facts of the case study. The program will not let them proceed until they have input at least two sentences into each box.

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<sup>73</sup> Elizabeth A Girot, 'Graduate Nurses: Critical Thinkers or Better Decision Makers?' (2000) 31(2) *Journal of Advanced Nursing* 288; Johnson and Johnson, above n 64.

**Figure 3**

Taxation of Capital Gains Module 2  
Case Study 3

Income Tax Assessment Act 1997 (Cth)

100%

Using the **MIRAT** process try to fill in as much detail as possible below. When you are ready to answer some questions, click 'Next'

**M** Material facts, either present or absent:

**I** Issues of law and "policy":

**R** Rules, research and resources:

**A** Arguments or application:

**T** Tentative conclusion:

Click the icon below to read the case study information .

Next

### ***D The Inclusion of Reflection in the Learning Modules***

The learning modules require students to take stock and reflect on the processes they have undertaken. They are required at various times throughout the modules to stop and type notes reflecting on their actions and experiences in the notebook that is embedded in the AES.

The purpose of such feedback and reflection is to ensure that students take a broad view of the situation, the extent of their knowledge, and how they apply their knowledge. In addition, the interpretation and categorisation of material is designed to foster deeper learning.<sup>74</sup> This opportunity for students to reflect on their learning experience is considered by many commentators as an essential aspect of effective learning.<sup>75</sup>

Once students have reflected on the processes they have undertaken they are required to re-evaluate the conclusions they have reached. The purpose of re-evaluation is to relate the new knowledge to existing knowledge and integrate this knowledge into the learner's own personal way of thinking. This is done in the modules by asking students to compare their own responses to suggested correct answers, reflect on this comparison and then move on to more complex case studies.

<sup>74</sup> Laurillard, above n 70, 23–4.

<sup>75</sup> See Quinton and Smallbone, above n 41; D A Schon, *Educating the Reflective Practitioner: Towards a New Design for Teaching and Learning in the Professions* (Jossey-Bass, 1987); D Boud, R Keogh and D Walker, 'Introduction: What is Reflection in Learning' in D Boud, R Keogh and D Walker (eds), *Reflection: Turning Experience into Learning* (Kogan Page, 1985).

Re-evaluation involves re-examining experience in the light of the learner's intent, associating new knowledge with that which is already possessed, and integrating this new knowledge into the learner's conceptual framework. It leads to an appropriation of this knowledge into the learner's behaviour. This can involve a rehearsal in which the new learning is applied mentally to validate its authenticity and the planning of subsequent activity in which this learning is applied in one's life.<sup>76</sup>

#### IV THE STUDENTS' EXPERIENCE

The learning modules were developed and piloted with a small group of students in late 2014. In 2015 and 2016 the learning modules were used as an optional part of three courses. These courses are very similar and teach essential aspects of Australian taxation law, including CGT. The students who undertook these courses were postgraduate students studying towards a Master of Professional Accounting, undergraduate business students undertaking a commerce degree and law students studying for a law degree. Each of the courses is taught over one semester and has a series of assessment tasks including an open-book exam at the end of the semester. CGT is integrated into the assessment tasks at the latter stages of the semester. Law students studying Business Taxation were surveyed in semester 1, 2016. Separate student cohorts studying for the Master of Professional Accounting were surveyed in semesters 1 and 2 of 2015, and students studying Business Taxation as part of their business degree were surveyed in semester 2, 2016.

In total 231 students answered the survey. Ninety-three per cent of the postgraduate students, 50 per cent (approximately) of the undergraduate business students, and 7 per cent of the law students reported that English was not their first language. The postgraduate students represented the majority of students who used the modules and who were surveyed (154 out of 231 students) and therefore it seems reasonable to assert that the majority of students who undertook the modules did not have English as their first language.

Quantitative data was collected through a series of 24 questions (in which students were asked to rank their responses based on a 5-point Likert scale), for example, how easy the students found working through the modules, whether they considered the use of the modules a good way to learn about CGT, and if they found the feedback on either correct responses or incorrect responses helpful to their learning of CGT. Qualitative data was collected via two open-ended questions. Ethics approval was obtained to survey the different student cohorts. Table 1 provides a snapshot of student responses to some of the questions.

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<sup>76</sup> D Boud, R Keogh and D Walker, 'Promoting Reflection in Learning: A Model' in D Boud, R Keogh and D Walker (eds), *Reflection: Turning Experience into Learning* (Kogan Page, 1985) 30.

**Table 1**

Question	Moderately Disagree and Strongly Disagree (1 and 2)	Neutral (3)	Moderately Agree and Strongly Agree (4 and 5)	Not Applicable (6)
1 – Working through the module(s) was straightforward	9.3%	10.6%	76.1%	3.4%
6 – Working through the module(s) was a good way of learning about CGT	8.2%	14.3%	70.3%	5.2%
16 – When I received feedback about an incorrect answer I found the feedback helpful	11%	11%	70%	8%
17 – The feedback provided when I answered a question <i>incorrectly</i> made me rethink aspects of my learning of CGT	11.6%	12%	67.5%	8.9%
20 – I felt that the feedback I received after answering a question made my learning experience more personal	10.1%	14.2%	69%	6.7%

The majority of students found the modules a good way to learn about CGT. Seventy per cent of students either agreed or strongly agreed that the modules were a good way to learn about this area of taxation law. In relation to reflection in learning, again the majority of students either agreed or strongly agreed that the feedback on their incorrect answer made them rethink their learning of CGT. Sixty-seven per cent of students stated that the feedback provided when they answered a question incorrectly made them rethink aspects of their learning of CGT.

Only a handful of students provided comments to the two open-ended questions. However, the majority of these were positive. One student commented in answer to the question 'What did you like/not like about the modules?', that 'It provides the solution clearly'. Another stated, 'Feedback provided to help better understanding'. The identified limitations of the modules were the inability to easily navigate back to earlier pages, and the inability of the software to recognise 'keywords' that the students might use. These are limitations of the software, but it is anticipated that the design will improve in these areas in the future as the Smart Sparrow designers are very open to academic feedback.

## V CONCLUSIONS

This study has identified that students perceive a number of benefits to using this teaching tool. The majority report that the modules helped them to learn about CGT and that the way they were structured, with 'trapped' states and feedback loops, made them rethink their learning and was helpful to their learning. The authors intended, through the use of multiple-choice questions in the initial stages of the design, to allow students to draw on their existing knowledge, reinforce their learning, and increase their confidence by highlighting and providing feedback on how much they already know and

understand.<sup>77</sup> As discussed in this paper, building on prior knowledge and providing immediate feedback are identified in the educational literature as effective ways of improving students' learning.<sup>78</sup> We argue that the use of problems or case studies based on a modified PBL approach and within an AES allows students to practice legal problem-solving skills in a private and non-judgemental environment. The emphasis on reflection as an important aspect of learning and the explicit articulation of legal problem-solving processes is intended to develop their legal problem-solving skills and assist their subsequent skill transfer to new situations, and we argue that this learning framework encourages reflection as a way of assisting students to better understand their learning materials.<sup>79</sup>

By providing students with the ability to set the pace of their own learning, AESs recognise that differences in background and levels of experience with decision-making will influence the time needed to complete learning modules. This personalises the learning process for each student. A particular advantage, especially for accounting students in this study, is that the use of technology provides them with a safe, private learning environment in which they can experiment with new skills and knowledge. This is relevant for students for whom English is a second language so they can practise their English reading and comprehension skills. As seen from the data provided in answer to the survey, a significant proportion of students who are taught taxation law at the authors' university are from backgrounds where English is not their first language. Being able to self-pace their learning is therefore very important to these students.

Overall the students' response to the AES experience, as demonstrated by the survey data, is very encouraging for future use of AES approaches. It is particularly pleasing that a large majority of accounting students found that feedback on their incorrect answer made them rethink their learning, indicating some level of reflection and re-engagement with the content of the course. A further point in favour of the learning modules is that, although they were optional and used outside class time, more than half the students enrolled in the courses attempted at least one module, indicating that they considered the modules a worthwhile use of their revision time. Future research in this area could include analysis of whether or not students' learning had actually improved, and the authors intend to embed a pre- and post-test into the modules the next time they are offered in order to attempt to determine this.

There are, of course, limitations with any teaching approach and the authors recognise this. Major downsides with AESs are that if students are not coping with a concept the feedback they receive is limited to what they can read and absorb from the screen. They can't engage with the AES the way that they can with a tutor or peer. Furthermore, the AES does not interpret the data that the student inputs into the text boxes. It is up to the student to compare what they have written with the feedback provided on screen to

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<sup>77</sup> Lawrence Chirwa, 'A Case Study on the Impact of Automated Assessment in Engineering Mathematics' (2008) 3(1) *Journal of the Higher Education Academy Engineering Subject Centre* 13.

<sup>78</sup> National Union of Students, above n 26, 11; Nicol and Macfarlane-Dick, above n 26; Anna Espasa and Julio Meneses, 'Analysing Feedback Processes in an Online Teaching and Learning Environment: An Exploratory Study' (2010) 59 *Higher Education: The International Journal of Higher Education* 277.

<sup>79</sup> Klett, above n 40.

evaluate where they might have gone wrong. Again, an informed tutor or peer is the best way to provide this analysis.

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