

**Using Schemas to Demonstrate the Methodology of Solving  
Complex Tax Problems: A Case Study**

Author

Mortimore, Anna, Dickfos, Jennifer

Published

2014

Journal Title

Journal of the Australasian Tax Teachers Association

Rights statement

© 2014 Australasian Tax Teachers Association (ATTA). The attached file is reproduced here in accordance with the copyright policy of the publisher. Please refer to the journal's website for access to the definitive, published version.

Downloaded from

<http://hdl.handle.net/10072/66702>

Link to published version

<https://www.atta.network/jatta-published-editions>

Griffith Research Online

<https://research-repository.griffith.edu.au>

**USING SCHEMAS TO DEMONSTRATE THE METHODOLOGY OF SOLVING COMPLEX TAX PROBLEMS:  
A CASE STUDY**

ANNA MORTIMORE AND JENNIFER DICKFOS\*

**ABSTRACT**

Two common misconceptions held by tax law educators are that students have the necessary cognitive ability to understand the Australian taxation system and that they have the legal comprehension necessary to develop a methodology to resolve complex tax problems. Graphical schemas, which are conceptual frameworks that help organise and interpret information, include concept maps and flowcharts. They may assist in addressing these misconceptions. This case study provides preliminary evidence that by using graphical schemas, complex tax laws are not only clarified, but simplified into a sequence of steps, providing a methodology, as well as the motivation and confidence for students to solve complex tax problems.

---

\* Anna Mortimore is a Lecturer in Taxation Law in the Department of Accounting, Finance and Economics, Griffith Business School, Griffith University, email: a.mortimore@griffith.edu.au and Jennifer Dickfos is a Lecturer in Business Law and Company Law in the Department of Accounting, Finance and Economics, Griffith Business School, Griffith University, email: j.dickfos@griffith.edu.au.

## I INTRODUCTION

Students in undergraduate taxation law courses may be at risk of being overwhelmed by the volume of material referred to in their tax courses. Although prescribed reading of textbooks<sup>1</sup> is the central means of conveying information quickly,<sup>2</sup> recent research<sup>3</sup> has recognised that students rely substantially on their instructors for knowledge and understanding, rather than their textbooks, which are primarily seen as reference material.

However, cognitive research suggests effective teaching and learning, leading to understanding, is not simply a process of relaying knowledge to students.<sup>4</sup> Many educators wrongly assume students have the necessary cognitive schemas to understand challenging intellectual topics: For example, teaching complexity science and complex systems requires thoughtful approaches to help students comprehend the content.<sup>5</sup> Similarly, while it is not a complex system in that sense, the legal framework does include webs of complex (complicated) rules that are difficult to comprehend and the Australian taxation system is a good example. A further misapprehension on the part of educators may be that students have the legal comprehension skills<sup>6</sup> to identify taxation issues, essential in resolving complicated tax problems. Providing too much information and failing to recognise students' lack of cognitive conceptual development may then impact on students' self-efficacy levels, cause undue stress and ultimately result in poor grades.

A challenge then for taxation law educators is to meet students' expectations for effective content delivery of complex taxation laws within a two hour weekly lecture, to large cohorts of students with varying reading, comprehension and problem-solving skills.

To address this challenge and to provide a methodology for problem solving in taxation law, the article's lead author has developed a comprehensive set of schematic diagrams:

---

<sup>1</sup> Additional materials may include Income Tax legislation, PowerPoint slides, review questions and answers, exemplars, study guides, and tutorial questions.

<sup>2</sup> See, for example, W Steve Albrecht and Robert J Sack, 'Accounting education: Charting the course through a perilous future' (2000) 16 *Accounting Education Series* (American Accounting Association, 2000); John Beegle and David Coffee, 'Accounting instructors' perceptions of how they teach versus how they were taught.' (1991) 67 (2) *Journal of Education for Business* 90; Shirley Dennis-Escoffier, Beth Kern, and Shelley Rhoades-Catanach, 'The revised model tax curriculum' (2009) 24(2) *Issues in Accounting Education* 141; Beth Kern and Shirley Dennis-Escoffier, 'Current tax status of the tax curriculum in accounting programs.' (2004) (November) *The Tax Advisor* 712.

<sup>3</sup> See, for example, Barbara J Phillips and Fred Phillips, 'Sink or skim: Textbook reading behaviours of introductory accounting students' (2007) 22(1) *Issues in Accounting Education* 21; Jefferson Jones, 'Enhancing student learning: An examination of the student use of textbooks in financial accounting' (2011) 1(1) *American Journal of Business Education* 29; Nell Adkins, B Charlene Henderson and Kimberly G Key, 'Graphical organizers in tax education' (2012) 30 *Journal of Accounting Education* 2.

<sup>4</sup> John D Bransford, Ann L Brown and Rodney R Cocking (eds), *How People Learn: Brain, Mind, Experience, and School* (National Research Council [USA], Committee on Developments in the Science of Learning, Commission on Behavioral and Social Sciences and Education, 1999).

<sup>5</sup> Cindy E Hmelo-Silver and Roger Azevedo, 'Understanding complex systems: Some core challenges' (2009) 15(1) *Journal of the Learning Sciences* 53.

<sup>6</sup> James F Stratman, 'When law students read cases: Exploring relations between professional legal reasoning roles and problem detection' (2002) 34 *Discourse Processes* 57.

flowcharts paired with step-by-step (SBS) conceptual schemas in tabular form for teaching and assessing key content areas in a final year undergraduate taxation law course at an Australian university.

Mental or cognitive schemas<sup>7</sup> have been theorised as cognitive frameworks or mental structures by which the brain itself organises and interprets information.<sup>8</sup> There is a substantial body of literature on cognitive schemas in several fields within cognitive science, including educational psychology and cognitive anthropology.

Diagrammatical schemas or 'graphical organizers'<sup>9</sup> are ways to classify problems into particular classes, which can then be solved by using a set of general procedures relevant to that particular class of problem.<sup>10</sup> The benefits of using graphical schemas in tax education<sup>11</sup> have been outlined previously. Adkins, Henderson and Key<sup>12</sup> describe the benefits of using schemas as follows:

- Reducing cognitive effort to understand complex relationships;<sup>13</sup>
- Reducing stress on working memory;<sup>14</sup>
- Assisting readers to organise and integrate related elements to see the 'big picture';
- Assisting students with low verbal ability in the language of instruction, such as ESL students.<sup>15</sup>

---

<sup>7</sup> Theorist Jean Piaget popularised the use of the term 'schema' in his stage theory of cognitive development in children. In terms of Piaget's theory as experiences happen and new information is presented, children develop new mental schemas and old schemas are changed or modified. See, for example, Jean Piaget, 'Piaget's theory' in Paul H Mussen (ed) *Manual of child psychology* (Wiley, 1970) 703.

<sup>8</sup> Robert J Dufresne, William J Gerace, Pamela T Hardiman and Jose P Mestre, Constraining novices to perform expert-like problem analyses: Effects on schema acquisition (2009) 2(3) *Journal of Learning Sciences* 307.

<sup>9</sup> The terms 'graphical schema' and 'graphical organiser' are used interchangeably in the body of this paper. See Nell Adkins, B Charlene Henderson and Kimberly G Key, 'Graphical organizers in tax education' (2012) 30 *Journal of Accounting Education* 2, 3. Graphical schemas and organisers encompass many forms of representation, but exclude aids without spatial representation, such as lists and outlines and aids containing non-verbal information such as pictures, and geographic maps.

<sup>10</sup> See, for example, Mary L Gick and Keith J Holyoak, 'Schema induction and analogical transfer' (1983) (14) *Cognitive Psychology* 1; John D Bransford and Daniel L Schwartz, 'Rethinking transfer: A simple proposal with multiple implications' (1999) 24 *Review of Research in Education* 61.

<sup>11</sup> See, for example, Nancy B Nichols, John O Everett and Richard Boley, 'Instructional resources for tax education: Communicating the complexities of capital gains for individuals after the 1997 and 1998 tax acts' (1999) 14 (1) *Issues in Accounting Education* 117; Adkins, et al, above n 9.

<sup>12</sup> Adkins, et al, above n 9.

<sup>13</sup> See, for example, Peter C H Cheng, Ric K Lowe and Mike Scaife, 'Cognitive science approaches to understanding diagrammatic representations' (2001) 15(1 -2) *Artificial Intelligence Review* 79; Mike Scaife and Yvonne Rogers, 'External cognition: How do graphical representations work?' (1996) 45 (2) *International Journal of Human Computer Studies* 185.

<sup>14</sup> Douglas D Dexter and Charles A Hughes, 'Graphic organizers and students with learning disabilities: A meta-analysis' (2011) 34(1) *Learning Disability Quarterly* 51.

<sup>15</sup> ESL students are those for whom English is a second language. Adkins, Henderson and Key, above n 9, 3 'citing John C Nesbit and Olusola O Adesope, 'Learning with concepts and knowledge maps: A meta-analysis' (2006) 76 *Review of Educational Research* 413'; Mark S Stensvold and John T Wilson,

While it is acknowledged that use of graphical schemas improves student performances and reduces cognitive effort,<sup>16</sup> little examination has been made of the types of schemas that may impact students' motivation to learn.<sup>17</sup> This article is a case study that attempts to address this gap. The article also extends and complements previous studies by providing preliminary evidence that the set of schemas developed by the lead author are not only a cognitive mechanism for the efficient teaching of taxation law, but they also impact on learning by motivating students through increased levels of confidence and self-efficacy in solving complex tax problems.

The remainder of this article is organised as follows. Part II provides a theoretical background describing the skills required to understand complicated intellectual topics; graphical schemas and their use in simplifying complex concepts; the general importance of confidence and self-efficacy in acquiring technical skills; and the use of graphical schemas as a role-modelling and mastery tool to increase students' confidence and self-efficacy levels in solving complex tax problems. Part III briefly describes and illustrates the design of the schemas. Part IV describes the research method used. Part V presents the preliminary qualitative and quantitative results. Finally, consideration is given to the limitations of the current research, the potential for further research, ending with the article's conclusions.

## I THEORETICAL BACKGROUND

### *A Learning Complex Intellectual Topics*

Making sense of a complicated tax system is a difficult task, because it is not predictable, it may require one to think abstractly and often challenges current beliefs on certain concepts that may be in conflict with a learner's prior experience. Anecdotal evidence exists of students' struggles with the study of taxation law courses, which may be attributed in part to the complexity of the taxation system. Understanding and reasoning within taxation law, is challenging, not only because legal reasoning is a complex cognitive skill and places a huge burden on working memory.<sup>18</sup> Difficulties in cognitive

---

'The interaction of verbal ability with concept mapping in learning from a chemistry laboratory activity' (1990) 74 *Science Education* 473; Xiangying Jiang and William Grabe, 'Graphic organizers in reading instruction: Research findings and issues' (2007) 19(1) *Reading in a Foreign Language* 34.

<sup>16</sup> Such results are accounted for by the expansion of the transfer of learning theory beyond the application of the 'classic' prior knowledge approach. See, for example, John D Bransford, and Daniel L Schwartz, 'Rethinking transfer: A simple proposal with multiple implications' (1999) 24 *Review of Research in Education* 61; James G Greeno, 'Authoritative, accountable, positioning and connected general knowing: Progressive themes in understanding transfer.' (2006) 15 *Journal of the Learning Sciences* 537; Joanne Lobato, 'Alternative perspectives on the transfer of learning: History, issues, challenges for future research' (2006) 15 *Journal of the Learning Sciences* 431; Daniel M Belenky and Timothy J Nokes-Malach, 'Motivation and transfer: The role of mastery-approach goals in preparation for future learning' (2012) 21(3) *Journal of the Learning Sciences* 399.

<sup>17</sup> Similarly, little examination has been given to the role of motivation as a factor in the theory of the transfer of learning. See Daniel M Belenky and Timothy J Nokes-Malach, 'Motivation and transfer: The role of mastery-approach goals in preparation for future learning' (2012) 21(3) *Journal of the Learning Sciences* 399.

<sup>18</sup> Stratman, above n 6.

processes are not limited to legal problem solving, but extend to reading processes of legal texts, including cases.<sup>19</sup>

Legal educators may make the faulty assumption that their students have the cognitive and meta-cognitive skills to process all the information provided in the course, identify the important issues, successfully apply legal reasoning to resolve complex tax problems and maintain motivational skills. All of these are required to sustain learning of the complicated, intricately interwoven tax system. This case study classifies those students who have such skills as 'experts', those who lack such skills, are classified as 'novices'. Experts are able to work through all the material provided in their course and learn to classify problems into particular classes which can be solved using the same basic approach.<sup>20</sup> Novices, on the other hand, have a less organised knowledge structure and may only apply what they have learned to similar situations following routine procedures, as they have little understanding of how the system works.<sup>21</sup>

### **B The Role of Conceptual Knowledge**

It has been suggested that possessing accurate conceptual knowledge is a prerequisite for accurate legal reasoning, as conceptual knowledge is required at all stages of the legal problem solving process.<sup>22</sup> First, conceptual knowledge is required to understand the legal problem: to decide what information in the particular case is important and what is irrelevant. Second, conceptual knowledge determines what rules or jurisprudence should be researched: by distilling the relevant rule of law from reading cases, or searching for exceptions in external information sources such as law books. Third, conceptual knowledge is needed to interpret and accurately apply the law once found.

A recent study by Nievelstein et al<sup>23</sup> found the availability of information sources improved legal reasoning for expert students, but not for novice students. Novice

---

<sup>19</sup> Ibid 59. Stratman emphasises 'how can we know the difference between when students are having difficulties as critical readers and when they are having difficulties as contextually sensitive legal problem solvers, or when in fact they are having difficulty connecting these two processes with each other?'

<sup>20</sup> Hmelo-Silver and Azevedo, above n 5.

<sup>21</sup> See, for example, C E Hmelo-Silver and Merav G Pfeffer, 'Comparing expert and novice understanding of a complex system from the perspective of structures, behaviours and function' (2004) 28 *Cognitive Science* 127; Cindy Hmelo-Silver, Surabhi Marathe, and Lei Liu, 'Fish swim, rocks sit and lungs breathe: Expert-novice understanding of complex systems' (2007) 16(3) *Journal of Learning Sciences* 307.

<sup>22</sup> See Mary A Lundeberg, 'Metacognitive aspects of reading comprehension: Studying understanding in case analysis' (1987) 22 *Reading Research Quarterly* 407; Susan M Williams, 'Putting case-based instruction into context: Examples from legal and medical education.'(1992) 2 *Journal of the Learning Sciences* 367; Dorothy H Deegan, 'Exploring individual differences among novices reading in a specific domain: The case of law' (1995) 30 *Reading Research Quarterly* 154; Lars Lindahl, 'Deduction and justification in the law: The role of legal terms and concepts'(2004) 17 *Ratio Juris*182; Fleurie Nievelstein, Tamara van Gog, Henny P A Boshuizen, Frans J Prins, 'Effects of conceptual knowledge and availability of information sources on law students' legal reasoning' (2008) 38 *Instructional Science* 23.

<sup>23</sup> Nievelstein, et al considered 'the lack of conceptual knowledge and lack of knowledge of how information sources are organized, both by themselves or in combination, indeed seemed to lead to ineffective search processes when using the information sources. Such processes impose a high

students, who lack the conceptual knowledge to distil the relevant information from case studies or hypothetical problems, find legal reasoning difficult to understand or formulate.

Practically, this manifests in students' complaints regarding the time taken in understanding the law and applying the law to solve complex tutorial tax problems.

Nievelstein et al<sup>24</sup> further suggest that law education's reliance on the idea that students learn to reason and solve cases by engaging in solving cases with the aid of external sources is of little value to novices and a sub-optimal instructional method for such students. Instead, Nievelstein et al<sup>25</sup> suggest that novice law students may need forms of instructional guidance such as scaffolding conceptual knowledge to assist them to effectively learn to solve complex law problems. Nievelstein et al's investigation focused on law students. If novice law students experience such difficulties, then it is the authors' contention that novice commerce students (including (ESL) students) may find studying complex law systems such as taxation extremely arduous.

Using worked examples, review questions and tutorial solutions may be effective in the initial stages of skill acquisition for such novices, but do not necessarily provide the deep conceptual understanding needed to apply complex taxation laws as discussed above. Novice commerce students, relying on such material, perform poorly when the tax problem questions are varied, as such materials do not provide the scaffolding necessary to solve problems in a complex tax system. Thus there is a need<sup>26</sup> for tax law educators to understand the complex nature of learning, to support learning and to determine what scaffolds are necessary to support student learning and how they should be applied.

This article provides preliminary evidence of the use of graphical schemas as a way to help students develop the cognitive resources to understand and apply what are rather difficult and complicated taxation laws.

### ***C Multiple Educational Uses of Graphical Schemas***

Graphical schemas have multiple educational uses. First, they may be used as pre-lecture preliminary materials. By condensing large amounts of information and showing their inter-component relationships and sequences, a broad conceptual understanding of complex topics and overview of knowledge is provided. Secondly, they may be used as problem-solving tools because they provide a framework for a more detailed and proficient analysis of a complex topic.<sup>27</sup> Where the tax system relies upon the satisfaction of a series of conditions, an accurately constructed graphical schema in the

---

additional and ineffective load on working memory.' F Nievelstein et al, 'Effects of conceptual knowledge and availability of information sources on law students' legal reasoning' (2008) 38 *Instructional Science* 23, 32.

<sup>24</sup> Ibid.

<sup>25</sup> Ibid.

<sup>26</sup> Identified by Hmelo-Silver and Azevedo, above n 5, 55.

<sup>27</sup> See, for example, Philip T Senatra, 'The statement of changes in financial position: A flow-chart approach to teaching concepts and procedures' (1983) 1 *Issues in Accounting Education* 95; Robert J Dufresne et al, above n 8.

form of a flowchart provides the means to sequentially analyse the information and solve the problem. Thirdly, graphical schemas might contribute to students' own motivation to engage in deeper conceptual understanding of complex tax laws, which can influence their attitude to their learning. Applying Bandura's<sup>28</sup> theory of self-efficacy, encouraging students to successfully use schemas in tutorials and exams to solve complex tax problems may increase their students' confidence and self-efficacy levels in their tax problem-solving abilities.

### ***D Using Schemas to Increase Students' Self-Efficacy***

Bandura defines self-efficacy as 'the judgements of one's capabilities to organise and execute the courses of action required to produce given attainments.'<sup>29</sup> Put simply, self-efficacy is an individual's estimation of their ability to perform a specific task. Thus the level of self-efficacy impacts on technical skill performance because it influences the choices, effort and persistence of human behaviour.<sup>30</sup> For example, a student with low self-efficacy for solving complex tax problems may avoid, or discontinue their attempts at solving complex tax problems.<sup>31</sup> Whereas, if that student's self-efficacy can be increased, they may persist in their attempts to solve a challenging tax problem, eventually overcoming their inhibitions or fears.

Fortunately, students' self-efficacy beliefs can be increased by the impact of each of the following four factors: mastery experiences, modelling, feedback and physiological states.<sup>32</sup> Mastery experiences increase self-efficacy as the successful accomplishment of a specific performance strengthens an individual's belief in their ability. Modelling builds self-efficacy. By observing the performance of others, seeing their success through sustained effort and making social comparisons, students' self-belief is increased. Receiving realistic encouragement or feedback from credible persuaders<sup>33</sup> also increases self-efficacy as recipients are motivated to make a greater sustained effort and become successful.<sup>34</sup> Improving physical or emotional conditions such as reducing stress levels can also impact on a person's perceived capability to perform tasks and thereby increase their self-efficacy.

Provision of graphical schemas in the undergraduate taxation law course seems to increase the self-efficacy of students' complex tax problem solving skills. They support subject mastery and provide modelling experience for students. Further, their use provides feedback and reduces students' stress levels, as discussed in Part IV.

---

<sup>28</sup> Albert Bandura, 'Self-Efficacy mechanism in human agency' (1982) 37(2) *American Psychologist* 122.

<sup>29</sup> Albert Bandura, *Self-efficacy: The exercise of control* (Freeman, 1997) 3.

<sup>30</sup> See, for example, Bandura, above n 29; Dale H Schunk, 'Metacognition, Self-Review, Self-Regulation and Self-Regulated Learning: Research Recommendations' (2008) 20 (4) *Educational Psychology Review* 463.

<sup>31</sup> Albert Bandura, and Nancy E Adams, 'Analysis of self-efficacy theory of behavioural change' (1977) 1(4) *Cognitive Therapy & Research* 287.

<sup>32</sup> Robert Wood and Albert Bandura, 'Effect of perceived controllability and performance standards on self-regulation of complex decision making' (1989) 56 (5) *Journal of Personality and Social Psychology* 805.

<sup>33</sup> Barry J Zimmerman, 'Self Efficacy: An Essential Motive to Learn' (2000) 25 *Contemporary Educational Psychology* 82.

<sup>34</sup> A Bandura and Daniel Cervone, 'Self evaluative and self efficacy mechanisms governing the motivational effects of goal systems' (1983) 45(5) *Journal of Personality and Social Psychology* 1017.

### ***E Using SBS Schemas in a Limited Teaching Timeframe***

Students' reliance upon their instructor as their principal source of learning both technical and generic skills severely limits course content coverage within the single undergraduate taxation law course. It is the authors' contention that the multi-educational uses of flowcharts and SBS schemas addresses this limitation by facilitating efficient content delivery: schemas are used to teach taxation concepts in lectures, to summarise taxation laws for exam revision purposes and to guide students in solving complex tax problems in tutorials, assignments and exams.

Schemas in the form of flowcharts may be found in Australian taxation law textbooks and the Australian income tax legislation. Yet students only benefit if they read the textbook and view the schema. Textbook readings maybe disregarded by students, if the lecturer provides printed materials, which may serve as the primary communication of content to students.<sup>35</sup> Similarly, students' motivation to read the textbook may wane during the semester. A study of undergraduate students' reading behaviours indicates that reading is a motivated behaviour, such that the amount of time spent engaging in reading, from in-depth reading to skimming, varies among academically strong and weaker students and the percentage of students who read the material prior to class declines as the semester progresses.<sup>36</sup> The subsidiary importance placed on textbooks as a source of learning by students is reinforced by Jones who states 'while students felt that both time spent in completing their assignments and the instructor added value, the textual material in the textbook does not appear to be of major importance.'<sup>37</sup>

Textbook flowcharts may omit key content areas in undergraduate taxation law courses and may fail to highlight the methodology required to solve complex tax problems. The set of schemas described in Part III addresses these possible failures by combining flowcharts with a series of steps to provide students with a methodology for solving complex tax problems.

## **II DESIGN OF FLOWCHART AND 'STEP BY STEP' SCHEMAS**

To improve students' understanding of the methodology of interpreting, organising and applying complex tax laws, combined flowchart and 'step by step' (SBS) schemas were developed and used in the undergraduate tax law course.

### ***A Flowcharts***

Butcher's<sup>38</sup> study on the use of text as opposed to (1) simplified diagrams and (2) detailed diagrams found that both types of diagrams supported student learning and

---

<sup>35</sup> Adkins, Henderson and Key, above n 9.

<sup>36</sup> Barbara J Phillips and Fred Phillips, 'Sink or skim: Textbook reading behaviours of introductory accounting students' (2007) 22(1) *Issues in Accounting Education* 21.

<sup>37</sup> Jefferson P Jones, 'Enhancing student learning: An examination of the student use of textbooks in financial accounting' (2011) 4(1) *American Journal of Business Education* 29.

<sup>38</sup> Kirsten R Butcher, 'Learning from text with diagrams: Promoting mental model development and interference generation' (2006) 98(1) *Journal of Educational Psychology* 182. Butcher's study was on student learning of the heart and circulatory systems (a complex system).

reduced comprehension error over text only learning. Groomer and Heintz<sup>39</sup> identified the benefits of flowcharts over the narrative or tabular communication as:

- mapping mental processes in a way that make decision points and consequences clearly identifiable;
- facilitating organisation and prioritising of issues that must be addressed; and
- offering efficient, comprehensive coverage in a single place.

Although the concept of flowcharts is not new, not all flowcharts are effective as conceptual schemas that help in building self-efficacy and motivation. Some may be poorly designed, as discussed in Part II. Flaws in the design of the diagram may hinder rather than assisting with the multiple educational goals discussed in Part II — for example their visual impact may be distracting, so as to hinder learning. To be effective, flowcharts must assist students to organise and integrate related areas of the law to see the 'big picture'.<sup>40</sup>

The sample flowchart in Appendix A offers a schematic approach to determining the tax deductibility of expenditure incurred for repairs under s 20 of the *Income Tax Assessment Act 1997* (Cth) (ITAA1997). The flowchart supports the cognitive processing of complex tax law by stepping the student through the process of reading the statutory law provision and visually simplifying the intent of the statutory tax provision by identifying the critical areas of the law.

The flowchart in Appendix A adheres to the recommendations of Dexter and Hughes<sup>41</sup> and Vekiri<sup>42</sup> that flowchart schemas should not be clustered with a lot of information so that students may easily perceive the relations that are important. The flowchart should only include keywords (over completeness) and use simple drawings.<sup>43</sup> Hence, the flowchart shows the 'instructional goal' in the application of s 20 of the ITAA1997 to determine the tax deductibility of expenditure incurred for repairs to premises or repairs to a depreciating asset. Adhering to the 'coherence principle' described by Clark and Mayer<sup>44</sup> the flowchart avoids the insertion of any material that does not support the 'instructional goal' which only creates additional cognitive processing.

---

<sup>39</sup> S Michael Groomer and James A Heintz, 'Teaching audit reports: A flowchart approach' (1991) 9(2) *Journal of Accounting Education* 291.

<sup>40</sup> Matthew T McCrudden, Joseph P Magliano, Gregory Schraw, 'The effect of diagrams on online reading processes and memory' (2011) 48 *Discourse Processes* 69.

<sup>41</sup> Douglas D Dexter and Charles A Hughes, 'Graphic organizers and students with learning disabilities: A meta-analysis' (2011) 34(1) *Learning Disability Quarterly* 51, 55.

<sup>42</sup> Ioanna Vekiri, 'What is the value of graphical displays in learning?' (2002) 14(1) *Educational Psychology Review* 27.

<sup>43</sup> See, for example, Joseph R Boyle and Noranne Yeager, 'Blueprints for learning: Using cognitive frameworks for understanding' (1997) 29(4) *Teaching Exceptional Children* 26; Vekiri, above n 42; Douglas A Wiegmann, Donald F Dansereau, and Edward C McCagg, Kirsten L Rewey 'Effects of knowledge map characteristics on information processing' (1992) 17(2) *Contemporary Educational Psychology* 136.

<sup>44</sup> Ruth C Clark and Richard E Mayer, *E-Learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (Pfeiffer, 3rd ed, 2011)151.

The flowchart in Appendix A applies the ‘segmenting principle’<sup>45</sup> by breaking down the meaning and interpretation of taxation law into more manageable ‘steps’ because ‘certain tax law cannot be easily simplified by omitting definitions, rules and exceptions without damaging the integrity of the tax treatment of the law.’<sup>46</sup> However, the application of the steps first identified in the flowchart schema is detailed and explained in the ‘step by step’ (SBS) tabular schema as shown in Appendix B. The SBS schema systematically guides the student ‘step by step’ in applying the law; and considers whether other tax law provisions need to be consulted in order to solve the tax problem.

### **B SBS Tabular Schema**

Each step of the SBS tabular schema provides the kind of scaffolding that researchers in educational psychology advocate to support meta-cognitive processes such as the legal reasoning skills that are critical to support the learning process of problem solving in the taxation system. The SBS schema reinforces the critical areas of the law identified in the flowchart, assisting students’ cognitive processing by detailing in ‘step by step’ order how the law is to be applied to the tax problem, and what must be discussed: case law, taxation ruling and other relevant information referred to in weekly lectures. This progression from simple, as shown in the flowchart schema to more complex, as in the SBS schema, is consistent with most instructional design theories.<sup>47</sup> The advantage of the SBS schema is that it prompts the student to read the facts of the tax problem, and identify the issue, apply the segmented law step by step, determining whether each step does or does not apply and to consider whether other areas of law may be relevant. Each step ensures the student has considered and addressed the critical areas of the law and any conditions and exceptions that may be relevant. For example, the SBS schema in Appendix B details the steps identified in Appendix A for the application of s 25-10 of the ITAA1997. In Appendix B, the SBS schema prompts the student, using a series of questions, to examine the facts of their hypothetical tax problem and determine first: whether the ‘repaired’ premises or the ‘repaired’ depreciating asset, were in need of repair? If the premises or asset were not in need of repair, the student will then write their findings (to Step 1a), and state why the law does not apply. For example, the expenditure is not deductible under the statutory provision s 20 ITAA1997 because the premises or the depreciating asset were not in need of repair? The student is then ‘prompted’ to proceed to ‘Step 6’ and then directed to another provision of the ITAA. Alternatively, the student will state that the premises or depreciating asset were in need of repair, (Step 1a) and then continue to apply the remaining ‘steps’ shown in Appendix B. The combined flowchart and SBS schema demonstrates the ‘legal reasoning skills’ and the ‘methodology’ used by experts to process the large volumes of law resources provided in the course and to interpret, and apply such resources to resolve tax problems. Novices, who lack this methodology, are provided with scaffolding to assist their understanding of the legal reasoning skills and the methodology required to problem solve in complex systems such as taxation law. Thus reducing their dependence on suggested answers and routine procedures as discussed above.

---

<sup>45</sup> Adkins, et al, above n 9.

<sup>46</sup> Ibid, 10.

<sup>47</sup> Adkins, et al, above n 9.

### III PRELIMINARY QUALITATIVE AND QUANTITATIVE RESULTS

Preliminary qualitative and quantitative results have been obtained to address the research question: Does the use of the flowchart and SBS schema influence students' tax problem-solving skills and self-efficacy, and if so why?

In 2012, a survey instrument was administered in class, at the end of the teaching period, to fifty-seven commerce and law students enrolled in the introductory undergraduate taxation course (Revenue Law). The survey instrument included three sections: demographic information; student use of the flowcharts and SBS schemas; perceptions of self-efficacy in understanding and applying complex taxation laws. Mark sense cards were used to record student responses. Students indicated the flexibility of the flowcharts and SBS schemas as a scaffolding tool by identifying how they used the flowcharts and SBS schemas: revising in private study; applying the law and preparing answers to tax hypotheticals. Students rated the strength of their self-efficacy using a 5 point Likert scale from 1 (not confident at all) to 5 (very confident).

Students also provided additional written commentary on what they considered were the benefits of using the flowcharts and SBS schemas. The survey results and additional student commentary supports the authors' contention that the flowchart and SBS schemas provide conceptual knowledge scaffolding to assist students to solve complex law problems and increase students' motivation and self-efficacy levels.

#### *A Impact of the Flowcharts and SBS Schemas*

##### *(a) Scaffolding tool*

The initial survey results and student commentary confirm the flowchart and SBS schemas use as a scaffolding tool to understand and apply complex taxation laws.

**Table 1: Flowcharts and SBS Schemas Survey: Benefits to Students**

<b>Perceived Benefit</b>	<b>Students who agreed (%)</b>
The flowcharts and SBS schemas simplify my understanding of taxation laws	86
By using the flowcharts and SBS schemas I have developed a methodology for solving hypothetical tax problems	89

Approximately 86 per cent of the student cohort considered the flowcharts and schemas had simplified their understanding of complex tax laws and assisted them in developing a methodology for solving hypothetical tax problems.

The 'steps' are successful in that they decrease the volume of information that is presented, whereby only relevant or typical scenarios are covered, but in such a way that technical accuracy is not compromised. (Student)

The 'steps' provide a roadmap for understanding complex taxation issues. They allow one to 'step' through the essential elements of the law and to arrive at a conclusion regarding the correct taxation treatment of a particular circumstance. (Student)

*(b) Increased self-efficacy*

Having gained a methodology and an understanding of complex tax laws, the survey shows that students were motivated to continue to use the flowcharts and schemas in lectures, and tutorials to successfully answer complex tax law problems and for private study purposes.

**Table 2: Flowcharts and SBS Schemas Survey**

<b>How the Flowchart and SBS Schemas were used by students</b>	<b>Students who agreed (%)</b>
When applying relevant tax law to hypothetical tax problems	89
When preparing answers to hypothetical tax problems	98
For private study and revision	96

Continual use of the flowcharts and SBS schemas by both teaching staff and students provided both a modelling and mastery experience for students which increased their confidence levels in understanding and applying complex taxation laws.

**Table 3: Flowcharts and SBS Schemas Survey**

**Self-efficacy and Motivation Levels**

<b>Self-efficacy: how confident are you in your ability to:</b>	<b>5 (%)</b>	<b>4 (%)</b>	<b>3 (%)</b>	<b>2 (%)</b>	<b>1 (%)</b>	<b>Average Ranking</b>
Understand Taxation Law	2	16	39	37	6	2.71
Apply Taxation law to hypothetical problems	0	16	42	32	10	3.54

At the conclusion of the teaching semester, 57 per cent of the student cohort were either moderately, substantially, or very confident in their understanding of taxation laws. Similarly, 58 per cent of the student cohort were either moderately, substantially, or very confident in applying taxation laws to resolve hypothetical tax problems.

In some students this increase in confidence and self-efficacy in legal reasoning was considered transferable to other areas of law

I personally believe that one may draw maximum utility from the 'steps' by viewing them as dynamic documents that can be tailored by each individual to suit his or her preferences and level of technical knowledge. It is through this customisation process that one truly begins to unlock their power as a learning tool. (Student)

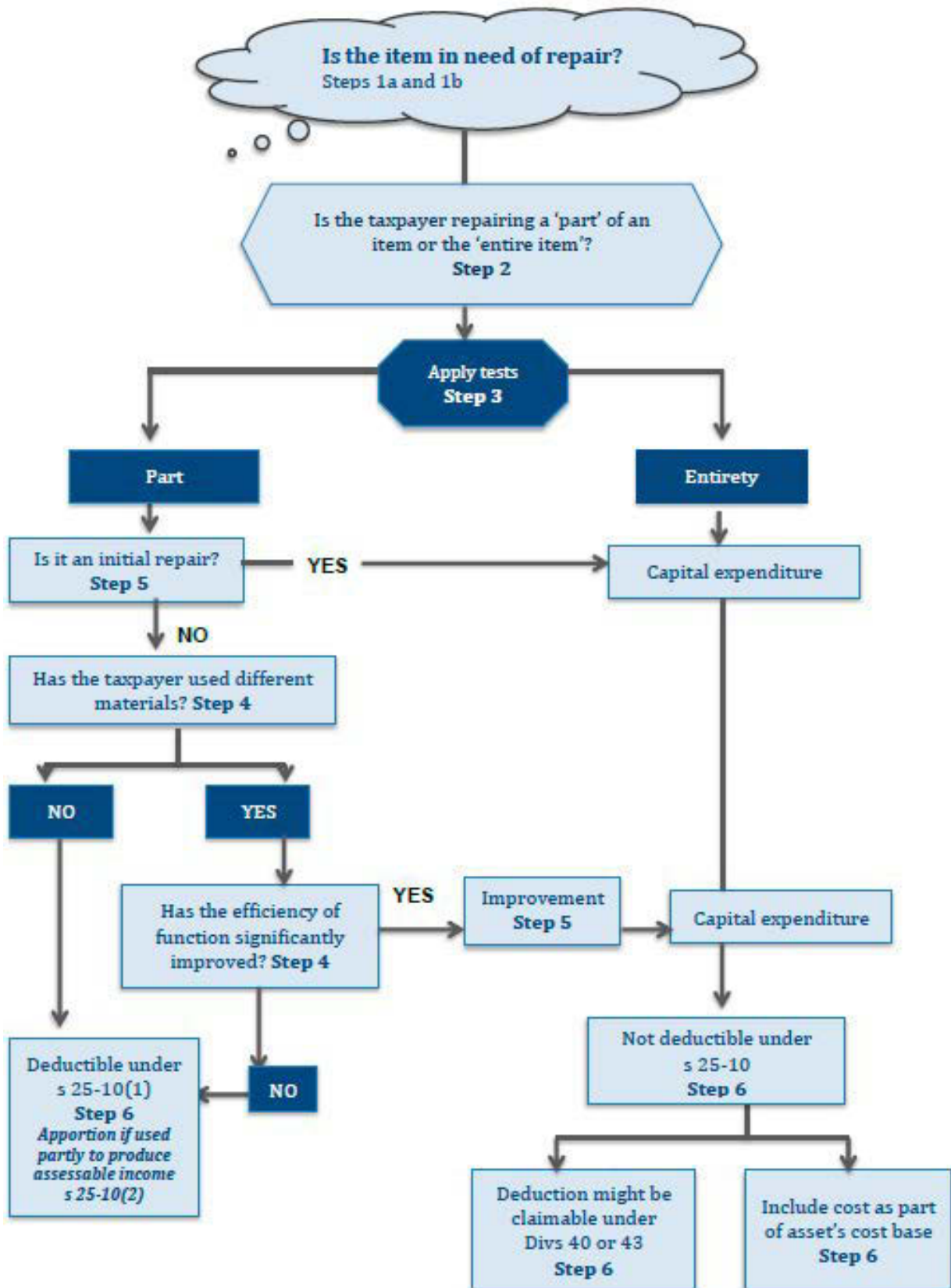
#### **IV LIMITATIONS AND FUTURE RESEARCH**

The primary methodological limitations of this study include the small sample size of the survey, the preliminary nature of the evidence and the short-timeframe of the analysis. These shortcomings will be addressed in future research, currently being conducted by the authors. It is their intention to conduct two surveys: pre- and post- flowchart and SBS schema, over a number of student cohorts, so as to measure the increase in student self-efficacy and confidence levels after using the flowchart and SBS schema methodology to answer complex tax problems. Future research will also consider postgraduate students' use of the schemas in their employment and postgraduate studies. Further research could also entail law educators using the flowchart and SBS schema in tabular form and reporting on their impact in terms of developing methodologies for understanding and applying other complex areas of law in their courses.

#### **V CONCLUSION**

This article provides preliminary evidence that the use of the combined flowchart and tabular SBS schemas are an effective and efficient teaching and learning tool in helping students acquire the cognitive ability to understand the methodology of problem solving in a taxation law course. Simplifying and clarifying complex taxation laws into a sequence of steps can reduce students' stress, increase their confidence and self-efficacy and motivate them to use their newly acquired technical skills to solve complex tax problems. The schemas' multi-educational uses, as described in the article, make them a worthwhile tool for teaching staff faced with the challenge of teach and assessing complex taxation law concepts within a single-semester undergraduate taxation course. Conceptual schemas address the need of students (experts and novices alike) for a methodology to help them solve complex problems in taxation law.

**APPENDIX A: SCHEMATIC APPROACH TO SECTION 25-10 ITAA 1997, REPAIRS (FLOWCHART)**



**APPENDIX B : ALTERNATIVE SCHEMATIC APPROACH TO REPAIRS: STEP-BY-STEP IN TABULAR FORM**

***Steps to answering questions on ‘repairs’***

**THE ISSUE:**

Can the expenditure incurred by the taxpayer be deducted as a ‘repair’ under s 25-10 of the ITAA 1997?

**THE LAW:**

**Section 25-10 Repairs**

- (1) You can deduct expenditure you incur for repairs to premises (or part of premises) or a\*depreciating asset that you held or used *solely* for the \*purpose of producing assessable income.

*Property held or used partly for that purpose*

- (2) If you held or used the property only *partly* for that purpose, you can deduct so much of the expenditure as is reasonable in the circumstances.

*No deduction for capital expenditure*

- (3) You cannot deduct capital expenditure under this section.

**INSTRUCTIONS:**

Students, apply the following Steps in the order shown. If the Step does not apply to your facts, then state that in your answer. If the Step does apply, then continue applying the Steps as shown. As you proceed through the Steps, you will be writing up your answer. Remember to cite the law and explain how the law does or does not apply to your facts.

<b>STEPS IN APPLYING S 25-10</b>	<b>APPLY THE FOLLOWING LAW</b>
<b>STEP 1(a)</b> <b>Is the item in need of repair?</b>	<p>The item must be in need of repair in order to claim a deduction under s 25-10. If not, it is a capital improvement. For example shortening an awning that is too long.</p> <p><i>Students: if the item is NOT in need of repair, a deduction cannot be claimed under s 25-10. Refer to Step 6.</i></p>
<b>STEP 1(b)</b> <b>What is a repair?</b>	<p>Meaning of ‘repair’ is not defined in the <i>Income Tax Assessment Act</i> (ITAA).</p> <p><i>Students: if there is a ‘gap’ in the legislation, identify whether applicable case law exists.</i></p>

STEPS IN APPLYING S 25-10	APPLY THE FOLLOWING LAW
<p><b>STEP 2</b>  <b>How does case law interpret what is a 'repair'?</b></p> <p><b>Cite the case law and precedent in your answer.</b></p>	<p>Courts have defined the essential attributes of a repair as:</p> <ul style="list-style-type: none"> <li>• A <b>repair</b> involves a <b>restoration</b> of a thing to a condition it formerly had without changing its character:   <i>W Thomas &amp; Co Pty Ltd v FC of T</i> (1965) 115 CLR 58. It restores it to its former efficiency, rather than an exact repetition of form and substance</li> <li>• A <b>repair</b> involves replacement or renewal of <b>part</b> of an item, rather than the entire item: <i>Lurcott v Wakely and Wheeler</i> (1911) 1 KB 905. If the entire item is replaced, this is not a repair, but a capital addition or improvement.                       For example: replacing a broken window, repairs to a wall or wooden floor, repainting a wall. Although oiling, brushing or cleaning items, which are in a good working order is not a repair. Such expenses are deductible under s 8-1(1)</li> </ul> <p><i>TR97/23 (paragraph 13) Remediating or making good defects in damage to, or to deterioration of property to be repaired.</i></p>
<p><b>STEP 3</b>  <b>Is the taxpayer repairing a 'part' or an 'entirety'?</b></p> <p>Refer to Commissioner's Ruling TR97/23 paragraphs 120 to 124</p> <p><b>Paragraph 37</b>                      The Commissioner states that there is no correct test – the question is one to be answered in light of all circumstances.</p>	<p><i>Students: Apply the following tests to your facts and determine if the taxpayer is replacing a 'thing' (part) or 'entirety'? Choose whichever of the following precedents of law apply to your facts:</i></p> <ol style="list-style-type: none"> <li>1. What is the 'functional entity'? That is, is it capable of performing a separate function? <i>Phillips v Whieldon Sanitary Potteries Ltd</i> (1952) 33 TC 213.</li> <li>2. Is it a substantial item of equipment or an 'inseparable part of a larger unit'? <i>Lindsay v FCT</i> (1960-1961) 106 CLR 377</li> <li>3. Is it physically commercially and functionally an inseparable part of a larger unit', which is an entirety.   <i>Samuel Jones &amp; Co (Devondale) Ltd v IR Commrs</i> (1951) 32 TC 513</li> </ol> <p><i>Students: in applying the above tests determine:</i></p> <ul style="list-style-type: none"> <li>• If the tests indicate the work performed is replacing an 'entirety' it is an <b>improvement</b> — refer to Division 43 for deductibility on 'capital works'.</li> <li>• If the tests indicate that the work is restoring a 'part' then it is a <b>repair</b> <i>unless</i> the taxpayer has used different materials, and improved efficiency of function. Refer to Step 4.</li> </ul>

STEPS IN APPLYING S 25-10	APPLY THE FOLLOWING LAW
<p><b>STEP 4</b>  <b>If it is a 'part', can the taxpayer use different materials?</b></p>	<p>Taxpayer can use 'different materials' providing the efficiency of function has not improved. (Refer to TR97/23 paragraph 48)</p> <p>ie, use of '<b>different materials</b>' will be an '<b>improvement</b>' and not a 'repair' if:</p> <ul style="list-style-type: none"> <li>• 'there has there been a significant increase in the efficiency of function'</li> </ul> <p><i>Students: this will apply, if you can establish from the facts of the case:</i></p> <ul style="list-style-type: none"> <li>• Not only has there been a significant reduction in future repairs (<i>Western Suburbs Cinema 1952</i>) but</li> <li>• More importantly a new, different, additional function.</li> </ul>
<p><b>STEP 5</b>  <b>Conclude</b></p>	<p><i>Students: make sure you conclude whether the item of expenditure IS/IS NOT deductible under s 25-10. If the item is not deductible as a 'repair' under s 25-10, then refer to Step 6.</i></p>
<p><b>STEP 6</b>  <b>The expenditure is of a capital nature if it is:</b></p> <ul style="list-style-type: none"> <li>• an initial repair</li> <li>• an addition</li> <li>• an improvement</li> </ul>	<p><b>Initial repairs</b> will be deemed to be <b>capital</b>, regardless of whether the purchase price was discounted because the asset was in a state of disrepair.</p> <p>There is no guidance about how long you need to own the property for it not to be an 'initial repair'. The ATO may look at claims within the first few years of owning a property.</p> <p><b>Additions</b> such as building an extra room are <b>capital</b>.</p> <p><b>Improvements:</b> where the repair has improved or created an <i>additional function</i> it is <b>capital</b>.</p> <p>The capital expenditure may be deductible under:</p> <ul style="list-style-type: none"> <li>• Division 40 (Capital Allowance) or</li> <li>• Division 43 (Capital Works)</li> </ul> <p>If not, the capital expenditure may be included in the cost base of the asset for CGT purposes under Division 110.</p>