

Introduction

Much is made of plagiarism and its causes with most studies highlighting why students plagiarise, the methods used to do so and the sanctions that can be applied. Among university students it is a problem not only limited to business and economics students, who may often be asked to write extensive essay type assignments (Caruana, Ramaseshan, & Ewing, 2000), but is a problem for many engineering students (Parameswaran & Devi 2006). It is a problem that is not only common, but is likely increasing (Park, 2003).

The problem of plagiarism is an ethical rather than a legal issue. The law does not regard plagiarism as being prosecutable as criminal theft (Green, 2002) although as a civil matter it may certainly equate to breach of copyright or theft of intellectual property. However an attempt by Boston University to bring a lawsuit against several online “term paper mills” that sell completed assignments to students for profit was dismissed in 1997 by the US federal Court (Austin & Brown, 1999). While many will argue that plagiarism and the operation of paper mills is fraud, the legislators and courts are yet to share that view. Universities are however almost universal in regarding plagiarism as constituting “academic dishonesty”. They deliver their own examples of guidelines, statutes and referencing rules for students. Federation University guidelines for students define what the university means by plagiarism and gives examples of approved referencing and citation practice.

Clear definitions of what constitutes plagiarism are important to a student’s understanding of the subject, but are often not enough in themselves. Shelley Yeo (2007) makes the point that students usually favour more lenient sanctions for plagiarism than their teachers and are more likely to view certain practices as acceptable, in other words seeing plagiarism in degrees of seriousness, rather than an all-encompassing single offence. First year students in particular often lack the knowledge of correct procedure and may rationalise their use of information from other sources as only being for their own use for their own assessment task. If the task was an assignment problem or if the work resulted from collaboration or group work then the perception was that it was not plagiarism or not very serious (Yeo, 2012).

Faculty are not only in charge of enforcing the university’s policies on plagiarism but have the responsibility of teaching plagiarism avoidance and the need for honest academic endeavour. When plagiarism is discovered, the faculty must apply sanctions consistently and fairly (Park, 2003) to be effective. Proper assignment design to minimize the abuse of electronic information sources (Austin & Brown, 1999) and proactive instruction (Cismas, 2010) in correct referencing are favoured methods of avoidance strategies. Computer algorithms (Parker, 1989) and detection software such as Turnitin (Jones, 2008) can be useful tools for assessing student submissions, but must also be used with some caution as discussed by Kaner and Fiedler (2008) as students can learn to use this software to their advantage and essentially create plagiarised works that are very difficult to detect.

As part of a restructure of the engineering programs at Federation University, new first year courses were developed to include a properly supported learning structure in the early part of a degree program. One of the aims of the new course structure was to change the attitudes of students towards plagiarism. Support such as class exercises, examples and discussion were provided during the first and second semesters as part of the new courses. If students are not made to realise that any case of plagiarism is severe then a culture of treating the problem lightly may arise (Nazir & Aslam 2010). However, if students come to realise that there is no difference between minor and severe cases of plagiarism, then a culture of avoidance may grow. This culture is one of training so that acceptance of avoidance strategies hopefully becomes second nature.

Method

During 2011 and 2012 new engineering programs replaced the existing three year programs and new four year programs were added. As part of this restructure two new first year

courses, Engineering in Practice 1 and 2, were introduced. The courses were the result of an internal review which identified a lack of “soft skills” as a concern in student learning outcomes. These skills are viewed as necessary for graduate engineers to be able to function within the profession (Moore & Voltmer, 2003).

The study that forms the basis of this paper was a result of a desire to test the efficacy of the teaching of various aspects of the courses, and the understanding that students gained. Only those subject areas specific to the study have been included in this paper.

New courses

The new courses are delivered in the first year, which is a common year for all engineering majors. Engineering in Practice 1 (EP 1) is studied in first semester while Engineering in Practice 2 (EP 2) follows immediately in second semester. Both courses are each designed around a semester long team-based project.

Alongside the project stream more tutorial time was devoted to team organisation and students were instructed in the use of team meeting minutes to help them track their own progress. To simplify report writing a standard report template was used. This became the required report format with the minutes attached in an appendix.

While there were existing avenues for students to learn correct report writing and referencing skills such as those held by student services, the library, or their own initiative, it was deemed appropriate to embed this training within the engineering curriculum. Effort was made to provide more in-depth explanation of referencing of information sources and expanded instruction on report writing, mostly during tutorial classes. Citing and referencing was highlighted as an important method of plagiarism avoidance and ethical practice as explained by Dowling, Carew, and Hadgraft (2013) in their book *Engineering Your Future: An Australasian Guide*, which is also used as a text for the courses.

The new courses introduced instructional sessions in report set-up and document formatting. Methods of referencing are taught in tutorial workshops. A test given in first semester assesses the student’s knowledge retention of plagiarism and referencing concepts. During second semester the topic of plagiarism was extended during lectures to explore the themes of ethics, engineering responsibility and intellectual property rights.

The study

A student survey was designed to examine students responses to topics covered within the new courses. The survey evaluated several areas including assignment workload, feedback, plagiarism, information use and referencing. Primary interests were with the outcomes in plagiarism, referencing and information use. Most questions were in the form of a Likert five-point scaled response (Allen & Seaman, 2007) from 1 to 5 as listed in Table 1. The Likert scaled questions were grouped (Boone & Boone, 2012) in order to measure particular attitudes rather than being stand-alone questions. Other questions were either a yes/no type, or required the students to nominate one response from a short list.

Table 1: Scaled responses to general questions

1	2	3	4	5
Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree

All questions designed to test students’ attitudes toward plagiarism were clusters of the Likert type using the scaled response. An example is shown in Table 2. Other sections of the

survey asked questions relating to assignment writing method such as cut-and-paste or paraphrasing, and knowledge of referencing.

Table 2: Example Plagiarism survey questions

1. You know that by using cut-and-paste and not making reference to the original author, that you are committing plagiarism? 1 2 3 4 5
2. You know that by paraphrasing and not making reference to the original author that you are committing plagiarism? 1 2 3 4 5
3. In your opinion plagiarism is a serious issue? 1 2 3 4 5
4. Teaching staff would usually describe plagiarism as cheating, do you agree with this? 1 2 3 4 5
5. Are you aware of the three strike system that the university uses to deal with reported plagiarism? 1 2 3 4 5
6. Did you know that you may be excluded from your program because of plagiarism? 1 2 3 4 5

The survey was conducted in a hardcopy format during classes, rather than online, and involved four groups of students. Table 3 shows the groups, with their year of study at the time of the survey, whether they had completed the course of instruction and the number of respondents within each group

Groups 2 and 4 were the first surveyed at the beginning of the second semester, 2013. Group 2 were first-year students who had just completed EP 1, which was the first time that this course had been run. Group 4 were second-year students who had never studied the new courses and their content, but had gained their knowledge of plagiarism and referencing via older methods. This may have been through occasional instruction from staff on individual assignments often in an ad hoc manner, through peers, library short courses or self-taught, perhaps even by reading the university's General Guide to Referencing (2014). It should be noted that all of the listed methods, even library courses, are entirely voluntary at Federation University. Group 4 was intended as the control, to use as a comparison to the instructed groups 2 and 3.

Groups 1 and 3 were surveyed within the first two weeks of the first semester in 2014. Group 1, who were very new to university, would be the baseline for the study. Group 3 were new to second year and had completed both Engineering in Practice courses. All groups were only surveyed once each.

Table 3: Student survey groups

Group No.	Surveyed	Year level	Completed instruction?	Pop. (n)
1	Sem 1,2014	First	No	57
2	Sem 2, 2013	First	Yes	43
3	Sem 1, 2014	Second	Yes	38
4	Sem 2, 2013	Second	No	39

Failing to reference correctly in a student submission does not necessarily equate to plagiarism. However, an honest mistake can be difficult to distinguish from deliberate plagiarism when a teacher is marking a piece of work, and so efforts were made to stress the importance of submitting correct work. It was stressed to students that for their work to be correctly referenced that a citation including author's name and the year must appear in the text and that this must match a full, correctly formatted, reference in the reference list. For if work is referenced correctly to the APA standards used at the university, then the issue of plagiarism can be avoided altogether.

As part of a test of the efficacy of instruction in EP 1, the survey asked the following questions:

19. Have you ever read the *General Guide for the Presentation of Academic Work* on the UB website?

- Yes
- No

20. When writing reports or academic writing, you know what a citation means?

1 2 3 4 5

21. Which of the following best describes what you think a citation is?

- Noting who the original author was in the text and the date it was written
- In a reference list it should contain enough identifying information to allow the reader to locate the source
- I have no idea of what a citation is

22. When referencing an original author in your own work what should be done?

- I have no idea
- Note the author's name in the text
- Note the author's name and date in the text
- Note the author's name and date in the text and with the details of the author's publication in a reference list
- Note the details of the author's publication in a reference list

Analysis

To test the change in student attitude towards plagiarism the responses from Table 2 were totalled for each group of students and the score divided by the number of participants in each group to arrive at an average score for each question of each group. A one-way ANOVA test was conducted of the scores against the null hypothesis that there is no significant difference between each group at a 95% level of significance.

Comparisons were made of the answers between Questions 20 and 21 as a check of the students' knowledge of citations, while Question 22 asked students to identify what constituted a reference. Question 20 results would compare total numbers for the Agree and Strongly Agree responses as a total against the number of total participants.

Results

Responses for each group of students for the six questions of Table 2 are shown in Figure 1 as the total score for each question divided by the number of responses. The scores were analysed using a one-way ANOVA test. The test proved that a significant difference did exist between at least one of the groups and the others ($F = 8.50$, $DF = 3$, 20 & $P = 0.00077$) for the four groups with means of 3.88, 4.25, 4.25 & 4.30 respectively. The means are the mean of each group's question scores and are shown in Figure 2 and Table 4.

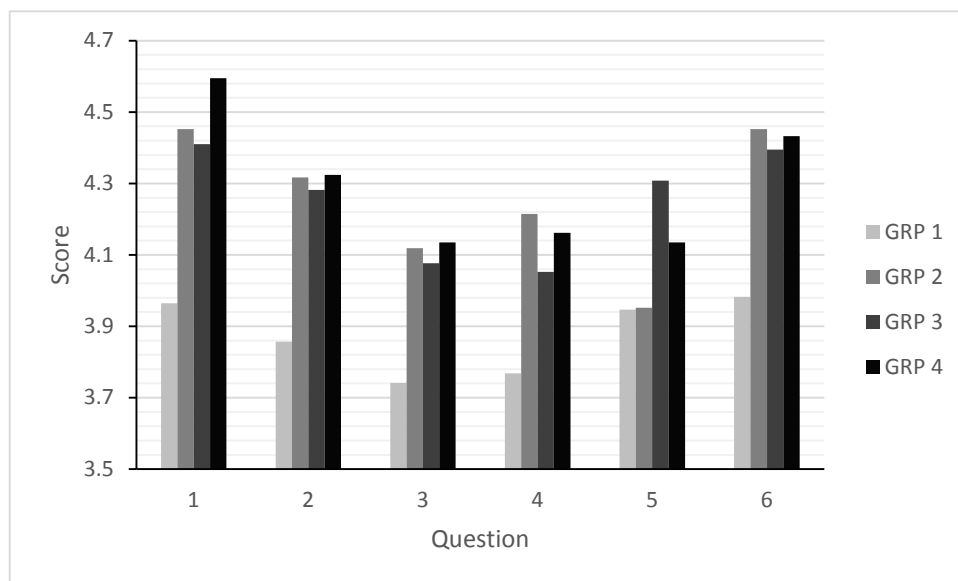


Figure 1: Score mean for each group

Table 4: Score mean data

Group No.	Mean Score	Standard Deviation
1	3.88	0.10
2	4.25	0.20
3	4.25	0.15
4	4.30	0.19

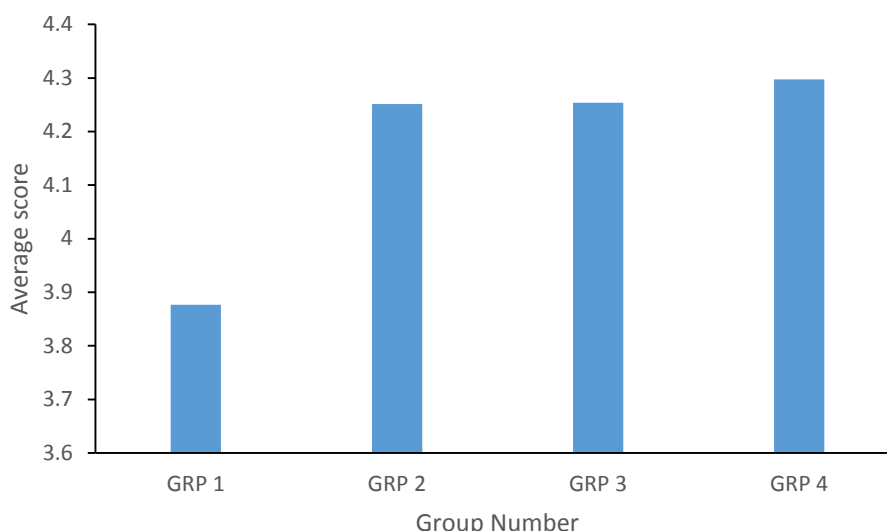


Figure 1: Score mean for each group

As expected, new students with little experience of university have a significantly different attitude to plagiarism than students that have completed at least one semester. The other groups have had at least one semester of plagiarism avoidance instruction or have had a minimum of two semesters to learn the same skills on their own.

When looked at in more detail using a paired t-test between Groups 3 & 4, both second-year students, the results showed that there was no significant difference between them and paired tests between all groups except Group 1 gave similar results. The conclusion from this is that there is no difference in student's attitudes to plagiarism between cohorts of students who have been instructed on embedded plagiarism avoidance and those who have essentially found their own way to deal with the issue.

Other results from the survey reveal outcomes that are just as disappointing on behalf of embedded instruction. Of Group 3, who had been instructed, only 42% had ever made use of the university's General Guide to Referencing, and 77% were confident that they could reference their writing correctly. Results are compared in Table 5.

Table 5: Student answers to Questions 19 – 22.

Group No.	Q. 19 Yes	Q. 20 Yes	Q. 21 correct answer	Q. 22 correct answer	Pop.
1	14 (25%)	25 (44%)	7 (12%)	38 (67%)	57
2	17 (40%)	30 (70%)	11 (26%)	30 (70%)	43
3	20 (53%)	26 (68%)	16 (42%)	32 (84%)	38
4	16 (41%)	30 (77%)	21 (54%)	30 (77%)	39

From a set of Likert scaled questions relating to methods of assignment work such as paraphrasing, cut-and-paste and directly quoting from work the four groups scored means of 3.29, 3.52, 3.38 & 3.58 respectively. All extremely close together. A one-way ANOVA test returned a result that was not significant, concluding that there is no difference between the groups.

Discussion

An expected result, that students after starting university would show a change in their attitude towards plagiarism, was confirmed. Students new to university study (Group 1) may not have even heard the term *plagiarism* prior to their first semester, so it should be no surprise that there would be an attitude shift. Of the other three groups there was no significant difference between them, which may indicate that embedded teaching of plagiarism avoidance has no effect in changing students' attitudes towards plagiarism.

Of the survey questions dealing with referencing, two deal with the students' perception: if they are confident of being able to reference correctly and whether they knew what a citation was. Questions 20 and 21 are paired: Q.20 asks students if they know what a citation means and they are then asked to identify a citation in the following question from a short list of possible answers. In each group the percentage of yes responses to Q.20 far exceeds the correct actual response from Q.21, although the gap narrows as students progress to second year. The answer to Q.22; being able to identify correct referencing technique, scores far higher. This may be because students are clearer on the meaning of referencing as opposed to citations, or that some students picked the most comprehensive answer if they were unsure, thus artificially inflating responses to the correct answer.

The table 5 results show that Group 4 are more confident in their referencing skills and a higher percentage have read the university guide. This is the group with no extra instruction.

Not included in the results were a group of questions relating to paraphrasing and cut-and-paste options used by students in assignment work using a likert 5 point scale. ANOVA analysis conducted in the same manner as for Table 2 showed no significant difference between the four groups of students with group means of 3.29, 3.52, 3.38 and 3.58 respectively.

This was the first run of the new courses and a review was conducted by teaching staff. One issue to be identified was the tone of the classes dealing in plagiarism avoidance as being slanted toward warning and sanctions applied to being caught, and while not specifically designed to frighten students into doing the right thing, it could be seen as threatening. Rather than using the stick, it was felt that emphasis should be on the carrot approach. The emphasis is on getting it right, rather than what happens when you get it wrong. There is no heavy emphasis of sanction or punishment, instead efforts are on correct technique. Students will always be confused about the correct way to research and write academic work (Ellery, 2008), but a student who is unsure and worried, or stressed about consequences, is someone who needs to be taught, not punished. The following quote, written on the back of the survey by a student of Group 3 highlights this:

“Being an undergrad means you are not allowed to have your own ideas but you can't have anyone else's either. Threats of cheating and plagiarism just complicates things further.”

Conclusion

The survey results were not those expected after the periods of instruction had run their course. The results indicate that the objective of changing student attitudes towards plagiarism by embedded instruction had not been met, that students who effectively learned their own way to avoid the problem were proved to be more effective than those being taught. While changes were observed from early first year students, these changes cannot be attributed to the course of instruction.

References

- Allen, I. E., & Seaman, C. A. (2007). Likert scales and data analyses. *Quality Progress*, 40(7), 64-65.
- Austin, M J., & Brown, L. D. (1999). Internet plagiarism: Developing strategies to curb student academic dishonesty. *The Internet and higher education*, 2(1), 21-33.
- Boone, Harry N, & Boone, Deborah A. (2012). Analyzing likert data. *Journal of Extension*, 50(2), 1-5.
- Caruana, A., Ramaseshan, B, & Ewing, M. T. (2000). The effect of anomie on academic dishonesty among university students. *International Journal of Educational Management*, 14(1), 23-30.
- Cismas, S. C. (2010). *Anti-plagiarism strategies for environment engineering students*. Paper presented at the *Recent Advances in Energy & Environment*, Proceedings of the 5th IASME/WSEAS International Conference on Energy & Environment (EE'10).
- Dowling, D, Carew, A., & Hadgraft, R. (2013). *Engineering Your Future, an Australian Guide*, 2nd Ed: John Wiley & Sons, Milton, Australia.
- Ellery, K. (2008). Undergraduate plagiarism: a pedagogical perspective. *Assessment & Evaluation in Higher Education*, 33(5), 507-516.
- Federation University Australia (2014), *General Guide to referencing 2014 Edition*, retrieved 30 July 2014, from <http://federation.edu.au/__data/assets/pdf_file/0015/164121/Federation-General-Guide-to-Referencing-2014.pdf>.
- Green, S. P. (2002). *Plagiarism, norms, and the limits of theft law: Some observations on the use of criminal sanctions in enforcing intellectual property rights*. *Hastings Law Journal*, 54(1).
- Jones, K. O. (2008). *Practical issues for academics using the Turnitin plagiarism detection software*. Paper presented at the Proceedings of the 9th International Conference on Computer Systems and Technologies and Workshop for PhD Students in Computing.
- Kaner, C., & Fiedler, R. L. (2008). A cautionary note on checking software engineering papers for plagiarism. *IEEE Transactions on Education*, 51(2), 184-188.
- Moore, D. J, & Voltmer, D. R. (2003). Curriculum for an engineering renaissance. *IEEE Transactions on Education*, 46(4), 452-455.
- Neville, L. (2012). Do economic equality and generalized trust inhibit academic dishonesty? Evidence from state-level search-engine queries. *Psychological Science*, 23(4), 339-345.
- Park, C. (2003). In other (people's) words: Plagiarism by university students--literature and lessons. *Assessment & Evaluation in Higher Education*, 28(5), 471-488.
- Parker, A. (1989). Computer algorithms for plagiarism detection. *IEEE Transactions on Education*, 32(2), 94-99.
- Yeo, S. (2007). First-year university science and engineering students' understanding of plagiarism. *High Education Research & Development*, 26(2), 199-216.
- Yeo, S. (2012). *Science and engineering students' beliefs about plagiarism: 'It's only an assignment'*. Paper presented at the Proceedings of The Australian Conference on Science and Mathematics Education (formerly UniServe Science Conference).

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