Cheating or 'Collaborative Work': Does it Pay?

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Abstract

Being a distance education institution, our current infrastructure does not allow group or collaborative work on undergraduate level. Although students are allowed to work together and assist each other, each student is required to submit individual attempts for assignments and/or projects. Assignments that are so similar that we could not accept them as individual attempts are considered cheating. According to the literature, cheating in assignments and projects is a problem in educational institutions at all levels. Students often use ingenious ways to disguise dishonesty. It is not always possible to determine the extent of the problem due to the inability to identify all instances, especially in modules with large student numbers. We investigated this problem in a second-level computing module. The examination results of students suspected of cheating were analysed and compared with the results of the rest of the students (the control group). This was done for 2004 and 2005. In this paper we report on our findings in this regard.

Keywords: cheating, assignments, examination results, programming education

Introduction

It is clear from the literature that student cheating is a serious problem in educational institutions at all levels throughout the world (McCabe, Treviño, & Butterfield, 2001; Sheard, Dick, Markham, MacDonald, & Walsh, 2002; Smith, 2005). We were hesitant to use such a strong word for this phenomenon but, even if one uses a synonym that 'sounds' less crude, this does not change the fact that cheating remains a serious offence which should be addressed urgently. Dick et al. (2003) state that student behaviour could be regarded as cheating if one or more of the following apply:

- the behaviour violates the accepted standard of the particular institution;
- the behaviour violates the rules laid down by the institution for the particular assessment task.

Using this as a guideline, the behaviour of students as described in this paper can be considered cheating.

This study is part of a long-term project where various ways in which the pass-rate of students in computer programming modules could be improved are investigated (Naudé & Hörne, 2003, 2004). In this paper we look at the phenomenon of cheating in assignments and how this affects the examination results of individual students. We identified a number of students that cheated in their assignments and looked at their examination results.

In the next section we discuss general reasons for students cheating in assignments, projects and examinations. We then discuss the methodology used for our research, the various ways in which the students tried to disguise the fact that they were cheating and the methods we used for detecting it. We present research results for the 2004 and 2005 academic years and in the final section we draw some conclusions and discuss further research. Note that we use the terms 'he', 'his' and 'him' to indicate both male and female students.

Reasons for Cheating

One could consider students cheating to be a three-layered event. Cheating is, in most cases, the result of a combination of factors or reasons. Firstly, there has to be the *necessity to cheat*. If a student could complete a sufficiently good assignment in time, and the perceived effort of the student is worth the benefit derived from it, then it is unlikely that he would even consider cheating. There would be no need to do so. Cizek (1999) supports this view by stating that students cheat to get a better grade. Drake, as quoted in (Cizek, 1999), found a clear relationship between cheating and grades. The weaker students were more prone to cheating. In our case, where assignments generally do not count towards the final mark of a student, this would mean that students cheat merely to achieve admission to the examination with less effort. Thus it has to be beneficial to the student to cheat.

Research (Cizek, 1999; Dick et al., 2003; McCabe et al., 2001) has identified a number of reasons related to the necessity layer. The following reasons can be assumed to be relevant to our students:

- external pressures to perform well (e.g. from parents and employers), thus the need for high marks;
- financial pressures;
- overly difficult assignments;
- time pressures;
- a heavy workload.

As far as the last two (related) reasons are concerned, it should be kept in mind that most of our students study part time. Their study time competes with family time, work time and time to socialise. Students often overestimate their own capabilities as well as the available time for studying, and also underestimate the amount of time needed to master a specific module. Thus they burden themselves with too heavy a work load. Unexpected events in the life of a UNISA student, such as starting a new job, job transfers, family matters such as unexpected pregnancies and illness may also encourage a student to cheat.

When a necessity to cheat has arisen, the next layer, namely the opportunity to cheat, needs to be present. Like a mountaineer that climbs a mountain 'because it is there', a student will cheat only if it is possible to do so. The following factors could be considered relevant:

- the availability of fellow students whose assignments can be copied;
- a person (e.g. friend, daughter, father, colleague) who can do all or part of the assignment for the student;
- chat groups, discussion forums and the Internet;
- a tutor doing large parts of the assignments for his students;

- availability of the solutions to questions asked in previous years: either the model solutions despatched by the University, or obtained from students that completed the module in a previous year;
- availability of a solution done by another student on a shared computer, e.g. in the computer laboratory of the University.

Technological advances have led to an increase in cheating (Dick et al., 2003) simply because it facilitates cheating and because of the increased availability of material on the Internet. The easier it is to cheat, the more prevalent cheating can be expected to be.

Many students that have both the need and the opportunity to cheat, still do not yield to the temptation. This brings us to the third layer, i.e. the internal influences that result in the final decision to cheat. Here we turn our attention to the student himself. The final decision to cheat is a personal choice made by weighing internal values and beliefs against the external factors discussed earlier. Some students consider cheating to be a 'victimless crime' – no one gets hurt, so it is acceptable (Dick et al., 2003). Related to this, is the belief that it really is not wrong to cheat in assignments as it has little or no influence on the final mark. Educators should clearly state what is and what is not acceptable behaviour and why. Students may find it difficult to understand the difference between helping a fellow student, and actually doing his work for him.

In the School of Computing at the University of South Africa one of the purposes of assignments is to provide students with the opportunity to obtain examination admission by earning a specified number of credits through the submission of assignments throughout the academic year. Some students might feel that, since they pay their fees, they are actually entitled to automatic admission to the examination and thus they are justified in cheating. Related to this is the issue of repeated assignments. 'If my lecturer does not bother setting a new assignment, why should I bother doing it. I might as well use last year's model solution.' These are forms of *neutralisation* which is defined as the denial of responsibility for improper actions because of the improper actions of others (Cizek, 1999).

Lack of character and integrity, and no pride in a job well done, as well as pure laziness, are more reasons mentioned by McCabe et al. (2001).

The decision to cheat may become easier if a student observes cheating by fellow students. 'Everybody else does it, so I might as well join in.' McCabe et al. (2001) have in fact found that peer behaviour showed the most significant relationship to cheating. This is another example of neutralisation.

The decision of a student to cheat will inevitably also depend on the perceived reaction of lecturers and the institution if he is found out. Especially in cases where an assignment contributes towards the final mark, a message that cheating will not be tolerated must be clearly stated.

Although in most cases all three of the layers discussed above are present when a student cheats, there may be the exception where a student cheats although there is no real necessity to do so. However, the opportunity and inclination still exist. An example may be when a student cheats because he does not see the educational benefits of assignments. Lecturers should emphasise the fact that assignments are not merely opportunities for gaining admission to the examination, but should rather be seen as opportunities for mastering the study material at a steady pace. This also means that the assignments should be relevant, geared to reaching the specific learning outcomes of the module, and neither too easy nor too difficult.

We may conclude that the decision to cheat is almost never the result of one reason only, but rather a combination of various factors.

Research Methodology

This study ran for two years: 2004 and 2005. We used a second-level module on computer organisation for this study. This module has a theoretical component as well as a practical component in which students have to write relatively small programs in assembly language. We clearly state in our tutorial letters that, since we are a distance learning institution, group work does not form part of our assessment programme and thus that students are not allowed to submit group efforts. We also emphasise the fact that students will be penalised if their assignments are so similar that they cannot be considered individual attempts.

There are four assignments for this module; two written and two multiple-choice. With the multiple-choice assignments we could not determine whether students cheated or not. Where cheating was detected in the first written assignment, students were given a strict warning that this is not acceptable and that they will be penalised in future.

The second written assignment consisted of a number of theoretical questions as well as an assembly language program which the students had to submit electronically. During the marking process, the programs were evaluated by testing the executable code and assessing a printout of the program to evaluate the structure, etc. of the programming effort. We only used one external marker for this assignment. With her help we were able to identify groups of students that cheated by submitting either identical assignments or assignments that were so similar that we could not accept them as individual efforts. For 2004, these groups were combined to form an experimental group and the rest of the students who were admitted to the examination for this module were the control group. The χ^2-test of independence is often used in research to compare two independent groups. For this reason we used this test to compare the examination results of the two groups mentioned above. Due to our findings, we decided to use two experimental groups and the control group for 2005.

Ways of Cheating

There were some cases where the students simply submitted exactly the same assignment, spelling mistakes and all. In several other cases the students used various techniques to disguise the fact that they were submitting the same assembly language code. A number of these could be identified:

- search and replacing variable and label names. This was also reported by Carter (1999) in a Java programming course;
- using different fonts in the printout they present as part of the written assignment;
- not submitting a program listing;
- changing the comments in the program;
- submitting programs without any comments.

Detecting Incidences

Cheating is not easy to identify if the program executes perfectly and does nothing unexpected. We suspect that several such incidents of cheating went undetected.

However, if the program does not produce the correct results and/or displays a message that catches the attention of the marker, e.g. a spelling mistake, it is easy for the marker to detect similarities. Such students also tend to submit their assignments on the same date so the marker gets them in the same batch. This was also reported by (Cizek, 1999; Dick et al., 2003).

Research Results

Results for 2004

We were able to identify 4 groups of students that cheated in the practical assignment. Groups 1, 2 and 3 simply submitted identical assignments. However, a relatively large number of the students in Group 4 used some of the techniques discussed earlier to disguise the fact that they were cheating. The students in this group differ from the others in the sense that they are all registered at one of the business schools that offer Unisa courses while the students write the official Unisa examinations. Since these students attend lectures, the possibility exists that the tutor 'assisted' the students with the programming assignment.

Table 1 contains a summary of the examination results of the four groups plus the results of the control group.

Table 1: Examination results 2004

	No of students Admitted	**No of students absent from exam**	**Passed**	**Failed**	**Total**
Group 1	3	1/3 = 33.3%	1/3 = 33.3%	1/3 = 33.3%	100%
Group 2	2	0/2 = 0%	0/2 = 0%	2/2 = 100%	100%
Group 3	7	0/7 = 0%	1/7 = 14%	6/7 = 86%	100%
Group 4	35	6/35 = 17%	11/35 = 32%	18/35 = 51%	100%
Experimental group (total)	**47**	**7/47 = 15%**	**13/47 = 28%**	**27/47 = 57%**	**100%**
Control group	**253**	**54/253 = 21%**	**120/253 = 48%**	**79/253 = 31%**	**100%**

The results of Groups 1 and 3 could be an indication that one person in the group did the actual work while the others merely copied the program and submitted it as their own. The result was that one student mastered the work and subsequently passed the exam while the others in the group did not master the practical work and were consequently unsuccessful in the examinations. The higher pass rate of Group 4 with respect to Groups 1-3 could be ascribed to the students being tutored. One may expect the pass rate of this particular group to be higher than the pass rate for the average UNISA student who does not attend lectures. However, this is not the case for the 2004 results (32% vs. 48% of the control group).

We used the χ^2-test of independence to compare the pass rate of the experimental group to that of the control group. Based on Table 1, $\chi^2_{(1, N=239)} = 5.37$ which is larger than the corresponding test statistic $\chi^2_{0.05} = 3.84$. Thus we can conclude that there is a statistically significant difference between the results of the experimental group and that of the control group. This indicates that cheating is not beneficial to the student since it does not contribute to the learning process. It also confirms the results reported by Drake as quoted in (Cizek, 1999) (see section on reasons for cheating).

Results for 2005

As shown in Table 2, we identified seven groups of students that cheated in the practical assignment with Group 7 once again the tutored group.

Table 2: Examination results 2005

	No of students Admitted	No of students absent from exam	Passed	Failed	Total
Group 1	2	2/2 = 100%	0/2 = 0%	0/2 = 0%	100%
Group 2	2	1/2 = 50%	0/2 = 0%	1/2 = 50%	100%
Group 3	2	1/2 = 50%	0/2 = 0%	1/2 = 50%	100%
Group 4	2	1/2 = 50%	1/2 = 50%	0/2 = 0%	100%
Group 5	2	0/2 = 0%	0/2 = 0%	2/2 = 100%	100%
Group 6	2	2/2 = 100%	0/2 = 0%	0/2 = 0%	100%
Group 7	17	7/17 = 41%	9/17 = 53%	1/17 = 6%	100%
Experimental group (total)	**29**	**14/29 = 48%**	**10/29 = 35%**	**5/29 = 17%**	**100%**
Control group	**288**	**60/288 = 21%**	**113/288 = 39%**	**115/288 = 40%**	**100%**

As mentioned earlier, Group 7 should actually be considered separately from the rest of the experimental group. This is summarised in Table 3 with Experimental group 1 comprising Groups 1 to 6 of Table 2 and Experimental group 2 the tutored students.

Table 3. Summarisation with regrouping

	No of students Admitted	No of students absent from exam	Passed	Failed	Total
Experimental Group 1	12	7 = 58.3%	1 = 8.3%	4 = 33.3%	100%
Experimental Group 2	17	7 = 41%	9 = 53%	1 = 6%	100%
Control group	288	60 = 21%	113 = 39%	115 = 40%	100%

When comparing the results from Experimental group 1 to the results of the control group, there is a significant difference in the pass rate (8.3% vs. 39%). Thus the same trend was observed in both year groups.

Contrary to the results for 2004, the tutored group, i.e. Experimental Group 2 in Table 3, did in fact outperform the control group in 2005 as far as the pass rate is concerned (53% vs. 39%). In Experimental Group 2, only 1 student failed. This probably collates with the higher percentage of absentees for this group (41% vs. 21% for the control group). This may be due to a tutor advising students who were not properly prepared to rather stay away from the exam.

Conclusion and Further Research

According to (Dick et al., 2003) one should consider cheating to be a serious problem if one or more of the following, amongst others, is/are true:

- many students are involved, not only one or two;
- students try to disguise the fact that they are cheating;
- the students did not achieve a satisfactory learning outcome; and
- the assessment task contributes to the final outcome of the course.

From the points listed above, it is clear that all of the above are relevant in this study:

- nearly 20% of the students that were admitted to the examinations were involved.

As stated earlier, we suspect that this number may be significantly higher;

- students used various techniques to disguise the fact that they were cheating;
- the examination results are significantly lower on average for the cheaters than for the control group;
- although the year mark counts only 10% of the final mark of a student, the marks for this particular assignment carries the most weight in establishing the year mark of a student for this module.

In a study conducted by McCabe et al. in 2001, it was found that 'some forms of cheating have increased dramatically in the last 30 years' (Dick et al., 2003). It is clear from the results in this study that, as is the case in most educational institutions over the world, cheating is a serious problem in our School and probably in the University as a whole. Apart from being dishonest, this study also indicates that it may have a strong negative influence on the pass rate.

As professed by (Dick et al., 2003) and (Rittman, 2005), a clear set of rules and standards should be set out for students registered for modules offered by the School of Computing. This should clearly state the policy of the School regarding cheating and the steps that will be taken if students do not abide by these rules and standards. Because of the high incidence of cheating and the low pass-rate of students in the School of Computing, this policy should not merely form part of the mountain of material the student is presented with on registration but rather sent out as a separate tutorial letter. A clear policy from the University as well as strict regulations for enforcing it is also needed.

Although this study provided some answers, a few important questions that require further research surfaced. We have a very high percentage of repeaters in this specific module. We would like to conduct a longitudinal study to determine what becomes of students that cheated and failed when they repeat the module. We also want to establish whether repeaters are more prone to cheating than students taking the module for the first time. The attitude of the students in our School with respect to cheating in assignments may be determined by means of questionnaires. Our student body is composed of different societies, each with its own set of norms. Do the social norms of a given society influence the incidence of cheating or is cheating universal? Does the IT environment have a sound ethical framework that could be enforced on students about to enter the profession?

Does informal group work encourage cheating in assignments? Formal group work and collaborative learning are often compulsory in undergraduate final year projects. Will all the members of the group necessarily develop the same set of skills required by the project to the same extent? For example, one person may solely be responsible for system specifications and documentation, another might do all the programming and a third the graphics or the final presentation.

Technology exists for identifying plagiarism but may not be so readily available for determining 'plagiarism' of executable program code.

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References

Carter, J. (1999). Collaboration or Plagiarism: What happens when students work together? *ITiCSE, 1999*, Cracow, Poland.

Cizek, G. J. (1999). *Cheating on tests: How to do it, detect it, and prevent it*. Mahwah, N.J.: L. Erlbaum Associates.

Dick, M. Sheard, J., Bareiss, C., Carter, J., Joyce, D., Harding, T. & Laxer, C. (2003). Addressing student cheating: Definitions and solutions. *ACM SIGCSE, 35*(2), 172-184.

McCabe, D. L., Treviño, L. K. & Butterfield, K. D. (2001). Cheating in academic institutions: A decade of research. *Ethics & behaviour, 11*(3), 219-232.

Naudé, E. J & Hörne, T. (2004). The role played by assignments in computer programming education. *Proceedings of SAARMSTE 2004*. Cape Town.

Naudé, E.J & Hörne, T. (2003). Investigating suggestions for increasing the throughput rate of IS students. *Proceedings of INSITE 2003*, Pori, Finland. Available at http://proceedings.informingscience.org/IS2003Proceedings/docs/116Naude.pdf

Rittman, A.L. (2005). Academic dishonesty among college students. Retrieved April 30, 2005 from http://www.mwsc.edu/psychology/research/psy302/fall96/andi_rittman.html

Sheard, J., Dick, M., Markham S., MacDonald, I. & Walsh, M. (2002). Cheating and plagiarism: Perceptions and practices of first year IT students. *Proceedings of the ITiCSE 2002*, Denmark.

Smith, S. L. (2005). At what age do children start cheating? Retrieved April 30, 2005 from http://clearinghouse.missouriwestern.edu/manuscripts/45.asp

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