

# Educating Students about Plagiarism Avoidance - A Computer Science Perspective

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**Abstract:** Plagiarism is a longstanding problem faced by academics. Detecting and processing cases of student plagiarism is a tedious and time-consuming task, and difficult to manage for the large class sizes common in the modern tertiary education environment. More importantly, policing does not address the underlying causes of academic dishonesty. In this paper, we describe our approach to educating students about issues related to plagiarism, copyright, and academic integrity early in their careers in the School. We describe workshops and tests used as part of this process, and evaluate student responses to these. Preliminary results indicate this approach, incorporating information specific to the students' field of study, has had a positive effect. It is our belief that adequate information and ongoing support can complement traditional methods of detection and help reduce the incidence of plagiarism among students.

**Keywords:** Plagiarism, Workshop, Scenarios, Online Test

## 1 Introduction

Teachers have always grappled with the issue of student plagiarism. New technologies have only served to amplify this concern. Wong (2004) notes, "Clearly, plagiarism is a growing problem. In a survey of 30 000 undergraduates at 34 colleges, 37 percent admitted committing cut-and-paste plagiarism using the Internet, up from 10 percent in 1999. Only 20 percent of their professors use plagiarism-detection tools". Moreover, ownership of written content is an emerging focus in the corporate and government sector (Wong, 2004).

Universities play a major role in instilling understanding of and respect for intellectual property. However, the management of plagiarism — its detection, investigation and punishment — is a hotly-debated issue among academics (Carroll, 2002; Zobel & Hamilton, 2002). Some keenly investigate all student submissions, and advocate routinely applying harsh penalties for students found guilty of plagiarism. Others balk at the effort involved in detecting plagiarism, interviewing implicated students, and effecting penalties. A third group adopts a hands-off approach and believes students who cheat will be appropriately chastened in the workplace.

Despite, or perhaps due to, these differing views, RMIT University has developed comprehensive regulations and procedures for handling cases where plagiarism is suspected. Importantly, lecturers must now report all incidents, and cannot deal with students independently. Our School in particular has a long history of according high priority to academic integrity, and most assignment submissions are checked for plagiarism as a matter of routine. While many universities provide materials giving citation guidelines, very few tutorials or referencing guides include advice on citation conventions for referencing computer code. However, there is evidence that student perceptions of plagiarism are often considerably different from those of academics (Ashworth, Bannister & Thorne, 1997; Park, 2003). Given the strictness with which offences are handled, it is important to ensure that students be appropriately educated about plagiarism and its consequences, both in academia and the workplace. To address this need, we designed a programme to be delivered to all newly-enrolled students in the School.

The rest of this paper is organised as follows. In Section 2, we describe issues related to plagiarism, its detection and management. In Section 3, we discuss the design and delivery of a workshop on study skills and plagiarism. Section 4 describes the online test designed to evaluate student understanding of important plagiarism concepts and the workshop content. Section 5 investigates student perceptions of the programme. In Section 6, we discuss the key issues arising from our delivery of this new program for students. We conclude with a description of our plans for revised workshops in upcoming semesters.

## 2 Background

The ease with which electronic content can be located and manipulated allows students to submit the work of others with negligible effort. Large class sizes encourage a sense of anonymity, and some students, faced with the pressures of other commitments, determine that the ease of cheating compares well with the perceived low likelihood of being caught.

The Web offers a wealth of content that students can easily incorporate in their assessment tasks. There are many sites — known as “paper mills” — that expressly purvey material for this purpose, and a student has also been known to run online tenders for programming assignments. However, most cases of plagiarism we encounter involve material reproduced from technical information web sites, provision of solutions for payment or favours, or traditional copying among classmates and friends. Zobel (2004) describes one notable series of cases involving a private tutor who wrote assignments and even sat exams for his clients.

Most of our courses require students to submit assessable material, whether program code or written reports, directly in electronic form. This allows us to employ semi-automated tools, such as JPlag (Prechelt, Malpohl & Philippsen, 2002) to identify cases of unusual similarity between student submissions. While labour-intensive, manual inspection is a necessary complement to these tools. When plagiarism is suspected, we require students to attend a disciplinary hearing (Zobel & Hamilton, 2002). After sitting through many such hearings and listening to some highly implausible tales, but also learning of some very desperate circumstances, we concluded that more effort was required to prevent situations where students see plagiarism as their only option.

We also found a troubling lack of awareness about plagiarism itself. There are a number of mechanisms by which students in the School are reminded about academic dishonesty. Lecturers are required to display and discuss a slide on plagiarism in the first lecture of each course. Course guides and assignment specifications generally include a note on this topic, while the electronic and paper-based assignment submission systems require students to affirm that submitted work is their own or unless acknowledged. There are also School and University web pages containing detailed information on policies and examples of correct and incorrect usage. Nevertheless, we have observed a surprising number of students who are unsure of what constitutes plagiarism, or its implications and

consequences. This lack of awareness has also been reflected in other studies (Ashworth, Freewood & MacDonald, 2003; Franklyn-Stokes & Newstead, 1995; Park, 2003).

Finally, a high level of staff participation in plagiarism detection and its followup generated a steady stream of students to be interviewed, but University regulations limit the time that can elapse when processing suspected cases. This led to unsustainable loads on staff, especially towards the end of semester when workloads are highest. The School had to appoint a team of disciplinary officers to share the load of chairing disciplinary hearings, and additional administrative support was needed to process the paperwork.

These three factors, namely familiarising students with available resources, increasing their awareness of the nature and consequences of academic dishonesty, and reducing the number of downstream cases to be processed, motivated us to design a workshop on study skills and plagiarism for new students in the School.

### **3 The Study Skills and Plagiarism Workshop**

While there are varied reasons and opinions on why students plagiarise, our experience and research evidence (Park, 2003; Carroll, 2002) indicate that primary factors are student underestimation of the heavy demands of university education, their inability to manage the demands of study and work, and inadequate understanding of the requirements for using and referencing the work of others.

We designed the workshop session to introduce resources such as School academic advisers, student counsellors, teaching and learning advisers, online learning guides and other support material. We also included discussion of general learning skills as a context for the introduction of referencing conventions and plagiarism guidelines. The workshop was held in the first week of semester as part of a range of induction and transition sessions available to all new students. Each workshop session lasted just over two hours and comprised three major sections:

#### **Learning at University**

Both local and international students newly arrived from secondary education or vocational training institutions often lack a clear understanding of what is expected of them in a higher education environment. We began the workshop by comparing student opinions with typical course requirements and lecturers' expectations. We followed with an exploration of the need for self-directed learning and research, the importance of submitting original work, the distinction between discussion and copying, and issues specific to group assignments. Finally, we introduced general referencing conventions and resources, referring directly to the University's plagiarism guidelines and policy document.

#### **Issues Specific to Computer Science**

Most programming courses describe code reuse as good practice. The community spirit widespread on the Internet and the easy availability of useful material also encourages students to share and reuse code. However, computer programming textbooks and manuals rarely contain discussion of copyright issues or correct referencing for program source code. Indeed, we found it difficult to find any useful resources on the Web.

Many students also feel affinity for the goals of the open-source software movement (Open Source Initiative, 2004), and wonder whether efforts to counter plagiarism imply opposition to this initiative. Indeed, we have heard students express very strong views on this topic.

In this part of the workshop, we discussed issues related to reuse of program code. These included appropriate referencing of verbatim or derived code, observing copyright requirements, and the implications of the open source software movement. Consideration was also given to code reuse in the workplace. The discussion was closely linked to School guidelines on plagiarism, with liberal use of code examples.

## **Study Skills and Seeking Assistance**

Here, we identified and discussed the main pitfalls and difficulties for new students. We incorporated a discussion of the need for students to become active learners, and introduced resources that they can access when they require help.

The percentage of international students enrolled in the School is high (approximately 50%) in comparison with overall University international enrolments (approximately 15%). Past experience has shown that international students are more likely than local students to be found submitting work suspected of plagiarism. There is evidence that international students learn more about citation using materials from their chosen discipline, rather than in the course of learning English (Leki & Carson, 1997). However, the best way to teach these students about plagiarism is unclear.

We considered in some detail whether to separately address cultural issues in the workshops. Cultural values — including educational — are acquired throughout schooling and thereby frequently remain “hidden”(Hofstede, 2001). Students are often unable to explicitly identify educational values. This is particularly true for issues related to text ownership and attribution, considered by many to be cultural values (Pennycook, 1998). We decided to approach this issue by having students discuss their own expectations of university study, and to compare these expectations with those of teaching staff.

Most new students were assigned to a session as they enrolled. While we made it clear that attendance was expected, it was not compulsory. Overall, 150 students attended the sessions, with undergraduate students outnumbering postgraduate students by a factor of approximately four to one. This was possibly due to many postgraduate students believing they had already acquired sufficient knowledge of plagiarism and related issues during their undergraduate studies. Many postgraduate students had work commitments and were unable to attend, while some international postgraduate students arrived later in the semester, after the last of the workshops.

The workshop was designed to be interactive. Short sections containing taught material were followed by segments where students formed small groups and worked through questions together. Groups were encouraged to present their conclusions to the full class for discussion. The students participated keenly in this activity, requesting further examples and asking detailed questions. They showed particular interest in learning how to reference code.

A resource booklet was provided to all who attended and also made available online. This contained a summary of the session, referencing guidelines for text and code, links to online resources, and advice on where to seek help.

## 4 The Online Test

To reinforce and assess the effectiveness of the workshops, students were asked to complete multiple-choice questions using the Web Learn online assessment system (Fernandez, 2001). The questions were designed according to the following four themes:

My friend has asked me for a copy of my assignment from a course I took last year. We've been best friends since primary school, and our parents are also friends. In fact, his Father is paying for my accommodation. What options do I have?

1. Let him know where my assignment is but ask him not to copy it.
2. Discuss possible solutions with him.
3. Recommend he speak to a teaching and learning adviser.
4. Give him my assignment to use. Submissions from previous semesters aren't checked, so he won't be caught, and nothing will happen to my result.
5. Find another place to live.

**Figure 1: The question from the online test on which most students had difficulty. Over 90% of students failed to correctly select options B, C, and E.**

## Online Resources Related to Plagiarism and Referencing

Students are sometimes unsure where to obtain more information about what constitutes plagiarism, how suspected cases are handled, and what penalties may be involved. Questions in this category underline the availability of School and University resources that students can refer to during their study.

## Situations Encountered in Actual Disciplinary Hearings

We have observed several recurring factors behind plagiarism, among them poor time management, illness, financial difficulty, and abuse of trust. In many cases, we found that students caught in this position appeared unaware of the considerable University and School staff resources available to help them. Questions in this category examine how a student may avoid such problems, and the options available under different scenarios.

## Correct Attribution of Text and Code

Questions in this category provided examples of situations where referencing of text or code was required, and prompted students to identify the most suitable method of attribution.

## Issues Raised by Students in Discussing Plagiarism

This category of question addresses common or interesting questions we have been asked by students. For example, they ask why they should not use code from online tutorial sites, reuse their own code from previous courses, or provide friends with content to help them through an assignment. The test questions aim to define the limits that apply to helping others, legitimate code reuse, open-source software, and plagiarism.

Many questions were phrased as scenarios that students could identify with. An example question is shown in Fig.1. Students were allowed up to three attempts at a test comprising ten questions selected at random from the twenty-five in the module. To pass a test, students had to correctly

answer at least seven of these questions. Since the aim of the exercise was to educate, students could first generate and attempt unlimited practice quizzes from the same question bank. The tests were not part of any assessable course component, and we encountered some difficulty in convincing students to follow through with the tests.

Of the 350 students new to the School that semester, 312 signed up for accounts on the online testing system, and 225 (72%) attempted the plagiarism test. A large majority of students, 202 (90%), passed the test, while 23 (10%) failed. However, 87 of the 312 students with accounts (28%) never attempted the test. Of the 148 students who attended the workshop, 77 registered for online test accounts, and 70 (91%) attempted the plagiarism test. Of these, 62 (89%) passed, 8 (11%) failed, while 7 (9%) did not submit. The corresponding pass and failure rates for the 235 students with accounts who did not attend the workshops were 140/155 (90%) and 15/155 (10%) respectively, while 80 (34%) did not attempt the test.

**Table 1: Student success rates varied greatly for different questions in the test module bank**

Total attempts	Percentage correct	Theme
118	99.15	Circumstances where special consideration is possible
136	97.06	Using a quote in a report
120	96.67	Acceptability of using solutions from the Web
110	96.36	Helping a friend in distress
118	95.76	Acceptability of looking at another student's solution
111	95.50	Plagiarism resources URL
126	94.44	Extent of collaboration with flat-mates and friends
130	93.85	Showing solutions to friends
125	92.80	Limits of help from private tutors
124	87.10	Having course-related material during the exam
112	84.82	Penalties
115	80.87	Policy on paraphrasing
114	78.95	Extent of collaboration between friends
131	72.52	Principles of reuse of code from book or web site
121	71.07	How to help a friend with a simple question
120	65.83	Marks where reuse has occurred with correct referencing
123	65.04	Principles of reuse of code from book or web site
117	56.41	Issues with group assignments
120	49.17	Issues to do with open source software
127	48.03	Options when student gets stuck on assignment
121	46.28	Options when assignment time runs out
139	45.32	Acceptable reuse of code from book or web site
130	32.31	Paraphrasing examples
110	21.82	Options when physically unable to submit an assignment
141	9.22	Options when friend/flatmate asks for the assignment solution

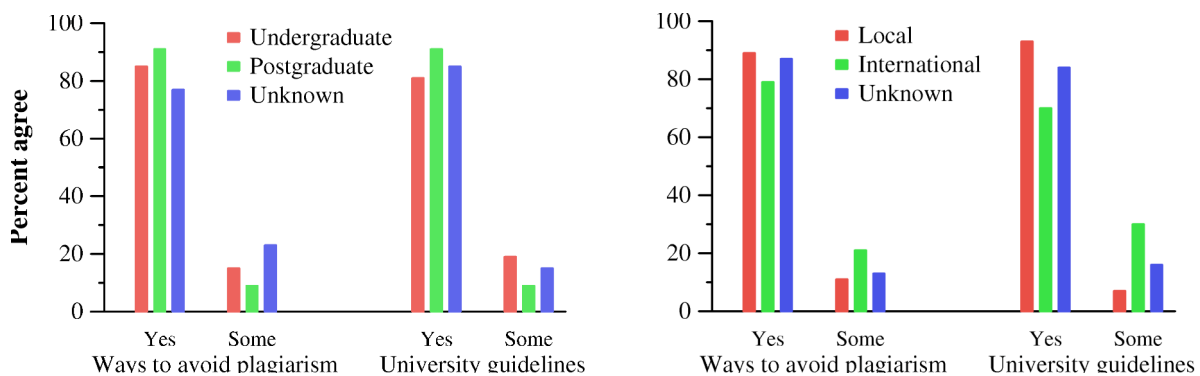
As Tab. 1 shows, the students did not fare equally well on all questions; success rates for individual questions varied from 9.22% to 99.15%. Students encountered the most difficulty with a question — shown in Fig. 1 — on what to do when a close friend and flatmate asks for an assignment solution. Interestingly, several students considered it acceptable to direct the friend to the assignment solution

and ask that it not be copied. This is in keeping with the findings in the research of Franklyn-Stokes & Newstead (1995). However, the option of moving house was one generally not countenanced, and is worth considering more seriously in future workshops. The next most problematic question was about options available to a student when physically unable to submit an assignment.

## 5 Student Evaluations of the Workshop

The new student cohort in the School comprised approximately 27% postgraduate and 73% undergraduate students. Attendance at the workshop was skewed towards undergraduate students, with 84% of participants enrolled in undergraduate programs. A total of 129 anonymous session evaluation forms were collected directly after each session ended. This forms a response rate of 86%, and the breakdown of 17% postgraduate and 83% undergraduate conforms with the attendance ratios. Some students did not provide information on their study level and enrolment type, and are considered to have “unknown” status, although we do know that all but two of this group were undergraduates.

The evaluation form asked students to indicate whether the session had provided useful information, an understanding of ways to avoid plagiarism, a clear idea of the University plagiarism guidelines, an idea of lecturers’ expectations of students, and a clearer sense of their own expectations of university study. We asked participants to provide their answer by indicating “yes”, “no”, or “some” on the form. We chose this simple measure over the slightly more complex Likert scale to capture spontaneous responses based on students’ first impressions of the workshop content.



**Figure 2: Student responses for feedback on the workshop. Most students indicated that the workshop provided information on how to avoid plagiarism, and led to a better understanding of University plagiarism guidelines**

Students indicated that the sessions provided an understanding of plagiarism and University guidelines on plagiarism, as without exception, all students answered “yes” or “some” to the corresponding question. Over 80% of the respondents also felt the session provided useful information; only one student indicated that the session had not provided any useful information. A comparatively small number of students indicated that the session helped clarify what academic staff expected of them.

Differences between groups emerged when specific student cohorts were compared. Fig. 2 shows the student responses to two questions. Most of the undergraduate group indicated that the session had only provided “some” useful information, or “some” understanding of the University plagiarism guidelines and of ways to avoid plagiarism. While the undergraduate and postgraduate cohorts are not directly comparable due to the different group sizes, we note that a far higher percentage of postgraduates gave “yes” answers to these questions. We believe this may be due to their previous exposure to the underlying concepts, which the workshops reinforced.

Similarly, differences emerged between the international and local student cohorts, with international students more likely than local students to circle “some” for the questions asking whether the session

had provided an understanding of ways to avoid plagiarism and a clear idea of the University's plagiarism guidelines.

The evaluation also asked four open-ended questions to investigate what students liked and disliked about the sessions, any recommended changes or additions for future workshops, and other comments. The items that students found useful, ranked by the number of responses, are shown in Fig.3. The most frequent response was that they felt they now better understood what constitutes plagiarism and how to avoid it. Many students also found the code referencing section particularly informative.

Students expressed opposing views on the workshop format; a few disliked the amount of discussion in groups, and wanted a more traditional lecture style, while others contended that it was conducted in an intensive manner, with not enough time for discussion. Some students wanted more time spent on study skills, while others said they wanted this topic removed and perhaps covered in a separate session.

The main suggestions for changes related to the length and scope of the workshop. Several students specifically mentioned they found it useful to learn about teachers' expectations. International students were the most likely to find value in the study skills section. Students also requested further examples and handouts of all the workshop material; these are now provided online.

## 6 Discussion

Overall, the workshops were well-attended, and the students actively engaged with the material. The workshops provided an opportunity to alert students to common pitfalls of university study. Such instruction is preferable to later trying to counsel students who are failing a course, or have been called to a disciplinary hearing for suspected plagiarism.

1. Improved understanding of how to avoid plagiarism, and understanding the boundaries of what is considered plagiarism.
2. Specific advice on how to cite and reference programming code.
3. Learning about University plagiarism guidelines.
4. Use of case studies and scenarios.
5. Referencing examples.
6. Discussion of study skills.
7. Directions on where to get help if needed.

**Figure 3: The seven most useful segments of the workshop according to student feedback.**

Presenters perceived that interspersing teaching points with group and class discussion worked well. This was particularly useful when discussing the more ambiguous aspects of plagiarism, such as group work or the paraphrasing of text. It was also useful to have the students — nearly all of them new to the University — form groups similar to tutorial groups and conduct discussions. While groups could not be closely monitored, and group activity may not have been equally useful for all students, several interesting questions arose from the discussions.

There was a noticeable difference in the relevance for postgraduate versus undergraduate students and for local versus international students. For example, postgraduate local students appeared most interested in the section on code referencing, reuse and copyright, whereas international students wanted to clarify the boundaries and the rules of all aspects of plagiarism, group work and assignment submission. This difference will be taken into account for subsequent workshops.

Approximately 44% of the workshop participants were students from non-Western learning backgrounds. While we did not directly discuss cultural differences during the workshops, cultural issues did arise. We found one case exceptionally interesting. During the first session of each workshop, a particular scenario was presented to the students, along with three examples of text reuse: appropriate paraphrasing, poor (too close) paraphrasing, and a correctly cited but inappropriately used quotation. One group of international students indicated that the too-closely paraphrased example was the best description of the scenario, because it was the closest to the original. This exact example did not arise in all the workshops, however, there were several points of discussion which showed that students were engaging with some of the more subtle concepts encompassed by the definition of plagiarism.

Analysis of incidents during the following semester where plagiarism was suspected shows that very few of the students involved had completed our awareness program. Of the twenty-two students in a major introductory course found to have committed plagiarism, only eight had attended a workshop. Importantly, only three had registered for the online quizzes, and only one had attempted the plagiarism quiz; this one student did pass the test. This indicates that to improve effectiveness, we should provide an environment where almost all students participate in both the workshop and the tests.

## 7 Conclusion and Future Work

In this paper, we have described the need to educate students about issues related to academic integrity, and discussed the design and delivery of a workshop programme that address this requirement. The workshops have been generally effective in raising student awareness of plagiarism, and in educating them about how to avoid typical related problems.

We ourselves found running the workshops an instructive experience, and plan to incorporate some of our findings — in particular about cultural perspectives — into future sessions. This may involve a separate workshop designed for international students, and focussing on aspects of studying in Australia. We also intend to better integrate the workshop and the online tests. All new students will be provided an account at enrolment and asked to take the test as part of the workshop. This will allow issues raised by the tests to be discussed further during the session. We have also designed a more detailed questionnaire to better evaluate student perceptions of the issues and the workshop. Finally, we plan to further encourage current students to attend the workshops, and to require students found to have engaged in plagiarism to attend.

The workshops described in this paper are part of a coordinated effort to address and reduce the incidence of plagiarism among our students. We firmly believe that training students to be aware, and to avoid academic dishonesty, is a far more effective and viable approach than application of penalties alone.

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