

## **Title of paper**

Exploring the use of artificial intelligence to improve law students' self-assessments

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## **Abstract**

Analytical writing is a core professional skill for lawyers. For this reason, many law degrees include writing tasks. This paper discusses a study being conducted by the author at the University of Technology Sydney (UTS), which has revealed this misalignment between law students' self-assessments and the markers' assessments of their work. Indeed, the scholarship on this point paints a negative impression of students' ability to self-assess.

This paper examines the trial of writing analytics technology to give students pre-submission feedback. This software is being developed by the Connected Intelligence Centre at UTS in conjunction with Xerox in France. It is argued that natural language processing powered by Artificial Intelligence (AI) can offer rapid formative feedback on draft essays. By coding their text, the application makes visible to learners their use (or lack) of key features of analytical writing. This innovative technology is intended to improve law students' self-assessments and it also provides an opportunity for students to trial and critique a future tool of their trade.

Part one of this paper explains why students struggle to read their draft essays critically. Part two considers this problem and early unsuccessful attempts to teach self-assessment. Part three examines the trial of writing analytics technology to improve students' self-assessments. This paper tentatively concludes that by exposing students to natural language processing technology, they are better equipped to discern and improve their essays; while at the same time experiencing in a practice-authentic way how AI works, including its limitations (at this time).

## Introduction

Academic writing is a key professional skill for law students to develop.<sup>1</sup> Despite its importance, some university students are seen to lack sufficient proficiency in writing for legal practice.<sup>2</sup> Support for academic writing has traditionally been limited, mostly taking the form of English for Academic Purposes (EAP) for non-native speakers, or remedial action to improve writing skills in an ad-hoc manner.<sup>3</sup> There is a need to help law students with their academic writing in an ongoing and integrated way.

There are many factors that influence decisions a student makes while writing an academic text. These include the purpose of the text, the academic and cultural context of the text, the extent to which academic writing the writer is given advice on the positioning and organisation of the text.<sup>4</sup> Formative feedback on writing assists students in gaining awareness regarding their progress against their goals.<sup>5</sup> An effective formative feedback process therefore begins with teachers clearly articulating and demonstrating the learning goals and success criteria for the knowledge, understanding and skills students are required to exhibit throughout the formative assessment task.<sup>6</sup>

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<sup>1</sup> B Paltridge, 'Academic writing' (Apr 2004) 37.2 *Language Teaching* 87, 87.

<sup>2</sup> A Ackerman C Magrath, T Branch, J Clinton Bristow, L Shade and J Elliott (The College Board), 'The neglected "R": The need for a writing revolution' (2003) *Report on The National Commission on Writing in America's Schools and Colleges* <[http://www.collegeboard.com/prod\\_downloads/writingcom/neglectedr.pdf](http://www.collegeboard.com/prod_downloads/writingcom/neglectedr.pdf)>

<sup>3</sup> English for Academic Purposes (EAP) provides an opportunity to learn English language in context in preparation for university study. It is for students who want to develop the foundations of English for studying in tertiary programs. See for example, B Ballard and J Clanchy, *Teaching international students. a brief guide for lecturers and supervisors* (IDP Education Australia, 1997)

<sup>4</sup> P Prior, 'Redefining the task: an ethnographic examination of writing and response in graduate seminars.' in D Belcher and G Braine (ed), *Academic writing in a second language: essays in research and pedagogy* ( Ablex, 1995) 47–82. It is interesting to note that this study explored the challenges faced by students writing in their second language. This is where significant and well-documented empirical work has been done with students to improve their academic writing.

<sup>5</sup> MR Lea and B Street, 'Student writing and staff feedback in higher education: an academic literacies approach' in MR Lea and B Street (ed), *Student writing in higher education: new contexts* (Open University Press, 2000) 32–46

<sup>6</sup> S McManus, 'Attributes of effective formative assessment' (2008) *Council of Chief State School Officers, Washington DC* <[www.ccsso.org/documents/2008/attributes\\_of\\_effective\\_2008.pdf](http://www.ccsso.org/documents/2008/attributes_of_effective_2008.pdf)>

Through such formative feedback, students can close the feedback loop by applying the feedback that they receive to improve their work, to address the gap between their performance and instructor expectations.<sup>7</sup> This approach results in greater impact on students' learning than summative assessments. However, for large classes, it is not practically possible for the instructor to provide formative feedback to all students since the process is time-consuming. To overcome this issue, students are encouraged to self-assess their work.

Inviting law students to self-assess is a practice-authentic activity. Critical reading is a daily task in legal practice. Critical thinking is considered as an important educational goal “because learning to think critically can help students deal with ambiguity and negotiate the bewildering pace of social and technological change.”<sup>8</sup> Indeed, learning to learning requires a reflexive view of one's own work and a conscious ability to question and challenge preconceptions.<sup>9</sup> Our complex and rapidly changing world creates a need for self-initiated and self-managed learning - not only during the years typically associated with formal education, but also across the lifespan. Technological advances provide new opportunities for such learning.<sup>10</sup> Knowing how to manage one's own learning activities has become, in short, an important survival tool.

### ***Rationale and background***

Knowing how to manage one's own learning has become increasingly important in recent years, as both the need and the opportunities for individuals to learn on their own outside of formal classroom settings have grown. However, students struggle to assess their own work. This is because the metacognitive processes involved in assessing the quality of written work, particularly one's own, are sophisticated.

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<sup>7</sup> Paltridge, B, 'Academic writing' (Apr 2004) 37.2 *Language Teaching* 87

<sup>8</sup> S Brookfield, *Developing critical thinkers: Challenging adults to explore alternative ways of thinking and acting* (Jossey-Bass, 1987)

<sup>9</sup> M Rawson, 'Learning to learn: More than a skill set' (Jun 2000) 25.2 *Studies in Higher Education*; Abingdon 228.

<sup>10</sup> J Dublosky RA Bjork, N Kornell, 'Self-Regulated Learning: Beliefs, Techniques, and Illusions' (2013) 64 *Annual Review of Psychology* 417, 418.

Students who practise self-assessing could be motivated to focus more on their learning than their grades.<sup>11</sup> The literature indicates that relatively few higher educators are putting student self-assessment into practice,<sup>12</sup> despite indications that it has many motivating benefits.<sup>13</sup>

With these challenges and potential benefits in mind, the author has undertaken a three-year study of undergraduate law students enrolled in Civil Practice at the University of Technology Sydney, with the aim of teaching the students how to self-assess.<sup>14</sup> In an effort to teach students how to self-assess critically and constructively, the author has adopted both traditional and innovative approaches with mixed results. The traditional approach adopted by the author invites students to mark their own essay against the ten criteria in the marking rubric against which their essay will be assessed by their tutor. Meanwhile, a more recent innovative approach deploys a web-based application that is designed to detect certain discernible features of good academic writing. The application uses natural language processing powered by artificial intelligence (AI). It is the methodical and critical self-assessment of this essay that the author seeks to teach to the students. Their interaction with AI technology is a practice-authentic experience and provides students with an insight into how natural language processing works. The students' responses to each of these approaches are discussed in detail below.

Importantly, this project has delivered to mid-degree law students interventions that aim to improve their academic writing. Although the pass rates for this group were generally

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<sup>11</sup> J Nozomu, *Self assessment as learning: Finding the motivations and barriers for adopting the learning-oriented instructional design of student self assessment* Capella University, ProQuest Dissertations Publishing, 2010), 1

<sup>12</sup> M McCulloch and M Scott D Hounsell, *The ASSHE Inventory: Changing Assessment Practices in Scottish Higher Education* (UCoSDA, 1996) ; NF Liu, 'Hong Kong academics' and students' perceptions of assessment purposes and practices. Learning Oriented Assessment Project report.' (2005) *Hong Kong Institute of Education* ; M Taras, 'To feedback or not to feedback in student self-assessment' (2003) 28(5) *Assessment and Evaluation in Higher Education* 549)

<sup>13</sup> D Boud and N Falchikov, 'Aligning assessment with long-term learning' (2006) 31(4) *Assessment and Evaluation in Higher Education* 399; Marcia Mentkowski and Associates, *Learning that Lasts: Integrating Learning, Development, and Performance in College and Beyond* (Jossey-Bass, 2000)

<sup>14</sup> Ethics approval ETH16-0285: Law Essay Self Assessment Project (LESA Project). Lead researchers Dr Philippa Ryan, Dr Simon Buckingham Shum, Dr Simon Knight. Partial funding for this project provided by way of a Teaching and Learning Grant in March 2017.

acceptable to above average, the students expressed concern that there was a significant gap between their expectations of their results and the marks assessed by their tutors. This expectation gap suggests that these students were failing to self-assess their essays in a meaningful way. The aim of this project was to teach the students how to self-assess in a way that would inform the changes they needed to make to their essays, so as to bridge the gap between their expectations and the mark they achieved for their work. It was hoped that in this way, the students would be better prepared for legal practice and the expectation that advice to clients and submissions in court would be closely aligned to the law and evidence.

### ***Methodology***

This project has been running for six semesters. It aims to develop an effective way to teach students to self-assess. It is not a “longitudinal” study of the same cohort of students over a number of semesters. It is a study of successive new cohorts of students enrolled in the same subject at approximately the same stage of their law degree. In this way, the study could be described as “cross-sectional”. Each new cohort has a slightly different learning experience to the previous group. This is because the method for teaching self-assessment skills has been adjusted each semester, in light of results and feedback from students in each previous semester. The author hopes that each new iteration of the learning experience is an improvement and that each consecutive group of students finishes the semester with self-assessment skills that are not only better than they had at the beginning of the semester, but also better than the self-assessment skills achieved by the previous cohort.

Over six semesters from Spring 2014 to Autumn 2017, the author coordinated and co-taught Civil Practice: a core mid-degree law subject in the Faculty of Law at the University of Technology. During this time, between 280 to 420 students were enrolled in the subject each semester, with a total of 2,160 students submitting essays over the six semesters. The stipulated length of the essays was 2,000 words. The same marking rubric was used each semester and the rubric was made available to the students in their Learning Guide at the start of each semester.

The marking rubric comprised 10 distinct criteria against which the essays would be assessed. They were:

- 1. Statement of argument*

2. *Statement of essay plan*
3. *Conclusion – reaches logical conclusion*
4. *Identification of relevant issues*
5. *Critical analysis, Evaluation, Original insight*
6. *Development of a sustained thesis with examples*
7. *Engagement with the law and scholarly literature*
8. *Plain English expression*
9. *Meaningful headings*
10. *Compliance with style guide and footnoting conventions*

Against each these 10 criteria, students were assessed on five levels:

*Fail*

*Pass*

*Credit*

*Distinction*

*High Distinction*

Figure 1 is an image of the marking feedback sheet used by assessors in all six semesters.

In the first two semesters during which this study was conducted (Spring 2014 and Autumn 2015), students were asked to self-assess their essays by submitting (with their final essay) a copy of the marking feedback sheet, ticked to reflect their impression of their level achievement in relation to each of the criteria. Although the submission of a self-assessment was voluntary and not assessable, more than 90% of students completed this step.<sup>15</sup>

In response to some unsolicited feedback from students about their level of confidence in their self-assessments, an additional field was introduced to the self-assessment sheet for the Spring 2015 session. This text box was in two parts and invited the students to reflect on how confident they felt about their self-assessments, and why; as follows:

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<sup>15</sup> The high level of participation in the self-assessment is likely attributable to the fact that only students who submit a self-assessment are entitled to request that their essay be re-marked.

*How confident are you in this self-assessment? Circle a number from 1 to 5, where 1 is not very confident and 5 is very confident.  
In a few words, please explain the reason for your confidence rating.*

The image in Figure 2 is an example of one of the self-assessment sheets completed by a student in Spring 2015.

As well as adding the “Student’s confidence” questions to the self-assessment form in Spring 2015, the author also invited a small group of students to test the Academic Writing Analysis software (AWA). After the submission of their final essays, this group of 32 students tested the software by running their essays through the application. Students were given a brief training session on the software’s intended to purpose and how to use it.

The 32 AWA trial students were then sent a survey with four questions about their experience with AWA. Those questions were:

- 1 *Today’s date*<sup>16</sup>
- 2 *How comfortable are you with getting feedback of this sort from a computer?  
(Possible responses: not at all comfortable; not very comfortable; neutral, somewhat comfortable, very comfortable)*
- 3 *Did you find the feedback meaningful, so you could see ways to improve your writing?  
(Possible responses: not at all meaningful; not very meaningful; neutral, somewhat meaningful, very meaningful)*
- 4 *If we continue to make AWA available, what is the likelihood that you would use it?  
(Possible responses: not at all likely; not very likely; neutral, somewhat likely, very likely)*
- 5 *We’d love to hear any further thoughts you have. Please comment here.*<sup>17</sup>

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<sup>16</sup> Answers to this question ensured that we could readily situate the student into a particular semester cohort.

<sup>17</sup> This was the only non-compulsory question in the survey.

In response to the feedback from the 32 AWA trial students, the author decided to trial AWA with the entire cohort in Autumn 2016.

To assist the students' in their understanding of this innovative natural language processing technology and to make sure that this information could be readily disseminated to a large cohort that does not always attend lectures, a five-minute video was created by the project's research team to explain how the software works. The video was published to YouTube, so that the link to the video could be made available to any students intending to trial AWA. The author made the link available via UTS Online with the "tracking" function enabled.<sup>18</sup> In this way the author was able to see how many students had (probably)<sup>19</sup> watched the video prior to using AWA.

In Autumn 2016, as well as inviting all Civil Practice students to trial AWA, the author added five "check box" questions to the self-assessment form. One of the check boxes gave students the option to "opt out" of the research so that submission of a self-assessment was still required, but their responses to the self-assessment form would not be used by the author in her research project. The other four check boxes invited students to identify what AI technologies they had used prior to submission of the final essay. Those technologies were *Spellcheck* (in Word), *Grammarly* (Grammar checker), *Turnitin* (plagiarism detector), *AWA*.

The author added the four questions about AI technologies so as to situate AWA alongside three other types of better-known tools, to make clear to the students that they already have access to AI to check their work, thereby characterising AWA as another product they can use to improve their document drafting.

Figure 3 is an image of the version of the self-assessment form that was introduced in Autumn 2016, and was then used in Spring 2016 and Autumn 2017.

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<sup>18</sup> UTS Online is a subject portal; and "tracking" allows subject coordinators to monitor student activity.

<sup>19</sup> The author uses the word "probably" parenthetically here, because evidence that a student clicked the link to the video is not evidence that the student watched the video. However, the author suggests that it is a reasonable inference to draw that after clicking on the link, the student "probably" watched the video. The author did some data matching between the number of clicks on the link and the number of views of the video and there was a correlation both in number and over time. The author accepts that this data is not definitive.

Feedback from the students who trialed AWA in Spring 2016, indicated that there was a lack of understanding of what AWA was programmed to detect and therefore a lack of appreciation of how to improve their essays in light of AWA's results. To address this gap in the students' knowledge of the grammatical features of academic writing being targeted by AWA, the author created a 10-minute podcast that explained to students three key things:

1. *Why it is important to write in a way that is explicit about purpose.*

2. *Examples of discourse markers and their function – for example:*

*Adding something to a previous concept:*                      *Further; What is more ...*

*Contrasting two separate things:*                      *On the other hand; In contrast*

...

*Making an unexpected concession or contrast:*                      *In spite of this; Nevertheless ...*

*Saying what the result of something is:*                      *Therefore; Consequently ...*

*Expressing a condition:*                      *Provided that; So long as ...*

3. *How to use discourse markers to advance an argument or strengthen persuasive appeal.*

The podcast about the use of discourse markers to make academic writing more explicit was provided to Autumn 2017 students in advance of the due date of their essay.

### ***Structure of this paper***

This paper is in three parts. The first part explains why students struggle to self-assess and includes a discussion of the current scholarship on this point. The second part describes the author's early unsuccessful attempts to teach students to self-assess by inviting them to consider the quality of a substantial draft of their essay in light of their marking rubric. Part three explores the use of AI to automate feedback on the students' draft essays.

### ***Conclusion***

Introducing automated feedback as an intervening step between completion of the final draft of the essay and its submission gives students an opportunity to assess their work in the absence of human feedback. It is hoped that this intervening step will cause students to

pause and think more critically about what they have written and what they have failed to write.

## Why do students struggle to self-assess their essays?

The metacognitive processes involved in assessing the quality of written work, particularly one's own, are sophisticated. Indeed, the scholarship on this point paints a negative impression of students' ability to improve their self-assessments. Research shows that people often have a faulty mental model of how they learn and remember, making them prone to both mis-assessing and mismanaging their own learning.<sup>20</sup> However, studies show that students who self-regulate their learning are more motivated to learn<sup>21</sup> and they are also motivated to improve their academic results.<sup>22</sup> Meanwhile, marking-criteria rubrics are commonly used to judge the quality of student work, but few students receive instruction to effectively use and apply rubrics.<sup>23</sup>

Students are usually admitted to a law degree on the strength of very good school-leaving results or upon successful completion of an undergraduate degree. As a general rule, both cohorts have strong writing skills. However, this study revealed that when students were invited to self-assess their own writing using the formal rubric they tended to over-rate their writing.

If law students are not taught how to assess their own written work meaningfully while at university, they will be unlikely to learn this skill in practice.<sup>24</sup> Yet it is in legal practice that the skill is most needed. The professional and ethical obligations that are imposed on legal practitioners mean that they must be mindful of what and how they write at all times.

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<sup>20</sup> RA Bjork, above n

<sup>21</sup> PR Pintrich and EV De Groot, 'Motivational and self-regulated learning components of class- room academic performance' (1990) 82 *Journal of Educational Psychology* 33

<sup>22</sup> BJ Zimmerman and A Bandura, 'Impact of self-regulatory influences on writing course attainment' (1994) 31 *American Educational Research Journal* 845

<sup>23</sup> B Allen L Jones, P Dunn, L Brooker, 'Demystifying the rubric : a five-step pedagogy to improve student understanding and utilisation of marking criteria' (2017) 36(1) *Higher Education Research and Development* 129

<sup>24</sup> Brookfield, above n

Most of what lawyers do involves reading, writing and critiquing correspondence, evidence, advice and instructions.

Self-regulation of learning comprises a learner's planning, monitoring, and evaluation of the learning process.<sup>25</sup> Self-regulation can take place on a metacognitive, motivational, and behavioural level.<sup>26</sup> There is a multitude of evidence on the effect of self-regulated learning on academic achievement and learning efficiency.<sup>27</sup> There are also numerous intervention studies on teaching different strategies to improve students' self-regulated learning.<sup>28</sup> Teachers play an important role in supporting their students' self-regulated learning, but training by teachers leads to lower effects than does training by researchers.<sup>29</sup>

However, there has been only a small body of research that has focused on the instruction of self-regulation strategies by regular classroom teachers.<sup>30</sup> These few studies have found that teachers spend little time on direct strategy instruction.<sup>31</sup> Common alternatives to teacher-assessment strategies have involved peer-assessment in collaborative learning frameworks.<sup>32</sup> In most of these studies, it is an important feature of the students' experience

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<sup>25</sup> DH Schunk and BJ Zimmerman, *Self-regulation of learning and performance: Issues and educational applications* (Lawrence, 1994)

<sup>26</sup> B Zimmerman, 'Self-Regulated Learning and Academic Achievement: An Overview' (1990) 25(1) *Educational Psychologist* 3

<sup>27</sup> For example, M Rijavec and I Brdar, 'Coping with school failure and self-regulated learning' (2002) 17.2 *European Journal of Psychology of Education; Dordrecht* 177; Bandura, above n ; C Dignath and G Buttner, 'Components of fostering self-regulated learning among students. A meta-analysis on intervention studies at primary and secondary school level' (2008) 3 *Metacognition Learning* 231; R Lawson D Boud, and DG Thompson, 'Does student engagement in self-assessment calibrate their judgement over time?' (2013) 38(8) *Assessment & Evaluation in Higher Education* 941; and David J. Nicol and Debra Macfarlane-Dick, 'Formative assessment and self-regulated learning: a model and seven principles of good feedback practice' (2006) 31(2) *Studies in Higher Education* 199

<sup>28</sup> For example, PR Pintrich, 'A Conceptual Framework for Assessing Motivation and Self-Regulated Learning in College Students' (2004) 16(4) *Educational Psychology Review* 385; and Zimmerman, above n 26.

<sup>29</sup> Buttner, above n 27

<sup>30</sup> N Perry, 'Using qualitative methods to enrich understandings of self-regulated learning' (2002) *Educational Psychologist* 37

<sup>31</sup> L Phillips N Perry, and J Dowler, 'Examining features of tasks and their potential to promote self-regulated learning,'" (2004) 106(9) *Teachers College Record* 1854

<sup>32</sup> Dr Rachael Hains-Wesson, 'Peer and Self Assessment' (2014) *Developed by Deakin Learning Futures, Deakin University*

that they perceive a benefit in self and peer-assessment.<sup>33</sup> A higher level of awareness of course expectations and requirements, combined with abilities to identify learning gaps and develop strategies to fill those gaps, are the mechanisms through which students perceived that peer and self-assessment promote their sense of responsibility towards their own learning.<sup>34</sup>

Although self-regulated learning is proving to be a recently well studied issue, the concept is based on historical results from educational research.<sup>35</sup> With the beginning of constructivist learning theories, the idea that students should take responsibility for their own learning and should play an active role in the learning process replaced instructional theories, which assigned a reactive rather than a proactive role to the learner.<sup>36</sup> A number of different self-regulation and self-learning strategies can be introduced at different stages of their development.

In this study, the students are half way through their law degree and the particular type of self-regulation being taught is self-assessment. Self-assessment falls within the metacognitive processes of planning, monitoring and evaluation.<sup>37</sup> Planning involves the selection of appropriate strategies and the allocation of resources. Monitoring refers to checking one's comprehension and performance, e.g. by means of self-testing. Evaluating

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<[https://www.deakin.edu.au/\\_\\_data/assets/pdf\\_file/0020/53462/peer-and-self-assessment.pdf](https://www.deakin.edu.au/__data/assets/pdf_file/0020/53462/peer-and-self-assessment.pdf)>

<sup>33</sup> C McNickle, 'Collaborative, peer and self assessment: what the literature says' (1998) *Canberra Institute of Technology*  
<<http://www.voced.edu.au.ezproxy.lib.uts.edu.au/content/ngv%3A39709>>

<sup>34</sup> A Ndoye, 'Peer/Self Assessment and Student Learning' (2017) 29(2) *International Journal of Teaching & Learning in Higher Education* 255

<sup>35</sup> For example, J Piaget, *The construction of reality in the child* (Basic Books, 1954) ; LS Vygotsky, *Mind in society: The development of higher psychological processes* (Harvard University Press, 1978) ; A Bandura, 'Social cognitive theory' in R Vasta (ed), *Annals of child development (Vol.6). Six theories of child development* (JAI, 1989) 1

<sup>36</sup> BJ Zimmerman, 'Theories of self-regulated learning and academic achievement: An overview and analysis' in BJ Zimmerman & DH Schunk (ed), *Self-regulated learning and academic achievement: Theoretical perspectives* (Erlbaum, 2001) 1–37

<sup>37</sup> Buttner, above n 27, 236

designates the judgement about the products and efficiency of one's learning, for example, by re-evaluating one's goals and conclusions.<sup>38</sup>

For many law (and other) students, a major barrier to self-assessment is the perception that they are not qualified to assess their own work and that this is the provenance of their teachers. Recent research indicates that student self-assessments tend to improve with practice and this experience can include the use of technologies to automate feedback.

## Unsuccessful attempts to teach self-assessment

In an early attempt to teach law students how to self-assess, the author provided students with the marking rubric against which their essay would be marked. Students were invited to self-mark their essays against each of the ten criteria in that rubric. Those criteria were:

- 1 *Statement of issue or thesis;*
- 2 *Statement of essay plan*
- 3 *Identification of issues*
- 4 *Original analysis*
- 5 *Engagement with scholarship and/or authorities*
- 6 *Evaluation*
- 7 *Conclusion*
- 8 *Meaningful headings and signposts*
- 9 *Plain English expression*
- 10 *Compliance with style and footnoting conventions*

These criteria were set out in a table that had five possible standards of achievement for the students to assess:

*Fail*

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<sup>38</sup> G Schraw, 'Promoting general metacognitive awareness' (1998) 26 *Instructional Science* 113

*Pass*

*Credit*

*Distinction*

*High Distinction*

On the first occasion that Civil Practice students were asked to self-assess their essays (Spring 2014), there were 280 students enrolled in the subject and more than 90% of the students completed the self-assessment form. Their self-assessments were on the whole unrealistically optimistic. When the students received their marks as assessed by tutors, they were disappointed by the gap between their distribution of marks in their self-assessment and the more critical assessment imposed by the academics.

There are a number of reasons why students might be overly optimistic or “rosy” in their self-assessments. These reasons could be based on an over-inflated impression of their own abilities in comparison to the rest of their cohort; or they might be ticking the boxes in the feedback form that align with where they would like their essay to be assessed, regardless of its actual qualities; or they might be trying (consciously or sub-consciously) to positively influence the assessor to give them a higher mark. In the case of the cohort in this study, this third and final hypothesis is the least likely, as the students were aware that the self-assessments would have no bearing on the final mark.

Research suggests that when taught to calibrate their self-reviews to instructor-defined assessment criteria, learning outcomes may improve.<sup>39</sup> However, in the author’s experience in this study, students on the whole responded in one of two ways to this task: they either over-rated the quality of their work; or they simply ticked the marking sheet according to the mark that they wanted to achieve. Rather than being self-critical, the students were merely aspirational.

It seems that what was missing was a self-review mechanism that was designed in such a way as to be formative in making critical judgments about the quality of the reviewed writing. It is important to note that tertiary students in particular can flexibly combine

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<sup>39</sup> D Boud, above n

different goals in different contexts. For example, law students are generally motivated by the desire to achieve maximum marks for a particular assessment task. However, they can be taught to shift their energies to non-assessment task, as long as the goals are still oriented towards maximising their marks when it comes time to be assessed.<sup>40</sup> A mechanism or intervention that causes students to pause and ask strategic questions about the content and quality of their writing could qualify as an incentive to proof-read and make the critical judgments required for meaningful self-monitoring.<sup>41</sup> Ultimately, the author seeks to build students' ability to assess themselves as accurately as an expert assesses them, which as Boud has argued, is the kind of "sustainable assessment" capability needed for lifelong learning.<sup>42</sup>

In order to work out how the students were approaching this task, the author interviewed twenty students in the Spring 2014 cohort.<sup>43</sup> On closer inspection, it became clear that students were completing the self-assessment form without actually looking for evidence in their essays that they had met the level of achievement they had asserted in their self-assessment. The failure of these students to self-assess in a critical and meaningful way was evidenced by their apparent surprise when they received a mark for their essay that was lower than they expected.

In these and other interviews with students who had sought a remark for their Civil Practice essays, it became clear that once the author pointed out the shortcomings in their essay, students readily accepted the assessed mark when the. The students' reactions were consistent with them not having critically conducted their own self-assessment with the

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<sup>40</sup> Pintrich, above n , 388. See also, J Biggs, 'What do inventories of students' learning processes really measure? A theoretical review and clarification' (1993) 63 *Br. J. Educ. Psychol* 3; J Biggs, 'Enhancing learning: A matter of style of approach?' in R Sternberg and L Zhang (ed), *Perspectives on Thinking, Learning, and Cognitive Styles* (Erlbaum, 2001) 73; K. Trigwell, Prosser, M., and Waterhouse, F. , 'Relations between teachers' approaches to teaching and student approaches to learning' ((1999)) 37 *Higher Education* 57

<sup>41</sup> Wise, Alyssa Friend, *Designing pedagogical interventions to support student use of learning analytics*, Proceedings of the Fourth International Conference on Learning Analytics And Knowledge

<sup>42</sup> D Boud, 'Sustainable assessment: rethinking assessment for the learning society' (2000) 22(2) *Studies in Continuing Education* 151

<sup>43</sup> These twenty students had asked received their essay mark and asked the author for a remark. The author invited the students to an interview to discuss the remarked paper and during this meeting with the student, asked about their self-assessment process.

same methodical approach adopted by the author. The approach adopted by the author in the assessment process undertaken during the re-marking interview involved asking the student to identify where in their essay they had written text that met each of the ten marking criteria; and – if found – by inviting the students to assess the quality of that text. When guided by the author, each student's understanding of the shortcomings in their essay was almost immediate and seemed obvious to them.

Despite the ability of these students to identify readily the presence or lack of key evidence that their essay had satisfied each of the criteria in the marking rubric, the author struggled to find ways to ensure that these elements were identified in an intervening step prior to submission of the essay.

In the second semester of this study (Autumn 2015), the author designed a compulsory tutorial activity that would provide an opportunity for the students to bring their draft essays to the tutorial more than a week before the essay was due and perform the self-assessment in class with a tutor's guidance. The idea was that the tutor would emulate the re-marking experience that seemed to be so successful the previous semester to demonstrate the way that a self-assessment can reveal the content and quality of the essay. Unfortunately, fewer than 10 students in a cohort of more than 300 brought their essays to the tutorial. The reason given by the majority of students for not having the draft essay with them at the tutorial was that the draft was not sufficiently close to completion to make self-assessment meaningful.

In the third semester (Spring 2015), students were asked not only to self-assess their essays, but also to reflect upon their level of confidence in their self-assessments. The results of this iteration of the study indicated that students were continuing to mark the self-assessment sheet without pausing to look for evidence in their essay that they had met the criteria set out in the marking rubric.

Clearly, if law students were to be taught to self-assess their essays prior to submission, it would be necessary to design activities with more concrete intervening steps. With this in mind, the author introduced a new tutorial activity using writing analysis software aimed at engaging the students more meaningfully with the self-assessment processes.

## Using artificial intelligence to automate student feedback

In the fourth semester of this study (Autumn 2016), the number of students enrolled in Civil Practice was 420. This unusually large cohort presented challenges and opportunities. The main challenge with these numbers was the prospect of being asked to re-mark 10% of their essays. For this reason, the author decided to try introduce a new intervention to encourage the students to self-assess their essays more effectively. As well as teaching the students this critical skill, it was hoped that the number of requests for re-marking would fall, if the students were more competent in their self-assessment and therefore more accepting of the assessor's mark.

The new intervention that the author introduced was writing analytics software using natural language processing, powered by artificial intelligence (AI).

AI and machine learning, building on neural networks and deep learning, applies knowledge from cognitive science to build systems that simulate human thought processes. However, rather than focus on a singular set of technologies, cognitive computing covers several disciplines, including machine learning, natural language processing, vision, and human-computer interaction.

Automated tools have been developed that use computational techniques to assess writing. The scope of such tools varies from Automatic Essay Scoring AES systems that provide a score based on the assessment of standardised writing, to Automated Writing Evaluation AWE systems that provide additional feedback to students on their writing . Learning Analytics, which makes uses of analytics techniques on student data to improve learning, can be used for providing formative feedback which is almost immediate. Several tools have been employed for university and school students to analyse text in the context of essays, problem solving, free form and collaborative writing. One such tool is the Academic Writing Analytics (AWA) tool that provides formative feedback on students' academic writing.

AWA uses natural language processing techniques to identify sentences in a text that match specific rhetorical functions, like emphasising an important point or summarising. The programme uses linguistic markers that indicate these rhetorical moves . Such moves are a key component in good academic writing and are seen to be correlated to essay quality.

Feedback on the presence of these moves should help students reflect on their writing and the rhetorical structure of it.

However, regardless of the quality of the technology, a concern in technology-enhanced learning is that technologies may not be used unless they are embedded in the curriculum.<sup>44</sup> The alignment of learning analytics to learning design has also been increasingly emphasised to provide a contextual framework for the pedagogic intent of analytics applications. A clearly defined pedagogical design closes the gap between the potential and the actual use of technologies, by helping students put these tools to appropriate use in order to add value to their learning. This forms the basis for learning analytics pedagogic interventions design which moves from developing learning analytics technologies to integrating them as part of a larger educational context.

The integration of learning analytics tools in pedagogic design should also be aligned to subject curriculum in order to find new ways of solving existing pedagogical issues using learning analytics. Good design of learning analytics platforms also makes collection of data much easier, which can give useful insights for guiding students during the length of the course and in future interventions. The aim of this study was therefore to design an effective pedagogical intervention and a learning analytics platform to introduce the automated writing analytics tool AWA to students to help them write better essays for their subject. The contribution of this study is to provide an exemplification of a pedagogically aligned learning analytics intervention and platform developed to gain research and learning insight into student writing and hopefully to improve law students' self-assessments.

AWA is being developed by the Connected Intelligence Centre at UTS in conjunction with Xerox in France. It is argued that natural language processing powered by AI can offer rapid formative feedback on draft essays. By coding their text, the application makes visible to learners their use (or lack) of key features of analytical writing. This innovative technology is intended to improve law students' self-assessments and it also provides an opportunity for students to trial and critique a future tool of their trade.

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<sup>44</sup> Ursula Wingate, 'Using Academic Literacies and genre-based models for academic writing instruction: A 'literacy' journey' (2012) 11(1) *Journal of English for Academic Purposes* 26

The way that AWA “codes” the text is to either highlight it or by tagging it with a letter reference. Figure 4 is an image of how AWA tags and highlights text.

AWA’s highlighting indicates that AWA has detected one of three features of academic writing:

*Summarising* [green highlighting];

*Importance* [yellow highlighting]

Both *Summarising and Importance* [purple]

AWA’s tags indicate where the text is providing, describing, recognising, or pointing out:

*Background* [B];

*Contrasting* ideas [C];

*Emphasising* important ideas (E);

*Novel* ideas (N);

*Surprising* facts, results, etc. (S);

*Question that remains open or insufficient knowledge* (Q); and

*Trends* (T).<sup>45</sup>

AWA’s parsing algorithms look for patterns within sentences. AWA is programmed to detect certain features of good academic writing. It does this by analysing the text in each sentence, working out the parts of speech of the keywords and highlighting what each sentence is doing. The software is not perfect and its degree of success depends on the sentence structure and language in each sentence. It does not assess the merits of an argument and it cannot situate the sentences in the context of a paragraph or chapter. The programme just isolates a sentence and then looks for grammatical rules and certain rhetorical features.

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<sup>45</sup> Knight, Simon et al, 'Designing Academic Writing Analytics for Civil Law Student Self-Assessment' (2016) *International Journal of Artificial Intelligence in Education* 1

In relation to the marking rubric used in Civil Practice, AWA engages with five of the ten criteria being assessed by the markers. They are Statement of issue or thesis; Statement of essay plan; Original analysis; Evaluation; and Conclusion.

The software had been in development for more than a year when a small study was conducted with 32 Civil Practice students in Spring 2015. Those students responded to this trial via a short survey that asked them for feedback about their experience. The results were divided into two distinct classes of response: half of the group responded that their experience with the software was pointless, because it did not inform or suggest how they could improve their essays. The other half responded that simply learning about the software and experiencing how it worked was valuable. Although the sample was small, it was accepted as potentially representative of the whole group and worthy of consideration when deciding how to proceed with the following group.

The next step in the study was to take more time explaining the particular features of academic writing that AWA could detect and that the students might consider worthy of inclusion in their essays.

To date, more than 180 students in this study have tested AWA by submitting their essays and then analysing the results. The students' responses to the study have continued to be mixed and on the whole more negative or neutral than positive. There seem to be two main problems for students when interpreting the results provided by AWA. First, the students assume that the programme is simply looking for keywords. This is not correct. AWA's rhetorical parser matches concepts, rather than simply finding keywords.<sup>46</sup> It is programmed to identify the salient discourse patterns of syntactically related words and expressions that convey constituent concepts. For example, sentences which contrasting ideas contain a pair of syntactically related words or expressions conveying the concepts of "contrast" and "idea/mental operation". The second problem facing students who tasked with interpreting AWA's results is that most of the students are not familiar with linguistic terms. Their use of correct syntax is the result of exposure to formal language, rather than

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<sup>46</sup> A Sándor, A Kaplan, and G Rondeau, 'Discourse and citation analysis with concept-matching' in *International Symposium: Discourse and document (ISDD)* (2006), 15–16. Retrieved from <<http://www.xrce.xerox.com/content/download/16625/118566/file/result.pdf>>

formal learning about parts of speech and how they operate. It is simply not possible to explain all of these new concepts in a tutorial.

To address the more substantive problem arising from the students' discomfort with the results (that is, the students' lack of familiarity with the linguistic rules being highlighted by AWA), the author introduced for the Autumn 2017 cohort a podcast that explains why and how AWA detected discourse markers. Even if this explanation did nothing to improve the students' experience with AWA, it was hoped that the level of understanding of the rules of grammar acquired in the process might (organically or otherwise) improve the students' academic writing.<sup>47</sup>

After trialing AWA, the students were invited to complete a short online survey about their experience. Of the 180 students who tested AWA in Autumn 2017, 160 students' responses have been analysed. The first question asked how comfortable they were with getting feedback of this sort from a computer. The answers to this question fell into two broad groups. About half of the students were somewhat positive for two reasons: there is less embarrassment when a computer identifies shortcomings in an essay; and the computer would respond at any time of the day and the feedback took less than a minute. The other half of the responses were somewhat negative, on the whole because students did not perceive any guidance as to how they might improve their essays. Only one or two of the students were very positive about their experience with AWA.

The second question asked the students whether they found the feedback meaningful, so that they could see ways to improve their writing. The majority of students responded to this question somewhat negatively. The predominant reason was a failure of the software to provide guidance as to how the essay could be improved. This shortcoming seems to be the most obvious difference between AWA and human feedback. It is interesting to note that the students' responses to the survey suggested a much more detailed self-assessment of their essays than evidenced in any previous semester. It seems the experience of analysing the feedback from AWA was a catalyst for a more meaningful intervention by the students, before submission of the final essay.

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<sup>47</sup> Lockyer, Lori, Elizabeth Heathcote and Shane Dawson, 'Informing pedagogical action: Aligning learning analytics with learning design' (2013) 57(10) *American Behavioral Scientist* 1439

The third question in the survey asked students the likelihood that they would use AWA again, if it were made available. The students' responses to this question aligned with the answers they had provided in question two. There were no surprises here.

The fourth question was open and invited further thoughts about AWA. This question was optional, but a number of students added further comments. Some noted that they valued the experience of using writing analytics software and they expressed an appreciation of how it could be applied in legal practice, as well as describing some of its limitations.

These survey results reveal that while the students were divided in their views as to the usefulness of AWA as an essay feedback tool, most students seemed to have had a more meaningful self-assessment experience as a result of trialing AWA (than previous cohorts of students who were simply asked to assess their essays against the marking rubric).

Looking at the results of the essays submitted by this cohort, there seems for the first time to be a closing of the gap between the students' expectations and their assessed mark. This is evidenced by a dramatic drop in the number of requests for essays to be remarked. However, the reason for this drop in re-marking requests is not definitive. One explanation may be that students are paying closer attention to the rubric and the content of their essays during the self-assessment process and thereby arriving at a self-assessment (either before submission or after retrieval of their marked essay) that more closely aligned with the markers assessment. Another explanation for the fall in the number of students asking for a re-mark, may be that the students' essays had on the whole improved in quality,<sup>48</sup> thereby closing the gap between their self-assessment and the mark determined by the assessor. In any event, these results are consistent with the scholarship on this point that suggests self and peer assessment tend to produce greater agreement between student self-assessed marks and marks that are provided by the instructor or tutor.<sup>49</sup>

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<sup>48</sup> This improvement could have been partially due to the introduction of the podcast explaining rhetorical moves and discourse markers and how they can strengthen an argument in an essay.

<sup>49</sup> Falchikov, above n

## Tentative Conclusion

One of the implicit aims of higher education is to enable students to become better judges of their own work.<sup>50</sup> This is particularly important in learning environments where there is not enough time and there are not sufficient resources for teachers to give students feedback on draft versions of their essays. In this case, the author has attempted to teach mid-degree law students how to self-assess their essays prior to submission, so as to identify weaknesses and accordingly to make meaningful improvements to their essays. However, repeated and various attempts to teach this type of self-regulation was not effective enough to reduce significantly the number of students who over-stated the quality of their work, despite the provision of a detailed marking rubric and clear evidence of shortcomings in the students' work.

There is widespread and sometimes conflicting literature about the use and effectiveness of feedback in formative assessment. In reviewing the use of feedback and instructional correctives, there is no simple answer to the question, what feedback works?<sup>51</sup> Perhaps a tentative conclusion that could be reached from the research in this self-assessment study is that even though the majority of students were not impressed by the quality of the feedback provided by AWA, this was better than no feedback at all. Across the six semesters that this study was conducted, the best efforts at self-assessment seem to have been achieved in Autumn 2017 – the same semester that the students self-assessed in conjunction with some automated feedback.

The intervention imposed by AWA seems to have focused the students' attention on identifying and improving particular features of their academic writing in a way that has not been achieved before.

The use and popularity of AI in document review and discovery processes is rising sharply. For this reason, students need to be aware of how it works, its applications, and its shortcomings. Writing analysis software is only as good as the AI that powers its natural language processes and the interpretation of results by the user. These findings are

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<sup>50</sup> D Boud, above n 941

<sup>51</sup> D Wiliam, 'Feedback and Instructional Correctives' in J McMillan (ed), *SAGE Handbook of Research on Classroom Assessment* (SAGE Publications, 2012)

important for law students to appreciate before they encounter the use of AI and writing analytics in legal practice.

At this time in its development, AI has limited capabilities as an assessment tool. However, by exposing students to natural language processing technology, they are better equipped to discern and improve their essays. When the technology's parsing algorithms are explained to students, they gain a better appreciation of the discernible features of good academic writing. By running their essays through the tool, students are also given a practice-authentic opportunity to reflect upon the software's potential uses and its limitations.

While this study has been constrained by the exigencies of voluntary participation and consequential gaps in the data set, it points to the potential for more systematic interventions to improve students' judgements. It also illustrates that the use of the web-based feedback software (AWA) can have considerable utility in aiding self-assessment research. Importantly, for the law students of the future, it gives them an opportunity to critique the strengths and weaknesses of writing analytics software.

# Figures

*Figure 1*

Demonstrated qualities /standards	Unsatisfactory Fail	Satisfactory Pass	Good Credit	Very Good Distinction	Excellent High Distinctn
<b>SUMMARISING</b>					
INTRODUCTION Statement of argument					
Statement of essay plan					
CONCLUSION Reaches logical conclusion.					
<b>ANALYSIS AND EVALUATION</b>					
Identification of relevant issues					
Critical analysis, evaluation, original insight					
Development of sustained thesis with examples					
Engagement with the law and scholarly literature.					
<b>ACADEMIC WRITING</b>					
Plain English expression					
Meaningful headings					
Footnoting & Bibliography per AGLC (3 <sup>rd</sup> edn)					



*Figure 3*

Demonstrated qualities /standards	Unsatisfactory Fail	Satisfactory Pass	Good Credit	Very Good Distinction	Excellent High Distinctn
<b>SUMMARISING</b>					
INTRODUCTION Statement of argument Statement of essay plan					
CONCLUSION Reaches logical conclusion.					
<b>ANALYSIS AND EVALUATION</b>					
Identification of relevant issues					
Critical analysis, evaluation, original insight					
Development of sustained thesis with examples					
Engagement with the law and scholarly literature.					
<b>ACADEMIC WRITING</b>					
Plain English expression					
Meaningful headings					
Footnoting & Bibliography per AGLC (3 <sup>rd</sup> edn)					
<b>STUDENT'S CONFIDENCE IN SELF-ASSESSMENT</b>					
How confident are you in this self-assessment? Circle a number from 1 to 5.	1      2      3      4      5 1 = not confident at all      5 = very confident				
In a few words, please explain the reason for your confidence rating.					

Please tick if you do not want this assessment included in data to be used for academic research.

PLEASE COMPLETE SECTION BELOW AND SUBMIT WITH FINAL ESSAY ONLY

Please tick if you used:  Word - spellcheck     Grammarly     Turnitin     AWA

## Figure 4

### Abstract

We propose that the design and implementation of effective Social Learning Analytics (SLA) present significant challenges and opportunities for both research and enterprise, in three important respects. The first is that the learning landscape is extraordinarily turbulent at present, in no small part due to technological drivers. **T**Online social learning is **emerging as a significant phenomenon** for a variety of reasons, which **we review**, in order to motivate the concept of social learning. **C**The second **challenge** is to **identify** different types of SLA and their associated technologies and uses. **We discuss** five categories of analytic in relation to online social learning ; these analytics are either inherently social or can be socialised. **C**This sets the scene for a third **challenge**, that of **implementing** analytics that have pedagogical and ethical integrity in a context where power and control over data are now of primary importance. **C**We **consider** some of the **concerns** that learning analytics provoke, and suggest that Social Learning Analytics may provide ways forward. **C**We **conclude** by **revisiting** the drivers and **trends**, and consider future scenarios that we may see unfold as SLA tools and services mature.

### Keyword(s)

Learning Analytics, Social Learning, Dispositions, Social Networks, Discourse, Informal Learning

### Key:

Summary
Important
Both
<b>B</b> Background
<b>C</b> Contrast
<b>E</b> Emphasis
<b>N</b> Novelty
<b>P</b> Position
<b>Q</b> Question
<b>S</b> Surprise
<b>T</b> Trend