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Some do, some don't: student use of online writing resources

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BACKGROUND
Employers, governments and professional bodies have identified that engineering graduates frequently have inadequate communication skills, particularly in the written form. The current generation of students prefers to get resources online and operates with a just-in-time, needs-to-know perspective, so the provision of structured support to develop writing skills over the web is expected to both suit and help them. To that end, we developed first the *WRiSE* and then the *iWrite* websites. While the former is more generic, the latter specialises in engineering-based instructional materials. It includes authentic writing examples (including annotated student work) and e-learning feedback options for a wide range of genres authentic to the professional practice of an engineer. It was designed with the intent to supplement classroom teaching. Alas, these resources are not being exploited by students as we had hoped.

PURPOSE
This paper primarily explores why students chose to use or not to use online resources for a variety of engineering writing tasks. The underlying purpose is to better understand how such resources should be used by teachers to help students.

DESIGN/METHOD
The two websites are used and have been evaluated at both of our institutions. Voluntary surveys and focus groups from several courses at both institutions were used to collect detailed information about students' perceptions of the online resources, including, unlike most surveys, from those who chose not to use our website. Detailed logs of the websites' usage provided information about how the students interact with the resources. At times, this has been matched with their prior and subsequent academic performances.

RESULTS
While results have been drawn from various surveys and focus groups, discussion is concentrated on responses from Stage 1 BE students. Answers indicate that students who most need to use supplementary resources are less likely to do so and that the most common explanations for failing to take advantage of them are (i) a lack of structured time and (ii) ignorance about what is available and what it offers. It is not that students do not see the need. Generally answers confirmed other findings about web-based resources, especially that students prefer them to be immediately relevant and easily accessed.

CONCLUSIONS
Results confirm that online resources which develop communication skills are more effective when time is made to introduce them in the classroom and room is found for their use in the assessed curriculum, so that they are a prescribed part of the learning, not an optional extra.
This becomes particularly important for those students who are more in need of using such resources.

KEYWORDS
engineering writing, student engagement, e-learning

Introduction

Communication skills are important. Students who commence engineering programs soon find that they need a high standard of writing, for various purposes and audiences. In our experience and that reported anecdotally by many others, they are often ill-prepared for this by prior education and not often well supported by their respective learning environments at university. This paper introduces a website developed to mitigate this problem and then explores how students interact with it, specifically why they may not do so at all. It is not about the quality of the resource, *per se*, though that is naturally of relevance. Nor are we making any claims about their novelty.

Part of the challenge in developing an engineer's professional communication skill is the diversity of different genres. A typical Arts student may write only essays and then a thesis, but then only if the honours year is undertaken. A typical Engineering student needs to write, at least, laboratory reports, design reports, and proposals, culminating with the compulsory thesis (capstone project). The list associated with professional practice extends to product reviews (books, equipment, software), business proposals, operational manuals, etc. This diversity of genres is one reason for generic writing support resources not forming the ideal support for discipline specific purposes (e.g., Brookfield, 2012).

To help students with their technically centred writing, *Writing Reports in Science and Engineering (WRiSE)* was developed. It included learning resources focussing on general aspects of writing as well as specific details about preparing and writing formal reports in both science and engineering contexts, although the former provided the majority of examples. The newer companion website *iWrite* specialises in support for engineering students. It combines the relevant examples and generic material from *WRiSE* with a wider range of writing genres relevant to engineering practice. This paper concentrates on *iWrite*.

Traditionally, communication skills have proven expensive for any institution to develop in its students, as they require intensive student-teacher interaction. The use of online resources can overcome, but only in part, these limitations and thereby enhance the scope to improve the communication skills of the undergraduate engineering cohort. Neither website is expected to replace teachers fully. Both websites are intended to be used in conjunction with other teaching methods in the context of a formal course, particularly *iWrite*. Frequently, though, there is little space devoted explicitly to communication skills in the engineering curriculum. The implication to students may be that learning support resources are an optional extra to be used only if they have time and the resources are considered convenient to access. Again, well designed online resources can address the need for accessible help.

As with the classroom, the online learning environment should encourage active interaction with the educational materials (Prosser & Trigwell, 1999; Laurillard, 2002). Active learning works much better if it anchored in the authentic, and to have authenticity in engineering genres needs the involvement of academic staff from Faculties of Engineering, not simply teachers of communication skills. Such collaboration between learning advisors and discipline-based academics is well established and known to work (e.g., Dudley-Evans, 1984; Ballard, 1994; Webb et al., 1995; Jones, 2004). From its inception, our project has been a conscious, deliberate collaboration between learning advisors and engineering academics. This collaboration has underpinned our projects and its success has been recognised: four of us have been awarded a Carrick (PM & IS), ALTC (HD) or OLT (RC) Citation for our respective outstanding contributions to student learning through work associated with academic literacy. The *WRiSE* project itself was recognised by an AAEE award in 2010.

But no matter how good a learning resource is, if it is not used by students, then it must be seen as unsuccessful. Use of *iWrite* has been less than that hoped for, given the significant investment of resources and identified student needs. It is important to better understand why. Perhaps students are ignorant of it; perhaps the website is actually of poor quality; or perhaps other reasons are at work. Resolving this is the major focus of this paper. It is

beyond the scope to review the full range of issues leading to students not exploiting a supplementary learning resource suggested to them. It suffices to note here that we believe one major reason to be that students see no immediate benefit unless they are fully embedded into a course of study (e.g., Wingate, 2007). Acquisition of writing skills is more effective when "built into" the discipline material than when it is "bolted on" (e.g., Bennett et al., 2000), i.e., when the skills are developed within an authentic disciplinary context. It was specifically to contextualise writing resources for engineering that the *iWrite* website evolved.

The next section presents an overview of *iWrite.* There is then an overview of the relationship between the website and students, with a brief look at patterns of student usage, analysis of why students did and did not choose to use it, and, for completeness, a short look at the student-friendliness and "effectiveness" of the online resources are. We conclude by pointing to two ways the online resources could be used better to support the learning of professional communication within an engineering course, namely, integration into both classroom activities and assessment items.

While the emphasis is on writing skills, we note that much of what applies to writing – structure, evidence, argument, etc – applies equally to high quality oral communication, too.

Website Overview

Before proceeding, we briefly describe the *iWrite* website.

To help students develop their writing skills, learning activities should address both the purpose and context of writing and the structure and language of written text. Genre-based pedagogy combines consideration of these two aspects of a given document (Hyland 2007). Both *WRiSE* and *iWrite* follow the systemic functional linguistic tradition (Halliday 1985; Butt et al. 2000; Swales 2004) which means that the traditions and orthodoxies of a genre are seen as evolving over time and it is that with which students are encouraged to comply. Using genres proves useful for teachers to diagnose student problems and consequently develop targeted learning resources (Jones, 2004; University of Sydney, 2010).

Within *iWrite*, learning resources are arranged to mimic the typical project cycle, as fully described by Mort et al. (2012). They introduce engineering students to a number of genres used in professional practice, namely, business and project proposals, lab books, and lab, design, field-trip and research reports. *iWrite* also provides generic information and associated interactive exercises on clarity, academic conventions, structuring an argument, and the inclusion of visual materials. The *iWrite* tutorials are presented in a linear sequence following the documentation process before, during and after a design project, but a student can work either sequentially or iteratively through them.

The use of genres proved an advantage for the website's progressive development: easy addition of new document types, with the eventual inclusion of those less common types that rarely feature in other sets of resources, e.g. the go-no-go analysis or field-trip report, simply because they are seen as less urgent to support.

It is beyond the scope of this paper to describe further the contents of *iWrite*. Interested readers are invited to explore it (iwrite.sydney.edu.au/home.htm) and/or *WriSE* (www.usyd.edu.au/learningcentre/wrise) which are both now open-access.

Students and the Website

Whether a website will be worth the attention of students and teachers depends fundamentally upon both its helping the students learn and its being seen, by the students, as helpful and accessible.

As well as by the underlying pedagogy, the actual arrangement and content of the online resources was informed by the preferences of the student users. For this reason, development proceeded in parallel with evaluation using surveys and focus groups, as

described below, and intensive study of usage logs. In this section there is a brief discussion about when students choose to interact with the website followed by a more detailed presentation of their perceptions of its usefulness, importance, etc. It ends with a brief discussion about their effectiveness as a learning resource.

Usage

A teacher doesn't want to work against students, but with them, so teaching activities are better designed when informed by knowledge of students' preferences about using a resource.

The daily pattern of student usage follows expectations, with peaks when an assignment is due. Over 1800 different students from our two universities (Sydney and UNSW) used *iWrite* at least once in semester 1 2012. Figure 1 illustrates how usage of *iWrite* has increased over the past year and how it peaks at particular times, specifically when assignments fall due in the middle and towards the end of semesters. This effect is clearer in Figure 2. During 2009, *WRiSE* was trialled in a few courses in which assignment submission dates were known: specifically mid-May and early June.

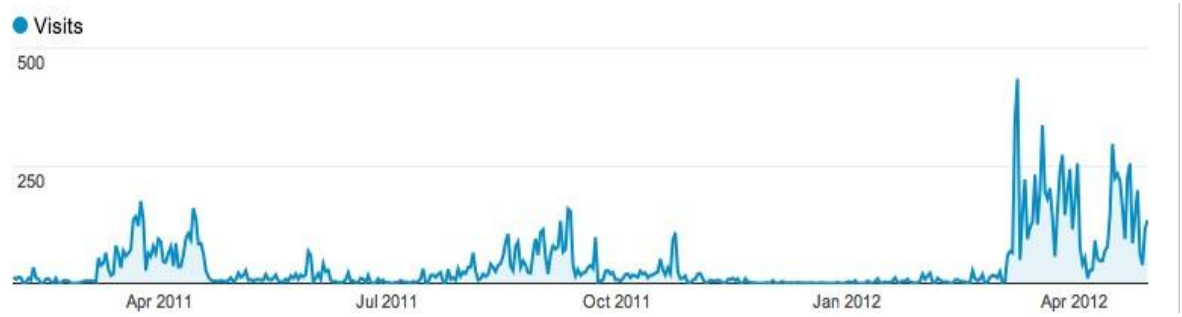

Figure 1: Weekly usage of the *iWrite* website (2011-12)

Furthermore, simply having *WRiSE* as one of several "useful links" meant there was less chance of students engaging with it. A specific, personal endorsement was needed. The arrows in Figure 2 show when students were directed explicitly to the site by staff during class-time – once in each of three of the associated courses. Notice how the first of these produced scant student interest. This observation suggests that the online resources are accessed more frequently when students are directed to the site by the teaching staff with such direction at the time seen relevant by the students, a point explored further below.

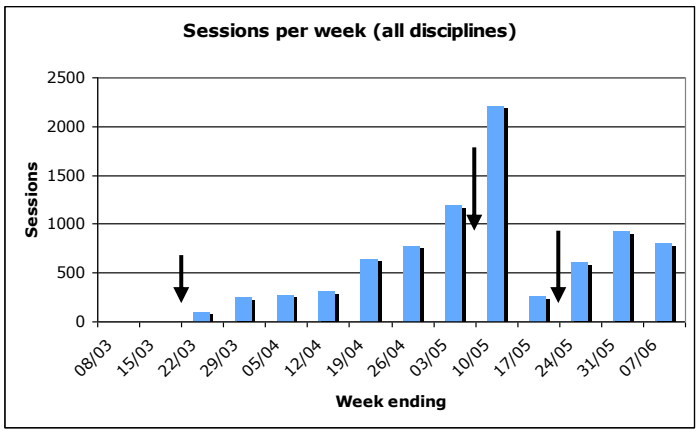

Figure 2: Weekly access of *WRiSE*-based resources in one session (2009)
Arrows indicate when students were introduced to it during a class.

Much as we might like students to steadily work through the resources, they generally don't. It is clear that students, instead, use the online resources on a "just in time" or "as needed" basis. This confirms the value of 24/7 websites but, more importantly, has implications for

the organisation of material on them. Rather than the traditional academic form which proceeds from the foundations, we organise materials so that the most immediately useful can, if desired, be accessed first, before generic background ideas are explored. This is similar to the journalistic tradition for arranging information.

Student Feedback

For several years, students have been consulted about the websites, helping the iterative process of development. All the surveys have been voluntary and scheduled to occur towards the end of the semester in which students were introduced to the resources. The questions used have been extensively tested for validity and refined over the years. The current version of the survey asks questions about these topics:

- students' course of study, language background, age, sex;
- experience and confidence when writing;
- self-assessment of ability to write, specifically reports;
- feedback on usability and utility of the resources;
- how they interacted with the resources (time, sections); and
- open-ended comments.

Except for the last item, these are scored on a 5-point Likert-scale. Further details, including the exact wording of the questions, can be found in Mort & Drury (2012). Additionally, at intervals focus groups have been assembled. These consist of students who volunteered while completing a previous survey.

A typical survey was conducted in semester 1 2012. It involved a course (UNSW) with an enrolment of 1259 stage 1 engineering students and was conducted using Moodle as its platform of delivery. One hundred and five replies were recieved, our largest survey to date of a single engineering cohort. We can only speculate about the reasons for opting in to this survey. The overall demographics (age, sex, first language) of the 105 participants reflected the Faculty averages, so on that count the sample was representative. Alas, only 19 replies came from students who actually used *iWrite*, though a proportion slightly higher than the rate of usage in the class overall. They were identified by their logins. But more from these users below.

It is more interesting to first examine why 86 students said they did NOT use *iWrite*. The size of this group is the strength of this study. Their reasons were collected with open-ended questions. Of non-users, 40% explicitly claimed that they did not know about it and a further 31% explained they saw no need for it. This claimed ignorance is consistent with the findings in the 2010 survey of *WRiSE* users (Mort & Drury 2012) and continues to be a disappointment, given the efforts made to publicise the materials to students. Some additional students explained how they were deterred by the awkward interface between Moodle and what was, then, a developmental website.

Sadly, it seems that those students more in need are less likely to use the website. A diagnostic exercise in week 1 of semester identified each student's personal communication skill as one of four grades: strong, OK, at-risk, or weak. The respective proportions of the four grades participating in the survey closely matched those in the cohort as a whole, but "strong" students were disproportionately represented amongst those who accessed *iWrite* and "at-risk" students disappointingly rare. This may be an artefact of the small sample size or it may indicate why these students are "at-risk," namely that better communicators are those more likely to access resources. Consistency with our other surveys, giving total numbers in the hundreds, supports the latter hypothesis. (Correlations between final marks and survey participants are unavailable. We do not have ethics clearance for this. However, the categorising of students as "weak, at-risk, OK or strong" by the diagnostic exercise is based on analysis of such correlations performed in 2005-06 and are a proxy for wider academic outcomes.) Considering only the students with greater need, the reason most commonly given by the "weak" and "at risk" students for not accessing the resources is not

knowing about it, followed closely by insufficient time or time management skill. This second reason differs from that given by the overall cohort. Consider the following comments by students (2012) who should have used *iWrite*, but did not.

> *... because it took up too much of my time, which i* [sic] *needed to complete other university tasks*
>
> *it was another internet site that would've been required for uni work adding to the abundance we already have*
>
> *Did not mamage* [sic] *my time efficiently enough to have a look at the* iWrite …

More research is needed to understand better what is really occurring, i.e. why weaker students find they have less time. Consistent evidence from student surveys, though, suggests the need to make space in the curriculum for students to deliberately work on their writing skills, and explicitly integrate the relevant resources into their other learning activities.

Above we had noted the value of having the website explicitly promoted by the teaching staff. However, consider the following explanation for not having used it.

> *I meant to check i* [sic] *out when i received the email about it but i totally forgot to do it*
>
> *It is because I totally forget* [sic] *that we have iWrite, I just realize it when I have submitted the report.*

Such promotion should occur when it is most relevant to the students' immediate need.

A more intriguing challenge is posed by the reasons for non-usage associated with the contradiction of students not perceiving the development of communication skills as urgent, although they simultaneously agree that such skills are important for their long-term ambitions as professional engineers.

Returning to the students who used *iWrite*, we observe that they did find the website helpful and easy to use. Figure 3 shows their replies to the 16 questions about usability and utility, answered on a 5-point Likert-scale from strongly disagree to strongly agree. In each case, the average response is "agree" with an unnervingly uniform standard deviation for all questions. It is reassuring that by we now have eliminated the negative features. For example, *WRiSE* originally included some audio-files of lecturers commenting on the various features of a genre. Students surveyed in 2009 did not really appreciate these. The two questions about them rated almost a standard deviation more negative than did other items. Anyone who has observed members of the generation using online resources out of class will have noticed a strong preference for doing this while listening to mp3-files. This suggests an explanation for the lack of enthusiasm for audio-files. That earlier survey was reported in detail by Mort & Drury (2012).

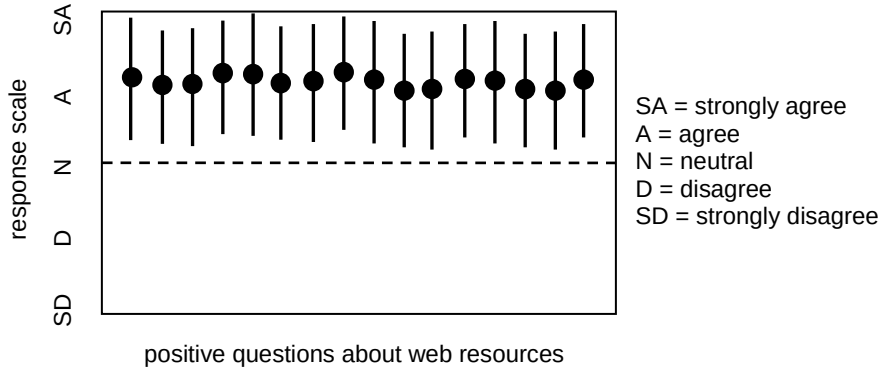

Figure 3: Student agreement with 16 questions about the online resources. The dots are the mean response; lines indicate a standard deviation either side.

Of the students who used the website, only 1 of 17 (2 gave no answer) identified English as a first language, although 6 claimed "native-speaker" fluency with it. Perhaps students who

are conscious of a problem with functional English are more inclined to seek help with their communication skills more generally. Further investigation is needed to tease out the complexity of the question of what causes what.

Consistent student feedback indicates that the most valued feature of the website is learning how to structure the various genres, i.e., what should and should not be included and how this is expected to be arranged. For example, consider the following verbatim comments from the 2012 survey of engineering students.

> *The module did not change my writing style, but it did help me structure the assessments better.*
>
> *How to structure the reports and use the proper turn of phrase*
>
> *It helped me to structure the text and provided guidance on what type of information to include.*
>
> *Before using it I was lost as to where I should start.*

Such appreciation is reassuring. Structure is what defines the genre as used within the profession and precisely what we would want them to learn.

A surprising finding from repeated surveys and focus groups is how much students value the annotated samples of typical student work. They do not only want to see an ideal case, but how normal student work can be improved. Again, the following verbatim answers from 2012 are typical.

> *taught me how to write in a proffessional* [sic] *way by looking at some examples as guidance to write*
>
> *The best thing I find are good examples.*
>
> [The best thing is] *The commented examples.*
>
> *Possibly more worked examples?*

(Surely only an engineering student could use such a description for samples of writing!)

To glimpse the overall experience of students using the online resources, we considered explicit student feedback from courses integrating the *iWrite* e-tutorials. This tells of a positive student experience. For example, in a Stage 3 course (Sydney) students responded to the statement “The unit of study helped me develop valuable graduate attributes … communication skills” significantly more positively than the relevant reference score, as shown in Figure 4. Of course, it may not be entirely a result of the e-tutorials.

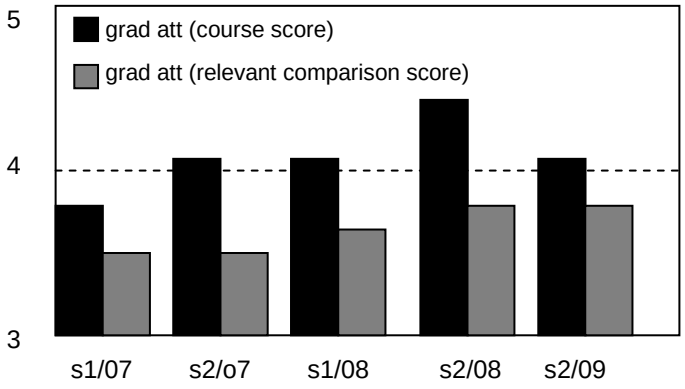

Figure 4: Student feedback on graduate attributes and satisfaction

Finally, one problem voiced by students and deserving further consideration is a consequence of the increasing use within institutions of group writing tasks. This gives less incentive for the individual student to seek personal improvement. *iWrite*, though, has a specific facility for projects involving collaborative writing.

Effectiveness for Learning

Although this paper is not about the effectiveness of the *iWrite* learning resources, it is worth reassuring you that we have sought to check their educational value, despite this being intrinsically difficult as actual learning is affected by very many variables. Two typical, encouraging findings follow.

First, in one course, 60 students in stage 3 of a BE degree (Sydney) were required to engage with feedback and re-submit their written work. The feedback explicitly directed students to use resources provided on *iWrite*. Students engaged in 2 cycles of the process. The average mark improved from 54% to 57% and then to 65% for the second re-submission. In each case, the teacher only informed each student of the relevant resource available on *iWrite* and did not provide details individually.

Second, although any one course cannot "prove" the efficacy of a resource, aggregating over many courses is suggestive. In semester 1 2010, eight courses (including some from a Science Faculty) required students to write a technical report and "suggested" they use *WRiSE* for guidance. Report marks were combined from all the courses, an those of the 204 students who had used the website were compared with those of the 144 who had not. When scaled by standard deviations (to normalise between courses), the average for *WRiSE* users was 0.32 standard deviations higher than that for the non-users, which is consistent with the website having a positive effect on skill development, although not proving a causal link. Course-by-course analysis is available in Mort & Drury (2012).

Discussion and Conclusions

Returning to our underlying question, what are the barriers preventing greater student use of *iWrite*? Yes, some students are ignorant of it – 40% in our case. Surely such a big percentage can be reduced by timely publicity in class, but probably some students will always fail to know about it. We don't believe (naturally!) that the website is no good, though it can always be improved.

Some students see *iWrite* as unnecessary. To be fair, for some it is unnecessary, but that is by no means true for all non-users. The more important group is those who should use but don't. For them, the most critical explanation to address is a lack of structured time. It is not that students fail to see their own need for such help. Rather, they can't fit it in. After all, accessing "extra" help is, by definition, extra to the course requirements and not accounted for in the course's time budget. That time is a major reason stated by nursing students was also reported by Stewart et al. (2001) who found lack of maturity (youth) to be important, too. Except for language background, however, our sample was not sufficiently diverse to analyse for other effects. Language background is part of our ongoing study.

More generally, why they choose not to access a website for support is related to the wider and much discussed problem of why students don't get help in general when they have difficulties. This is a multi-faceted problem involving extrinsic constraints (e.g., location or employment) and psychological factors (e.g., self-image or the process of seeking help). The finding that weaker students, those who most need to use the supplementary resources, are generally less likely to do so is consistent with the wider literature (e.g., Wingate, 2007; Durkin & Main, 2002). To increase the uptake of the resources provided on *iWrite*, particularly and importantly, by those students who are more in need of using them, our research supports the argument for the activities using the literacy resources to be woven into the course, "built-in" rather than "bolted on." Embedding skills into the course makes better pedagogical sense on the consideration of authenticity, too.

In summary, our work reaffirms that activities to develop communication skills should be intrinsic to an engineering course, rather than grafted onto it. Finding ways to make it easy for academics to co-operate and do this is our next project.

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