

EXPLORING CONTRACT LAW USING DIGITAL FLASHCARDS

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ABSTRACT

This paper describes, evaluates and reflects upon the use of digital flashcards in teaching Contract law. The usefulness and difficulty students experience in using various types of flashcards in legal education is empirically evaluated. Two experimental groups were provided with digital flashcards and printed flashcards, respectively. A control group was not provided with flashcards. Participants were surveyed and an interview conducted with the academic coordinator. Students responded positively to the use of flashcards, although the use of the flashcards made no statistically significant change in their assessment results. Students describe the positive and negative aspects of using flashcards and how the flashcards might be improved. The paper also discusses how the use of flashcards may be used to support assessment tasks.

I INTRODUCTION

Law, perhaps more than most academic disciplines, has a focus upon the past. Great weight is attached to the doctrine of precedent. It is little surprise, then, that much of legal education remains modelled upon learning and teaching methods developed in the nineteenth century such as the Langdellian, Socratic and Case Method pedagogies.¹ Law students spend much of their time in (or listening to) lectures, occasionally making responses to tutorial questions and the rest of their time reading and researching assignments.²

Legal education has not, of course, stood entirely still. The use of online databases of case law and statute mean that students can now plausibly complete an undergraduate law degree without setting foot in a physical law library, nor handling an actual law report, even once.

At the same time, however, students attending law schools *have* changed. For one thing, they are *busy*. Many full time undergraduate students are required to take on significant amounts of part-time work to survive financially. Many students are now choosing to study part-time and externally,³ perhaps as a process of professional development or because they are commencing formal education later in life. Younger undergraduate students entering the study of law now have grown up in a digital environment. Many of them we suspect cannot recall, and cannot conceive, life prior to the Internet. They have had smartphones their entire teenage and adult

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1 Áine Hyland and Shane Kilcommis, ‘Signature pedagogies and legal education in universities: epistemological and pedagogical concerns with Langdellian case method’ (2009) 14(1) *Teaching in Higher Education* 29, 32–4.

2 Susanne Owen and Gary Davis, *Learning and Teaching in the discipline of law: achieving and sustaining excellence in a changed and changing environment* (ALTC, 2009) 30, 54.

3 Ibid 40.

life. Their manner of learning, manner of recall, and manner of thinking *integrates* technology in a manner which demands that education providers move swiftly to keep up.⁴

Educators in various disciplines have responded, over time, to the demand from these students for new methods of learning and teaching, adapted to suit the needs of these new students.⁵ One method, which has been in use for many years but has been readily adapted to the modern technological environment, utilises learning activities and assessment tasks enabling students to *learn through making*⁶ or engage in *learning by doing*.⁷ These learning experiences are often informed by constructionism⁸ and social views of learning.⁹ Technological development continues to enable new opportunities for such activities and assessment tasks.¹⁰ The online environment offers particular opportunities — for instance, for collaborative learning processes that can be successfully conducted by students using both synchronous and asynchronous communication and online collaboration tools.¹¹

How has the teaching of law responded to this new learning environment? Hermida, speaking about Canadian Law Schools, observed, ‘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.’¹² Aside from Microsoft PowerPoint, only a handful of tentative steps have been made in Australian Law Schools towards audio-visual teaching methodologies, multi-media literacy and a visual pedagogy.¹³ Instruction is often lecturer- and print-centered. ‘The teaching methods do little, if anything, to encourage students to create and produce their own (and collective) legal texts and knowledge, whether media centered or not’.¹⁴ Often lectures are simply captured and made available for replay.¹⁵

If law schools have continued to offer what amounts to twentieth-century teaching methods to twenty-first century students, and if there genuinely are differences between the cohorts of this century and last, then one would expect to see tensions emerging. Ronahoe,¹⁶ from her observations of Georgetown University Law students, observed some of these tensions:

Taking notes and watching PowerPoint slides are passive activities that do not engage these students.¹⁷ [PowerPoint slides are weak in relation to the visual standards set by professional image makers in the television, film, video-gaming, and advertising industries.] Text alone

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- 4 Pew Research Center’s Internet & American Life project, ‘The future impact of the Internet on higher education: Experts expect more-efficient collaborative environments and new grading schemes; they worry about massive online courses, the shift away from on-campus life’ (27 July 2012) <http://www.pewinternet.org/files/old-media/Files/Reports/2012/PIP_Future_of_Higher_Ed.pdf>.
 - 5 Stephen Colbran and Anthony Gilding, ‘e-Learning in Australian Law Schools’ (2013) 23(1&2) *Legal Education Review* 201, 208.
 - 6 Garry Hoban, Wendy Nielsen and Charles Carceller, ‘Articulating constructionism: Learning science through designing and making “slowmations” (Student-generated animations)’ in C H Stell et al (eds), *Curriculum, technology and transformation for an unknown future* (Paper presented at ASCILITE Sydney, 2010) 433-443 <<http://ascilite.org.ua/conferences/sydney10/procs/Hoban-full.pdf>>.
 - 7 Clark Aldrich, *Simulations and the Future of Learning: An Innovative (and Perhaps Revolutionary) Approach to E-Learning* (Pfeiffer, 2004).
 - 8 Seymour Papert, ‘Situating constructionism’ in I Harel and S Papert (eds), *Constructionism* (Ablex Publishing, 1991) 32–64.
 - 9 Etienne Wenger, *Communities of Practice: Learning, Meaning, and Identity* (Cambridge University Press, 1998).
 - 10 Colbran and Gilding, above n 5, 209.
 - 11 Ibid.
 - 12 Julian Hermida, ‘Teaching Criminal Law in a Visually and Technology Oriented Culture: A Visual Pedagogy Approach’ (2006) 16(1&2) *Legal Education Review* 153.
 - 13 Des Butler, ‘Entry into Valhalla: Contextualising the learning of legal ethics through the use of Second Life Machinima’ (2010) 20 (1&2) *Legal Education Review* 87; Stephen Colbran and Anthony Gilding, ‘e-Learning in Australian Law Schools’ (2013) 23 No 1&2 *Legal Education Review* 201.
 - 14 Marelen Le Brun, and Richard Johnstone, *The Quiet (R)evolution: Improving Student Learning in Law* (Law Book Co, 1995) 26.
 - 15 Colbran and Gilding, above n 5.
 - 16 Diana Donahoe, ‘An Autobiography of a Digital Idea: From Waging War against Laptops to Engaging Students with Laptops’ (2010) 59(4) *Journal of Legal Education* 485, 490.
 - 17 Alison Sulentic, ‘Adventures in PowerPoint: Teach with Punched-up Visual Aids and See the Difference’, *The Law Teacher* (2009) 7(1) 1; Douglas Leslie, ‘How Not to Teach Contracts and any Other Course: PowerPoint, Laptops, and the Case File Method’ (2000) 44 *St. Louis University Law Journal* 1304; Joel Forman, ‘Next-Generation Educational Technology versus the Lecture’ (2003) *Educause* 12.

often bores digital students.¹⁸ Multimedia, such as computer graphics, video and animation, will help engage digital students by bringing material to life and helping them understand the context and relevance of the material to the ‘real world.’ However, students need even more. They need their learning to be three-dimensional—not flat, linear or purely textual. They need interactivity where their minds (and screens) are turned on and working in overdrive. They need to become a part of the material through collaboration, interactivity, and simulation.¹⁹

Digital students also crave peer review and interaction. Collaboration is at the heart of learning for them. Learning is a social phenomenon as well as a cognitive process.²⁰ By bouncing ideas off each other, students can formulate their own opinions and drive the discussion themselves. They enjoy learning through discovery and discussion.²¹ Their collaboration can be in class, in person or virtual.²² As a result, the professor no longer needs to be the sole and centre point of learning; instead students have many resources from which to choose. Digital students often set up blogs for specific issues. They also e-mail and IM each other often (usually in the middle of class).

Law schools, then, are challenged with the need for a dramatic shift in thinking. Students sending text messages to one another in the middle of a class need to be regarded as learning collaborators rather than distracted students. The academic’s job is to engage them sufficiently to ensure that they are sending messages about their studies and not about their social lives. If they are distracted, it may be because the material they are being taught has failed to engage them in a meaningful way.

Digital flashcards provide an opportunity for students and academic staff to work collaboratively to create authentic,²³ digitally connected, modern learning artefacts for contemporary law students. Such learning artefacts may assist students to ‘master new knowledge and skills, critically examine their existing assumptions and beliefs, and engage in an invigorating, collaborative quest for wisdom and personal, holistic development’.²⁴ Flashcards may assist students’ memory retention of legal concepts, enabling them to more easily pass assessments²⁵ and, in the United States, the bar exam.²⁶

Flashcards in themselves, of course, are not a new concept. They have been in routine use, particularly among students in fields requiring deep recall, for many years.²⁷ Merely digitising flashcards, in the sense of taking the material from a paper flashcard and putting into onto a smartphone, would accomplish little more than did the digitising of law reports in recent decades: that is, it may increase convenience while presenting the same old material.

18 Scott Carlson, ‘The Net Generation in the Classroom’ (2005) 52 *Chronicle of Higher Education* 7.

19 Clark Aldrich, *Simulations and the Future of Learning: An Innovative (and Perhaps Revolutionary) Approach to E-Learning* (Pfeiffer, 2004).

20 John Brown, ‘Growing Up Digital: How the Web Changes Work, Education, and the Ways People Learn’ (2000) 11 *Change* 14.

21 Ibid.

22 Note 17.

23 Jan Herrington, Thomas Reeves and Ron Oliver, ‘Authentic Tasks Online: A synergy among learner, task, and technology’ (Aug. 2006) 27(2) *Distance Education* 233.

24 D Eastmond and L Ziegahn, Instructional design for the online classroom, in Z Berge and M Collins (eds), *Computer-mediated Communication and the Online Classroom, Vol 3 Distance Education* (Cresswell, NJ: Hampton Press, 1992) 59.

25 Stephen Colbran et al, ‘The impact of student-generated digital flashcards on student learning of constitutional law’ *The Law Teacher* 2015 DOI: 10.1080/03069400.2015.1082239; Stephen Colbran, Anthony Gilding and Sam Colbran, ‘The role of digital flashcards in legal education: theory and potential’ (2014) 5(1) *European Journal of Law and Technology*.

26 Bar Advisor, ‘How to Make Bar Exam Flashcards’ on Bar Advisor A blog all about passing the bar exam <<http://baradvisor.blogspot.com.au/2010/05/how-to-make-bar-exam-flashcards.html>>; Lee Burgess, ‘10 tips for #BarExam Success — #lawschool’ on Susan Liebel, Solo Practice University (1 June 2012) <<http://solopracticeuniversity.com/2012/06/01/10-tips-for-bar-exam-success-lawschool/>>.

27 David Pursell, ‘Adapting to Student Learning Styles: Engaging Students with Cell Phone Technology in Organic Chemistry Instruction’ (2009) 86(10) *Journal of Chemical Education* 1219.

II FLASHCARDS: A SHORT HISTORY

Before the discovery of paper in the Western world, most writing was done on parchments.²⁸ However, due to its complex manufacturing process and expensive nature, not everyone was able to afford parchment, and it was not feasible to have an entire book made out of it. Some schools used chalkboards or wax tablets, but neither was able to provide ample writing space or durability as the writing was erased when no longer needed.²⁹ From the fourteenth to the eighteenth centuries the use of hornbooks was quite common in England and America.³⁰ A hornbook consisted of a sheet of parchment or paper with the alphabet, phonics and a prayer, mounted on a small, paddle-shaped wooden board and protected by a thin sheet of flattened animal horn attached with metal strips and nails. Another example is a crib book carved on wood, as shown in Figure 1.

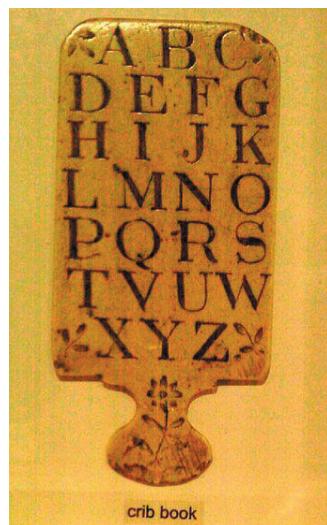


Figure 1: An example of an early Hornbook or Crib book³¹

When paper became more readily available in the eighteenth century, other forms of study material, such as paper-based flashcards, quickly became more popular.³² A flashcard is a card containing some information on both sides, usually in question and answer format. Flashcards may be combined to form a pack of flashcards, and can be used to learn or memorise almost any subject material. Though it is not clear when learning through flashcards started, the earlier uses of flashcards were credited to a British woman and author of educational books for children, Favell Lee Mortimer, in the 1800s.³³ She taught religious education to children on her father's estates and developed her own method of teaching children to read using flashcards. Her teaching notes gained significant popularity and were collected and published as 'Peep of Day' and 'Reading Without Tears'. Her innovative book *Reading Disentangled*³⁴ included a set of illustrated phonics cards with drawings as well as the corresponding word and its

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- 28 Kare Parchment, History of Parchment <http://www.parsomen.com/history_of_parchment.htm>; History World, History of writing materials <<http://www.historyworld.net/wrldhis/PlainTextHistories.asp?historyid=aa92>>; Metropolitan Museum of Art, *Pen and Parchment: Drawing in the Middle Ages*, (7 July 2009) <<http://blog.metmuseum.org/penandparchment/2009/07/07/from-animal-to-art-the-story-of-parchment/>>.
- 29 Raffaella Cribiore, 'Education in the Papyri' in Roger Bagnall (ed), *The Oxford Handbook of Papyrology* (Oxford University Press, 2009) 320–37.
- 30 George Plimpton, 'The Hornbook and its use in America' (American Antiquarian Society, 1916) 264.
- 31 Crib book from the Derby Museum <[https://commons.wikimedia.org/wiki/File:Derbymuseumrelated_\(5\).jpg](https://commons.wikimedia.org/wiki/File:Derbymuseumrelated_(5).jpg)>.
- 32 Isabell Collet, *Reading Disentangled — The Beginnings of Flashcards* (20 March 2012) <<https://flashcardsguru.wordpress.com/2012/03/20/reading-disentangled-a-short-history-of-the-flashcard/>>.
- 33 Isabell Collet, Flashcards Guru, *Your go-to guide for any and all things flashcard* (20 March 2012) <<https://flashcardsguru.wordpress.com/2012/03/20/reading-disentangled-a-short-history-of-the-flashcard/>>.
- 34 Favell Mortimer, *Reading disentangled; or, Classified lessons in spelling and reading, by the author of 'Peep of day'* (1873) <http://books.google.com.au/books/about/Reading_disentangled_or_Classified_lesso.html?id=ANcDAAAAQAAJ&redir_esc=y>.

first letter.³⁵ These flashcards helped children to read and speak. Since then, flashcards have become a popular tool to teach subjects like language learning, medicine, psychology, history, mathematics, and many more.

Basic flashcards were developed in the form of large and small paper index cards, each card containing a question on one side and the answer on the back.³⁶ Other kinds of flashcards had words or picture on one side and information relating to the picture or word on the other side.³⁷ With the advancement in technology, flashcards also changed their shapes and platforms from computer-generated standalone applications to web-based flashcard generators (for example *Anki*, *Mnemosyne*) and from flashcard computer games³⁸ to collaboratively developed online flashcard games in Facebook.³⁹ Ready-made flashcards on a whole range of subjects are also available for learners to simply download and use, or print for offline use.

Electronic or digital flashcards are mostly designed to imitate traditional paper-based flashcards. The digital flashcards tools allow users to do similar tasks, for example to create individual cards with text and images; practice with the cards; print out paper-based versions of the card; and share the cards with other users.⁴⁰ More recently, with the advent of smart phones and mobile apps, there has been an increase in apps designed to facilitate studying including flashcard apps.⁴¹ It is estimated that almost 90 per cent of college students will own a smart phone by 2016,⁴² so app-based flashcards could be of great use for them. Burgess and Murray⁴³ noted that:

When compared to traditional flashcards, flashcards used on smartphones have the additional advantages of being available whenever the smartphone is in use, ability to carry as many cards as desired for multiple classes, and collaboration with other students to create large groups of flashcards. Also, smartphone technology enables the students to set reminders to study.

A Benefits and drawbacks of using flashcards

Flashcards are considered a powerful tool that can help people remember information such as maths formulas, words vocabulary, history facts and difficult medical terminologies.⁴⁴ Isabella Rosse,⁴⁵ in her blog on the history and impact of flashcards, states that flashcards serve as a memory technology that help learners memorise information. She further states that developing and studying flashcards with friends or a group could be more advantageous, as students can collaborate with their peers on information, quiz each other, make social groups or communities, and become more literate. In case of visual flashcards, the images or pictures may provide a fun way of learning for some students. Voxy, a company that develops mobile apps, including flashcard apps, conducted an anonymous survey in 2011 on the effectiveness of flashcards for

35 Todd Pruzen, and Favell Mortimer, *The Clumsiest People in Europe or Mrs Mortimer's Bad Tempered Guide to the Victorian World* (Bloomsbury Publishing, 2005).

36 Isabella Rosse, Flashcards: a memory technology <<https://isabellarosse.wordpress.com/flashcards-a-memory-technology/>>.

37 Michael Thayer, Kenneth Tepper, David Kelts, Colin Ross, Jerry Gulla and Les Ilic, (1996) *Method of Simulating Flashcards for Learning Purposes*, US Patent number: 5494444.

38 Rebecca Lyons, Christine Allen, Sallie Weaver, David Metcalf, Clarissa Graffeo, and Eduardo Salas, 'The Combat Medic Card Game for Emergency Medical Procedures: A Usability and Learning Study' (Paper presented at the Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 2011, 55:1323).

39 Kathleen Tuite et al, *Picard: A Creative and Social Online Flashcard Learning Game*, *Foundations of Digital Games* (Raleigh, 2012).

40 Tim Green and Baynard Bailey, *Digital Flashcard Tools*, Tech Spotting: Observations of Technology Integration and Application (2010) 54(4) *Tech Trends* 4.

41 Gary Shelly, Glenda Gunter and Randolph Gunter, *Teachers Discovering Computers Integrating Technology in a Connected World* (7th ed, Course Technology Cengage Learning, 2012) 309.

42 Stephen Burgess and Ashley Murray, 'Use of traditional and smartphone app flashcards in an introductory psychology class' (2014) 13 *Journal of Instructional Technology* 1, 1.

43 Ibid 2.

44 Charles Mangrum and Stephen Strichart, *Using Flash Cards to Remember Information* (2014) <<http://www.how-to-study.com/study-skills-articles/using-flash-cards-to-remember-information.asp>>.

45 Isabella Rosse, *History of Flashcards* <<https://isabellarosse.wordpress.com/history-of-flashcards/>>.

language learning.⁴⁶ The survey results were that 93 per cent of the participants agreed that flashcards do help students learn languages. The researchers also report that flashcards help active recall, spaced-repetition, metacognition, self-directed study, and help students gauge their progress.⁴⁷

Despite all these advantages, flashcards can also have a negative effect on student learning. For example, a student who goes through flashcards in the same order each time without mixing them up won't be helped to retain information better because the exam question may come in any order.⁴⁸ Sometimes, flashcards make students memorise information in a robotic fashion rather than fully understanding complex ideas.⁴⁹ Therefore, it is important that flashcards are designed in a way that encourages a real understanding of the basic concepts. Another negative aspect of using flashcards is the use of poorly designed questions.⁵⁰ For example, long and complex questions could make it difficult to understand the ideas underlying the concept and thus retain information. Teachers should not force students to use flashcards as the only learning tool. Good teachers should always expose their students to a variety of learning tools in order to address the needs of the majority of learner types in the class.

B Flashcard Systems

Learning may be considered as a hierarchy of processes reflecting progressive orders of change.⁵¹ Edge⁵² notes that reviewing a physical flashcard is an example of first-order learning: the front side of the card acts as a cue for the target on the reverse. When a learner attempts to recall the target given such a cue, the learning is called cued recall. In a review of 427 articles on cued-recall learning, it was found that the optimal inter-study interval increases as the retention interval increases.⁵³ The literature also shows that learning improves when time elapses between reviews of material and 'the optimum inter-repetition interval is likely to be the longest interval that avoids retrieval failures'.⁵⁴ This phenomenon is called spaced repetition, in contrast with the concept of massed repetition, where material is reviewed immediately, which creates a negative impact on memory performance.⁵⁵ The Leitner System⁵⁶ for physical

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- 46 Voxy, *ELT Poll: Are flashcards an effective language learning tool?* (16 May -21 May 2011) <https://voxy.com/blog/wp-content/uploads/2011/05/Voxy-Poll-Summary-Are-Flashcards-An-Effective-Language-Learning-Tool.pdf>.
- 47 Voxy, *Are Flashcards an Effective Learning Tool? [Infographic]* 25 May 2011 <<http://voxy.com/blog/index.php/2011/05/are-flashcards-an-effective-learning-tool-infographic/>>.
- 48 Mangrum and Stephen Strichart, n 44.
- 49 Andrew Cohen, *How to Use Flashcards the Right Way*, Brianscape Blog (7 October 2015) <<http://blog.brainscape.com/2011/04/use-flashcards-right/>>.
- 50 The literature on poorly designed Multiple Choice Questions is relevant by analogy: N E Gronlund, *Constructing Achievement Tests* (Prentice Hall, 1977) Ch 3; Edwina Higgins and Laura Tatham, Manchester Metropolitan University, *Exploring the potential of Multiple-choice questions in Assessment* (Winter 2003) <http://www.celt.mmu.ac.uk/lta/issue4/higgins_tatham.shtml>; N Connolly, *Multiple Choice: A guide to good practice*, Educational Assessment Australia, University of New South Wales 2008 <http://www.eaa.unsw.edu.au/pdf/M_Multiple-Choice_Good_Practice.pdf>; Stephen Draper, 'Catalytic assessment: understanding how MCQs and EVS can foster deep learning' (2009) 40(2) *British Journal of Educational Technology* 285; Karen Scouller, 'Influence of assessment method on students' learning approaches, perceptions, and preferences: assignment essay versus short answer examination' (1996) 19 *Research and Development in Higher Education* 776.
- 51 Gregory Bateson, *Steps to an ecology of mind* (Ballantine Books, 1972).
- 52 Darren Edge et al, *MemReflex: Adaptive Flashcards for Mobile Microlearning*, Mobile HCI'12, (September 2012), San Francisco, CA.
- 53 Nicholas Cepeda et al, 'Distributed Practice in Verbal Recall Tasks: A Review and Quantitative Synthesis' (2006) 132(5) *Psychological Bulletin* 354.
- 54 Piotr Wozniak, *Economics of Learning: New aspects in designing modern computer aided self-instruction systems* (PhD, University of Economics in Wrocław, 1995) <<http://www.supermemo.com/english/ol/background.htm>>.
- 55 Ibid.
- 56 Leitner Portal <<http://leitnerportal.com/LearnMore.aspx>>; Sebastian Leitner, *So lernt man lernen. Angewandte Lernpsychologie — ein Weg zum Erfolg*. Verlag Herder. Freiburg im Breisgau (1972).

flashcards was also designed on the principle of spaced repetition with the aim of maximising long-term retention of study material. According to Mubarak:⁵⁷

In Lietner system, flashcards are sorted into boxes according to how well they are known. If card content can be recalled the flashcard is promoted to a higher box. Because box sizes increase in ascending order, and a card in a higher box is only retested, when the box is filled, increasing time lags in between learning repetitions are created. If at any time *card content cannot be recalled the flashcard is demoted to box one again.*

This approach led to many other flashcard systems and the most notable among them the computer assisted *SuperMemo* algorithm. According to Edge:⁵⁸

In SuperMemo, the optimum interval I_R following a repetition R of an item is calculated as the product of $I_R - 1$ and the ‘optimum factor’ for items of that ‘easiness’ at repetition R. The table of optimum factors is updated over time, in response to achieved recall rates, aiming to converge on a long-term recall rate of 95%. Self-assessment on a 6-point scale updates the easiness of the current item and in the case of a low score, resets the repetition count of the item to be relearned.

The *Super Memo* algorithm has been incorporated into more recent digital flashcard systems such as *Anki*, which is quite popular and widely used.

III A TAXONOMY OF FLASHCARDS

Flashcards developed for the study of the law fall within the following taxonomy of 16 major types of flashcards developed by the authors.⁵⁹ While this is not a closed domain and other types of digital flashcards may be developed, the following list is quite comprehensive.

Case card — details the facts, points of law and outcomes of a case. The card includes the full reference and a link to full text where available.

Legislation card — details legislation, subordinate legislation, rules, or practice directions. The point of law is clearly stated. Links are provided to the legislation and any relevant case cards.

Flowchart card — visually depicts a series of events or processes. Flowchart cards may take several forms: a diagram with links to other cards or a series or stack of cards enabling a process to be followed. Links are provided to any supporting materials.

Legal principle card — identifies a key legal principle, along with its primary authority.

Review card — asks a question requiring a response. This may be a multiple-choice question, short answer question, or reflection.

Audio-visual card — this card requires the embedding or a link to a dynamic element such as an animation, film, YouTube film, interactive reveal etc. The audio-visual card should also identify the legal principle and link to any supporting materials.

Conundrum card — presents a legal dilemma, or something within the law, which seems unreasonable or otherwise noteworthy. The student may simply choose to use the conundrum as food for thought, or they can tap the link and link through to a discussion board where the issue can be discussed. A conundrum card may raise a complex question requiring research or extended thought or group discussion. There may be no right or wrong answer.

Secondary source card — contains information or issues arising from a secondary source such as a book, article, newspaper clipping, report, conference paper etc. Links should be provided to the secondary source where available.

57 Rehana Mubarak, ‘Spacing Effect and mnemonic strategies: a theory-based approach to E-Learning’ (2008) *IADIS Conference*, 269–72.

58 Bateson, above n 51.

59 Stephen Colbran and Anthony Gilding, ‘e-Learning in Australian Law Schools’ (2013) 23 (1&2) *Legal Education Review* 201.

Comparative card — explores comparisons between different jurisdictions or cultures.

Reform card — explores issues for law reform.

Practical application card — shows a real-world application of the relevant legal principle. Links are provided to any supporting materials.

Discussion card — is similar to a conundrum card, but the topics for discussion are more about analysing the operation of the law (as opposed to discussing its quirks and difficulties). Again, the student may simply use the card as food for thought, or alternatively they may link through to a bulletin board to share in the discussion with others.

Role-play card — is designed to allow students who are studying together to work through simple problem-style issues, which call into question the legal principles discussed elsewhere in the stack. These role-play situations may be quite simple (as in this one) or very complex, and the students may decide how ‘legalistic’ their responses are to be.

Interview card — is a transcript, audio, or visual interview.

Question and answer card — is designed to ask one or more questions. The reverse side of the card provides the suggested answers and links to further information.

Timeline card — is designed around a timeline of sequenced events. The timeline can run horizontally or vertically. Links on the cards may branch to different outcomes. The reverse side of the card provides further information and links.

IV ACADEMIC-GENERATED DIGITAL FLASHCARDS

Academic generated digital flashcards have been used in a number of disciplines, primarily language learning⁶⁰ and those with a scientific focus such as organic chemistry,⁶¹ and psychology,⁶² where part of the learning process for students involves the memorization and then application of significant amounts of data. In these disciplines, flashcards have already become a customary learning method for student.

The development of digital flashcards has become — at least in part — an exercise undertaken by academic staff. A number of reasons have been advanced for this, but the two key reasons echo the motivations of the current study. The first is an acknowledgment that the contemporary generation of undergraduate students see their smartphone or tablet as their primary technological tool. Engaging with this tool as a device for learning meets the students on the ground of their own choosing.⁶³

A second identified reason for the use of flashcards is their potential utility for students who may be struggling to achieve a passing grade using current teaching methodologies alone. In a study by Davis, flashcards were successfully developed to assist struggling students in a first year undergraduate construction course.⁶⁴

60 Cennet Altiner, *Integrating a Computer-Based Flashcard Program into Academic Vocabulary Learning*, Master’s thesis, Iowa State University, 2011, Paper 10160 <<http://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=1122&context=etd>>; Craig Albers and Alicia Hoffman, ‘Using Flashcard Drill Methods and Self-Graphing Procedures to Improve the Reading Performance of English Language Learners’ (2012) 28(4) *Journal of Applied School of Psychology* 367; Emrah Basoglu and Omur Akdemir, ‘A Comparison of Undergraduate Students’ English Vocabulary Learning: Using Mobile Phones and Flash Cards’ (2010) 9(3) *TO JET: The Turkish Online Journal of Educational Technology* 1; Marina Dogidovic, ‘Vocabulary Learning with Electronic Flashcards: Teacher Design vs. Student Design’, (2013) 1(1) *Voices in Asia Journal* 15.

61 D Pursell, ‘Adapting to Student Learning Styles: Engaging Students with Cell Phone Technology in Organic Chemistry Instruction’ (2009) 86(10) *Journal of Chemical Education* 1219.

62 Jonathan Golding, Nesa Wasarhaley and Bradford Fletcher, ‘The Use of Flashcards in an Introduction to Psychology Class’ (2012) 39(3) *Teaching of Psychology* 199.

63 Richard Pennington et al, ‘Adapting to Student Learning Styles: Using Cell Phone Technology in Undergraduate Science Instruction’ (2010) 8(5) *Systemics, Cybernetics and Informatics* 2.

64 Kirsten Davis, ‘Using Electronic Flashcards for Student Self-Evaluation of Readiness for Exams’ (Paper presented at the *Proceedings of the American Society for Engineering Education Annual Conference and Exposition*, 2013).

In the current study, students were provided with digital flashcards from a taxonomy of digital flashcards developed by the researchers, including case cards, legislation cards, flowchart cards, legal principle cards, audio-visual cards, conundrum cards, secondary source cards, comparative cards, reform cards, role-playing cards and question and answer cards.

Several hundred printed and digital flashcards were developed using software known as FlashCram created by Samuel Colbran. Some sample cards are reproduced below in Figures 2–5.

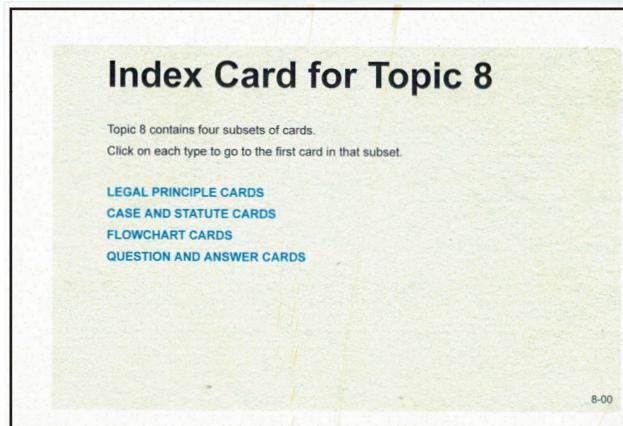


Figure 2: Example of an index card

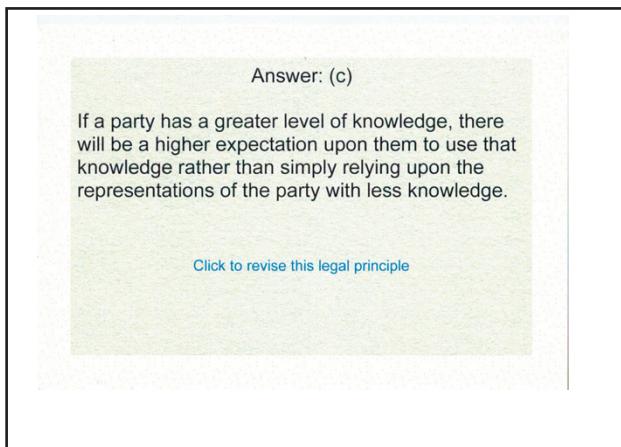
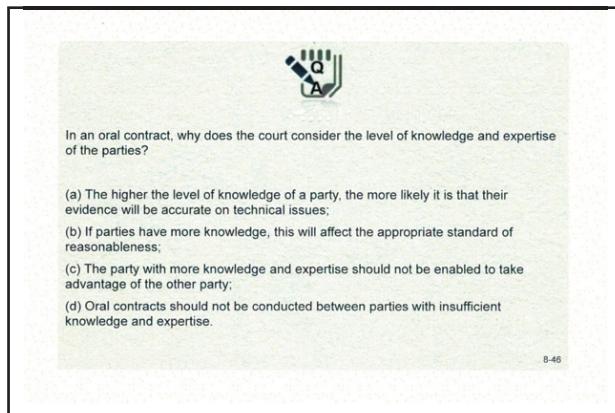


Figure 3: Front and back of a question and answer card

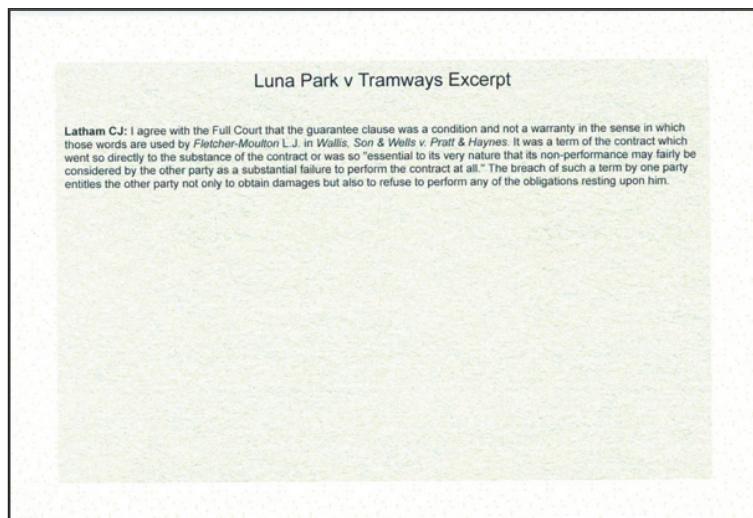
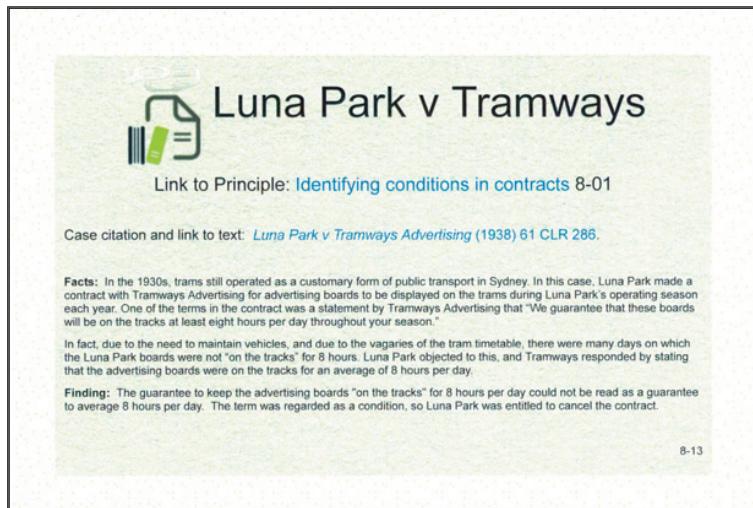


Figure 4: Front and back of a case card

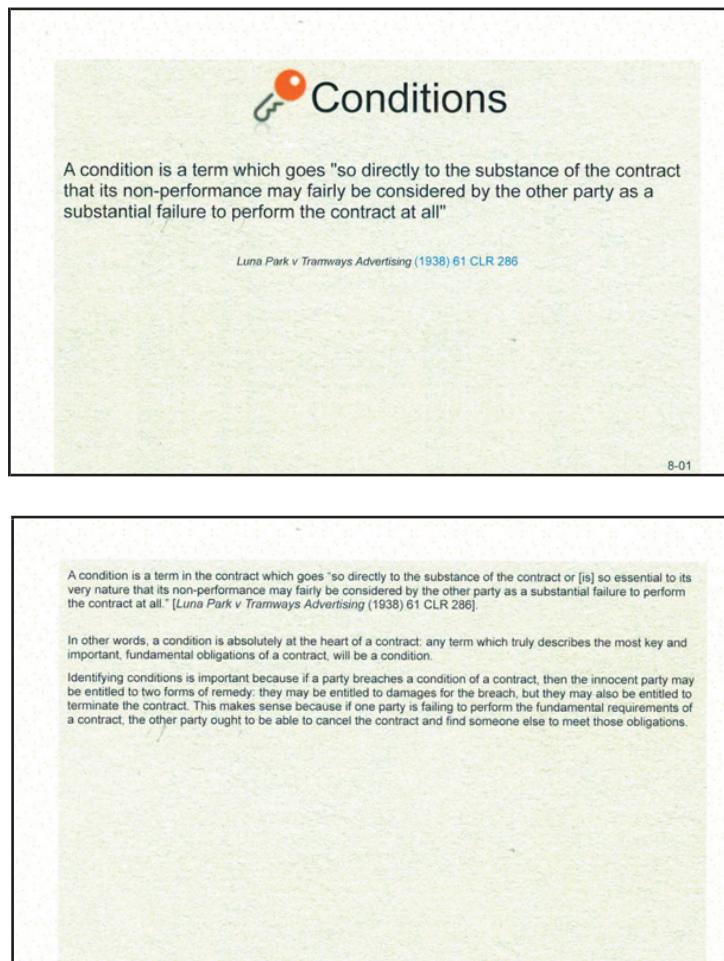


Figure 5: Front and back of a definition card

This study sought to determine whether the reported advantages of flashcards were evident in the assessment undertaken by undergraduate law students. It was hoped that the flashcard exercise would motivate students in their study of contract law, in the sense described by Jenkins referring, ‘to those inner processes that determine whether learners will engage in a task, the amount of effort they will expend, the length of time that they will persevere and the persistence they will show when obstacles are encountered’.⁶⁵ It was envisaged that students would no longer be passive consumers of content,⁶⁶ but would become actively engaged in development, peer discussion and reflection upon material of mutual interest.

V METHODOLOGY

Three online survey instruments (Ethics approval H14/02-027) were prepared and distributed using Qualtrics (www.qualtrics.com) to 112 undergraduate students (53 male, 59 female) enrolled in LAWS11061 Contract Law at CQUniversity in Term 1, 2014. LAWS11061 is a second year subject in Contract Law in an Australian online undergraduate accredited law degree. Students were randomly partitioned into three groups. Group 1 (19 male, 19 female,

⁶⁵ Alan Jenkins, *Reshaping Teaching in Higher Education: A Guide to Linking Teaching with Research* (Routledge, 2002) 31.

⁶⁶ Nancy Falchikov, *Improving Assessment Through Student Involvement* (Routledge, 2005) 246; Lisa Claydon, ‘Engaging and motivating students: assessment to aid student learning on a first year core law module’ (2009) 43(3) *The Law Teacher* 278.

total 38) received all cards including dynamic digital flashcards. Group 2 (20 male, 18 female, total 37) received all cards in hard copy excluding dynamic digital flashcards. Group 3 (14 male, 22 female, total 36) received no flashcards.

Survey instruments are a widely used method of collecting and analysing factual information about populations used in academic research.⁶⁷ The survey provides an efficient structured data set for descriptive and inferential statistics. It also provides opportunities for open-ended comments useful for qualitative analysis. Given that the survey participants were studying online from dispersed locations, an online survey was administered.

The survey provided both quantitative and qualitative data concerning the research question of the overall value of animation as a formative assessment tool. Student comments were analysed and an online interview with two volunteers was conducted to follow up on some of the significant themes identified in the survey data.

A mixed-method design using both qualitative and quantitative analysis was used for triangulation of the data,⁶⁸ and to assist in the identification and investigation into emergent themes/categories that are used in the discussion of how students related to the use of flashcards. While the interviews started with open-ended evaluation questions, particular themes arising out of the answers in the survey provided topics for further discussion with the students. A constant comparison method was used to identify, confirm and explicate important categories in the data. While the evaluation was influenced by Grounded Theory⁶⁹ the focus was on the identification of categories that were useful to an evaluation of the assessment task. The analysis process did partly depend on the researchers' insight and intuitive action as they sought to understand the data in the context of the study. While the constant comparison of the data and discussions surrounding the categories identified was designed to guarantee the trustworthiness of the results and discussion, the small number of students interviewed still means that the observations should be read with a level of caution, skepticism and care.

Student comments were analysed and an online interview with several volunteers was conducted to follow up on some of the significant themes identified in the survey data. An interview was also conducted with the course coordinator who created the flashcard content.

The survey data was analyzed to provide descriptive statistics for each of the questions. The Pearson correlation coefficient⁷⁰ was used to identify any dependence between variables identified through the questions in the survey, for example whether the results were influenced by demographic variables, such as age and gender. The coefficient indicates the strength of the relationship in a range from 0 to 1. The larger the value, the stronger the relationship between the variables. A *t*-test⁷¹ was used to identify any significant variation between the neutral value and the mean results that cannot be explained by chance.

The survey quantitative data and student comments were analysed to identify key themes that could be investigated using student interviews. Two randomly selected students volunteered to be interviewed to further discuss the issues raised by the study.

VI SURVEY RESULTS AND DISCUSSION

The response rate for the respective surveys was 25/37 or 67.6% (6 male, 19 female) for survey group 1 digital flashcards, 21/37 or 56.8% (8 male, 13 female) for survey group 2 static flashcards and 20/36 or 55.6% (4 male, 16 female) for survey group 3 no flashcard control group. The student cohort consisted mainly of mature age students. The age profile for each survey appears in Figure 6.

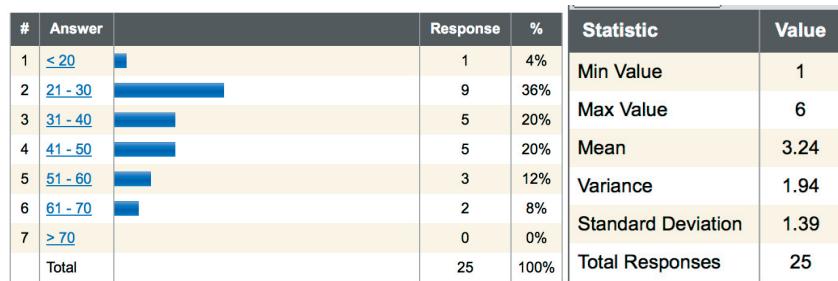
⁶⁷ Michael Lewis-Beck, Alan Bryman and Tim Jiao, *The SAGE Encyclopaedia of Social Science Research Methods* (SAGE Publications, 2014), vol 3.

⁶⁸ Nigel Fielding, 'Triangulation and Mixed Methods Designs: Data Integration With New Research Technologies' (2012) 6(2) *Journal of Mixed Methods Research* 124<<http://epubs.surrey.ac.uk/532394/>>.

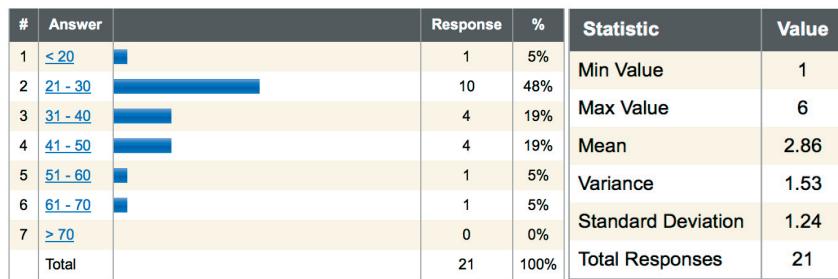
⁶⁹ Barney Glaser, *Basics of grounded theory analysis* (Sociology Press, 1992).

⁷⁰ Lewis-Beck, Bryman and Jiao, above n 67, vol 2, 807.

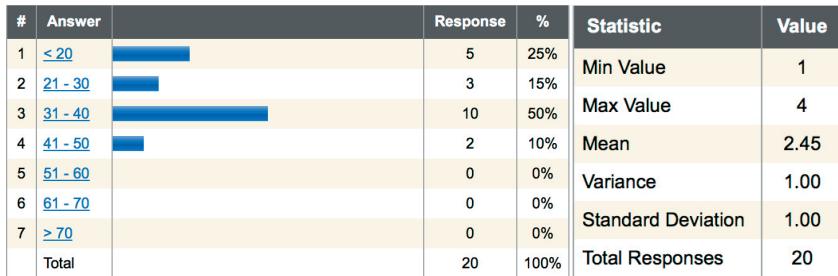
⁷¹ Lewis-Beck, Bryman and Jiao, above n 67, vol 3, 1114.



Group 1 Digital flashcards



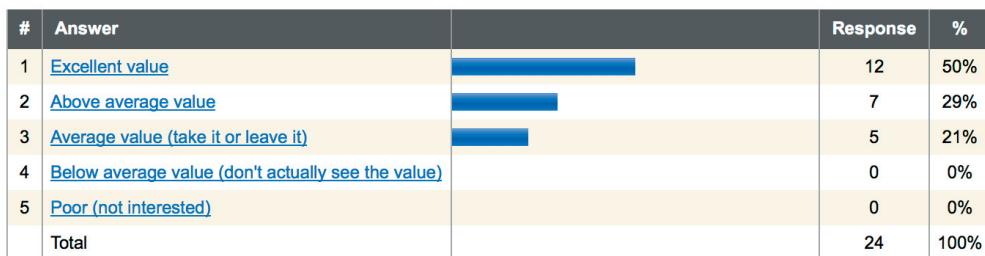
Group 2 Static flashcards



Group 3 No flashcards control group

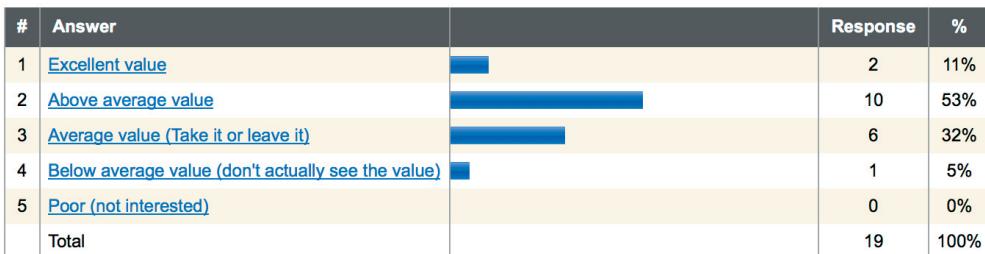
Figure 6: Age profile of students

Participants in groups 1 and 2 rated the overall value of digital flashcards in understanding the contract issues, using a 5-point LIKERT scale of the perceived value of the flashcards. The mean for group 1 of 1.71 was statistically significant (Sig. (2-tailed t test) = .000) compared with the test value of 3. The mean for group 2 of 2.32 was statistically significant (Sig. (2-tailed t test) = .001) compared with the test value of 3. The profiles appear in Figure 7. Pearson correlation coefficients did not reveal any significant age or gender correlations.



Statistic	Value
Min Value	1
Max Value	3
Mean	1.71
Variance	0.65
Standard Deviation	0.81
Total Responses	24

Group 1 Digital flashcards



Statistic	Value
Min Value	1
Max Value	4
Mean	2.32
Variance	0.56
Standard Deviation	0.75
Total Responses	19

Group 2 Static flashcards

Figure 7: Overall value of the digital flashcards

Participants rated their level of agreement with several statements concerning their experience with using flashcards using a 5-point LIKERT agreement scale (1 Strongly disagree, 2 Disagree, 3 Neutral, 4 Agree, 5 Strongly agree). Table 1 indicates all the questions asked of Group 1 who received digital flashcards. Pearson correlation coefficients did not reveal any significant age correlations, except in relation to two questions where gender was moderately positively correlated to 'flashcards made contract law more interesting to learn' ($r = .609^{**}$, Sig. 2-tailed = 0.01) and 'flashcards helped me retain knowledge of contract law' ($r = .560^{**}$, Sig. 2-tailed = .004). This suggested female respondents were associated with higher agreement with these statements.

Table 1: Questions and One-sample *t* Test Group 1 Digital flashcards

Question	1 Strongly disagree	2	3	4	5 Strongly agree	Total	Mean	Sig, (2-tailed <i>t</i> test)
The flashcards made Contract Law more interesting to learn.	4% 1	4% 1	16% 4	40% 10	36% 9	25	3.24	.247
The flashcards did NOT assist my learning of Contract Law.	52% 13	12% 3	24% 6	8% 2	4% 1	25	2.12	.014
The flashcards helped me retain knowledge of Contract Law.	4% 1	0% 0	32% 8	52% 13	12% 3	25	2.72	.070
The flashcards did NOT assist my exam preparation.	36% 9	28% 7	20% 5	8% 2	8 % 2	25	3.00	1.00

Table 2 indicates all the questions asked of Group 2 who received printed flashcards. Pearson correlation coefficients did not reveal any significant age or gender correlations.

 Table 2: Questions and One-sample *t* Test Group 2 Printed flashcards

Question	1 Strongly disagree	2	3	4	5 Strongly agree	Total	Mean	Sig, (2-tailed <i>t</i> test)
The flashcards made Contract Law more interesting to learn.	5.6% 1	5.6% 1	38.9% 7	44.4% 8	5.6% 1	18	3.39	.090
The flashcards did NOT assist my learning of Contract Law.	17.6% 3	58.8% 10	23.5% 4	0% 0	0% 0	17	2.06	.000*
The flashcards helped me retain knowledge of Contract Law.	5.6% 1	5.6% 1	22.2% 4	55.6% 10	11.1% 2	18	3.61	.017
The flashcards did NOT assist my exam preparation.	17.6% 3	41.2% 7	23.5% 4	17.6% 3	0 % 0	17	2.41	.028

Student respondents found that flashcards assisted their learning of contract law. This was statistically significant for printed flashcards and very close to significance for digital flashcards. With respect to the remaining questions students took a neutral view.

Students were asked to rate the level of difficulty in using the various types of flashcards.

Participants rated the level of difficulty in creating the various types of flashcards using a 5-point LIKERT difficulty scale (1 Very difficult, 2 Difficult, 3 Neutral, 4 Easy, 5 Very easy). Table 3 indicates all the questions asked in this study.

Pearson correlation coefficients did not reveal any significant age correlations. There were numerous positive gender correlations indicating that females were associated with higher difficulty scores. The *r* values (2-tailed) have been included in Table 3.

Table 3: Card difficulty Group 1 Digital flashcards

Card type	1 Very difficult	2	3	4	5 Very easy	Total	Mean	Sig, (2 -tailed t)	r gender	Sig (2 tailed r)
Case card	0% 0 1	5% 4	10% 6	30% 9	45%	20	4.15	.000*	.495**	.027
Legislation card	0% 0	5% 1	10% 4	35% 7	40% 8	20	4.10	.000*	.478**	.033
Flowchart card	0% 0	5% 1	10% 4	45% 9	30% 6	20	4.00	.000*	.488*	.047
Legal Principle card	0% 0	5% 1	10% 4	40% 8	35% 7	20	4.05	.000*	.463*	.040
Audio-visual card	0% 0	5% 1	30% 6	30% 6	35% 7	20	3.95	.000*	.516**	.020
Conundrum card	0% 0	5% 1	30% 6	30% 6	35% 7	20	3.95	.000*	.526**	.020
Secondary source card	0% 0	5% 1	25% 5	35% 7	35% 7	20	4.00	.000*	.559**	.010
Comparative card	0% 0	5% 1	35% 7	25% 5	35% 7	20	3.90	.001*	.477*	.033
Reform card	0% 0	5% 1	30% 6	30% 6	35% 7	20	3.95	.000*	.516*	.020
Role-play card	0% 0	5% 1	30% 6	30% 6	35% 7	20	3.95	.000*	.516**	.020
Question and Answer	0% 0	5% 1	25% 5	35% 7	35% 7	20	4.00	.000*	.419	.066

Table 4 indicates responses of Group 2 who received printed flashcards. Pearson correlation coefficients did not reveal any significant age or gender correlations.

Table 4: Card difficulty Group 2 Printed flashcards

Card type	1 Very difficult	2	3	4	5 Very easy	Total	Mean	Sig, (2 -tailed <i>t</i> test)
Case card	0% 0	6.7% 1	20% 3	46.7% 7	26.7% 4	15	3.93	.001*
Legislation card	0% 0	0% 0	21.4% 3	50% 7	28.6% 4	14	4.07	.000*
Flowchart card	0% 0	13.3% 2	13.3% 2	46.7% 7	26.7% 4	15	3.87	.001*
Legal Principle card	0% 0	6.7% 1	20% 3	53.3% 8	20% 3	15	3.87	.004*
Audio-visual card	0% 0	0% 0	46.7% 7	40% 6	13.3% 2	15	3.70	.003*
Conundrum card	0% 0	6.7% 1	26.7% 4	53.3% 8	13.3% 2	15	3.73	.003*
Secondary source card	0% 0	0% 0	20% 3	73.3% 11	6.7% 1	15	3.87	.000*
Comparative card	0% 0	0% 0	26.7% 4	60% 9	13.3% 2	15	3.87	.000*
Reform card	0% 0	6.7% 1	26.7% 4	53.3% 8	13.3% 2	15	3.73	.003*
Role-play card	0% 0	6.7% 1	20% 3	60% 9	13.3% 2	15	3.80	.001*
Question and Answer	0% 0	0% 0	26.7% 4	46.7% 7	26.7% 4	15	4.00	.000*

Table 3 indicates that digital flashcard students found all types of flashcard as having a low level of difficulty. In contrast, Table 4 indicates that printed flashcard students only found legislation cards, secondary source cards, comparative cards and question and answer cards had a low level of difficulty. The difficulty level on raw means was higher for printed rather than digital flashcards. An Analysis of Variance (ANOVA)⁷² comparing means of the two groups did not indicate any significant difference between the two experimental groups on any type of flashcard.

Table 5 indicates usefulness responses of Group 1 who received digital flashcards. Participants rated the usefulness of the various types of flashcards using a 5-point LIKERT difficulty scale (1 Completely useless, 2 Not useful, 3 Neutral, 4 Useful, 5 Very useful). Table 5 indicates all the questions asked in this study.

Pearson correlation coefficients did not reveal any significant age correlations. There were numerous positive gender correlations indicating females were associated with higher difficulty scores. The r values (2-tailed) have been included in Table 5. There were also significant age effects with the following variables: Audio-visual card ($r = .510^*$, sig .022), Conundrum card ($r = .513^*$, sig .021), Secondary source card ($r = .513^*$, sig .021), Comparative card ($r = .475^*$, sig .034), Reform card ($r = .475^*$, sig .034), Role-play card ($r = .513^*$, sig .021). *Correlation was significant at the 0.05 level (2-tailed). **Correlation was significant at the 0.01 level (2-tailed).

Table 5: Card usefulness Group 1 Digital flashcards

Card type	1	2	3	4	5 Very useful	Total	Mean	Sig, (2 -tailed t test)	r gender	Sig (2 tailed r)
Case card	0% 0	5% 1	10% 2	30% 6	55% 11	20	4.35	.000*	.645**	.002
Legislation card	0% 0	5% 1	10% 2	30% 6	55% 11	20	4.35	.000*	.645**	.002
Flowchart card	0% 0	5% 1	10% 2	30% 6	55% 11	20	4.35	.000*	.645*	.002
Legal Principle card	0% 0	5% 1	10% 2	30% 6	55% 11	20	4.35	.000*	.645*	.002
Audio-visual card	5% 1	10% 2	20% 4	25% 5	40% 8	20	3.85	.006*	.356	.124
Conundrum card	0% 0	15% 3	20% 4	25% 5	40% 8	20	3.90	.002*	.413	.071
Secondary source card	0% 0	15% 3	20% 4	25% 5	40% 8	20	3.90	.002*	.413	.071
Comparative card	0% 0	15% 3	15% 3	30% 6	40% 8	20	3.95	.001*	.443	.050
Reform card	0% 0	15% 3	15% 3	30% 6	40% 8	20	3.95	.001*	.443*	.050
Role-play card	0% 0	15% 3	20% 4	25% 5	40% 8	20	3.90	.002*	.413	.071
Question and Answer	0% 0	10% 2	5% 1	25% 5	55% 11	19	4.32	.000*	.436	.062

Table 6 indicates usefulness responses of Group 2 who received printed flashcards. Pearson correlation coefficients did not reveal any significant age or gender correlations.

Table 6: Card usefulness Group 2 Printed flashcards

Card type	1 Complete- ly useless	2	3	4	5 Very useful	Total	Mean	Sig, (2 -tailed t test)
Case card	0% 0	0% 0	20% 3	40% 6	40% 6	15	4.20	.000*
Legislation card	0% 0	0% 0	20% 3	46.7% 7	33.3% 5	15	4.13	.000*
Flowchart card	0% 0	0% 0	23.1% 3	46.2% 6	30.8% 4	13	4.08	.000*
Legal Principle card	0% 0	0% 0	26.7% 4	40% 6	33.3% 5	15	4.07	.000*
Audio-visual card	0% 0	18.2% 2	36.4% 4	36.4% 4	9.1% 1	11	3.30	.082
Conundrum card	0% 0	0% 0	40% 6	46.7% 7	13.3% 2	15	3.73	.001*
Secondary source card	0% 0	0% 0	33.3% 5	53.3% 8	13.3% 2	15	3.80	.000*
Comparative card	0% 0	0% 0	26.7% 4	53.3% 8	6.7% 1	15	3.67	.001*
Reform card	0% 0	0% 0	40% 6	46.7% 7	13.3% 2	15	3.73	.001*
Role-play card	0% 0	6.7% 1	40% 6	46.7% 7	6.7% 1	15	3.53	.015
Question and Answer	0% 0	0% 0	26.7% 4	53.3% 8	20% 3	15	3.93	.000*

Table 5 indicates that digital flashcard students found all types of flashcard were useful. In contrast, Table 6 indicates that printed flashcard students also found all cards useful except the role-play card. An ANOVA comparing means of the two groups did not indicate any significant difference between the experimental groups on any type of flashcard.

Table 5 indicates usefulness responses of Group 1 who received printed flashcards. Participants rated the usefulness of the various types of flashcards using a 5-point LIKERT difficulty scale (1 Completely useless, 2 Not useful, 3 Neutral, 4 Useful, 5 Very useful). Table 3 indicates all the questions asked in this study.

Participants rated their overall course satisfaction using a 5-point LIKERT difficulty scale (1 Very unsatisfactory, 2 Unsatisfactory, 3 Neutral, 4 Satisfactory, 5 Very satisfactory). An ANOVA did not reveal any significant difference in how each group viewed the overall value of the Contracts A course. Pearson correlation coefficients did not reveal any significant gender or age correlations. All three groups were highly satisfied with the Contract Law A course — see Table 7.

Table 7: Satisfaction with Contract Law A Course

Satisfaction level	1 Very unsatisfactory	2	3	4	5 Very satisfactory	Total	Mean	Sig. (2-tailed t test)
Group 1 (Digital flashcards)	5% 1	0% 0	5% 1	20% 4	70% 14	20	4.50	.000 *
Group 2 (Printed flashcards)	0% 0	0% 0	0% 0	33.3% 5	66.7% 10	15	4.67	.000*
Group 3 (No flashcards)	10.5% 2	0% 0	0% 0	21.1% 4	68.4% 13	19	4.37	.000*

A comparison was also made between the assessment performance and groups across the five items of assessment for LAWS11061 Contract Law A: Online Quiz [5%], Semester plan [5%], Written assignment [40%], Online Quiz [10%], and Take-home paper [40%]. The first three items occurred before flashcards were provided to groups 1 and 2. One-way ANOVAS and independent samples t tests indicated no statistically significant difference between the three groups on the first three items of assessment, between the three groups on the last two items of assessment, or between the three groups, comparing the first three items of assessment with their last two items of assessment. Group 3 indicated that they did not have access to any flashcards. The groups were statistically indistinguishable. The results obtained by students were unrelated to whether or not they had access to flashcards.

This outcome may be consistent with several possibilities, such as students not using the cards effectively and with the literature that suggests that the memory benefits of flashcards are associated with staged repetition.⁷³ In this study students were not provided with any information concerning how to use the cards or with any inbuilt staged repetition system.

VII QUALITATIVE COMMENTS

In the survey instruments, Groups 1 and 2 participants were asked open-ended questions about both the positive and negative aspects of flashcards. All three groups were asked to identify the best and worst aspects of the course. The lecturer for the Contracts subject was also interviewed about the subject and how he supported the students in using the flashcards.

Several major themes were identified in the analysis of the survey comments, including:

1. The positive aspects reported for flashcards centred on issues of mobility, ease of use and familiarity with the traditional study of the law. Hypertext and some visual elements added interactivity and complexity to the digital flashcards:

'The positive aspects of using flashcards are that they provide a good summary of the learning material, they are easy to use, they provide an interactive way to learn the course material and they make learning a more pleasurable experience.'

Negative aspects centred on the limitations of physical card systems in the digital age. The usefulness of digital cards was impacted by the design of the software, Internet usage and bandwidth constraints:

'Technology was needed to access the information' and 'Had to go back to the email that had the links to the flash cards. Would be great ... if accessing them was in a format readily available to get to them. Maybe a link on each weeks list of work similar to how <lecturer> has the moodle setup. A link for PDF, a link for Camatasia, a link for notes etc.'

2. Suggested improvements focused on more effective graphic design for the printed cards. Digital cards needed better indexing, navigation and access offline:

Printed cards: 'Vary the format — colours and layout — to help visual learners'; 'The only thing I would ask to be changed would be the size of the font and maybe colour code the different areas just to make it even easier again.'

Digital cards: 'Make it easier to navigate through the cards and get back to the main index. I had to keep closing down and re opening to go back to the index. Maybe put the options eg. Statute, legal principles etc as tabs so you can always easily click from one to another'; 'In the case cards, the facts could be pointed out in dot points instead of sentences. Just brief and to the point'; 'little bit larger font. I don't wear glasses but even at times I found myself squinting to see.'

3. Students will use digital flashcards beyond using them to memorise facts about the law:

'I was very excited at being chosen for the flash-card group. I used them after I read the relevant textbook chapter and the information was reinforced. I also used them when I was trying to remember a case and the principle behind the decision. They were useful to skim over before attempting the second quiz.'

4. Current use of digital flashcards may not be seen by students as integral or relevant to assessment in the subject:

'No (I did not use the digital flashcards for exam preparation), because I forgot they were even there. I was that busy I forgot. I made a little folder of all the flowcharts that <the lecturer> put together. I had that there and then I had all the notes. I completely forgot about the actual cards because it wasn't something that was normal. It was only 4 weeks worth.'

5. Digital flasheards have potential for continued use in the study of contract law and potentially law in general:

'I was very excited at being chosen for the flash-card group. I used them after I read the relevant textbook chapter and the information was reinforced. I also used them when I was trying to remember a case and the principle behind the decision. They were useful to skim over before attempting the second quiz.'

6. There were impacts on the educational design arising out of our research design. In this instance, the research may have impacted on the use and relevance of the digital cards to the students' study of contract law:

'No, because I forgot they were even there. I was that busy I forgot. I made a little folder of all the flowcharts that <the Lecturer> put together. I had that there and then I had all the notes. I completely forgot about the actual cards because it wasn't something that was normal. It was only 4 weeks worth.'

VIII CONCLUSION

While flashcards have a long history they have not been the subject of empirical evaluation of their potential in the study of law. This study has shown that for the small cohort of mature age students studying Contract Law that the use or otherwise of flashcards had no impact on the grades that students received for their assessment. Despite this, students who received flashcards rated them as valuable.

Table 3 indicated that students provided with digital flashcards found all types of flashcard as having a low level of difficulty. In contrast, Table 4 indicated that students with printed flashcards only found legislation cards, secondary source cards, comparative cards and question and answer cards had a low level of difficulty. The remaining card types were perceived as

more difficult to use. Table 5 indicated that students provided with digital flashcard found all types of flashcard useful. In comparison, Table 6 indicated that students with printed flashcards also found all cards useful except the role-play card.

The qualitative responses identified numerous issues related to flashcards and their design and implementation. For the majority of student respondents, the use of flashcards was a positive experience based on improved mobility, ease of use and alignment with the traditional study of the law. That layout and format of the flashcards had an influence on how students perceived them. Hypertext and some visual elements added interactivity and complexity to the digital flashcards. The experimental group who received printed cards noted their limitations in the digital age. The usefulness of digital cards was impacted by the design of the software, Internet usage and bandwidth constraints.

Participants suggested improvements to the flashcards that focused on more effective graphic design, particularly for the printed cards. Clearer indexing, navigation and offline access for digital flashcards were suggested improvements. It was also revealed that students would use digital flashcards beyond using them merely to memorise facts about the law. For example, they can be used as a structure to ground their study of contract law.

The research design may have resulted in a perception by students that the flashcards were not integral or relevant to assessment in the subject. There may have been insufficient scaffolding on how flashcards may be used by students in learning contract law and completing assessment; how to use the digital flashcard software; and how flashcards related to the assessment design. There were impacts on the educational design arising out of the research design. In this instance, the research may have impacted on the use and relevance of the digital flashcards to the students' study of contract law. Despite this, digital flashcards have potential for continued use in the study of contract law and perhaps law in general.

To maximise the benefit in using digital flashcards to support assessment tasks, it may be useful to:

1. Provide flashcards for the entire subject, including a range of digital flashcard types to highlight the learning outcomes for the subject. For example, flowchart cards to highlight legal reasoning, case cards to point to legal authorities, multimedia cards to depict interactions between client and lawyer etc.
2. Provide cards for all the subject content to allow for continuity and relevance across the entire subject.
3. Make better use of any planning exercise and/or learning activities designed to highlight where and how the digital flashcards may be used well to support study, completion of assessment tasks and preparation for any open book/take home exams.
4. Discuss with students the relevance of flashcards (digital or in print) to the students' learning in the subject and their future professional practice needs.
5. Emphasize the usefulness and relevance of the flashcards to aspects of the subject on a regular basis, with links to cards being incorporated into the other digital learning resources.
6. Incorporate the use of the digital flashcards into an assessment task. Highlight their relevance to the assessment task.
7. Use the digital flashcards in group activities to support discussion about the subject's content and legal skills.
8. Create well-designed assessments that use feedback to help students to be more successful in later assessment tasks in the subject. Consider how the digital flashcards may be used as feedback to students and/or how students may use the digital flashcards to assist them to complete their assessment tasks and/or prepare for exams. Build these activities into the assessment tasks.
9. To remember that any digital resource and/or tool will be used by students in a range of ways that may or may not help them achieve the learning outcomes for the subject. They need to know not only how to use the digital resource, but how to best to use it in the context of your subject.

Numerous questions arise which may be the subject of future research, including:

- Whether flashcards have different levels of usefulness comparing mature age student cohorts with school leaver cohorts.
- Whether it is beneficial for students to construct and share their own flashcards.
- Whether the same results hold true for other disciplines.
- Whether introduction of a staged repetition system for flashcards will improve the grades of law students.
- Whether the results will vary when some of the constraints of the empirical design are relaxed.

Flashcards require a considerable investment in time and money, not only in developing their content, but also in terms of graphic design and programming. While numerous digital tools, such as Flashcram, are available to create digital flashcards, academics need to consider using flashcards among a variety of other approaches to learning. It would also make sense for academics from different institutions to collaborate to reduce the burden of creating flashcards, while creating a broader audience of students whom may benefit from them.