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Student projects: plagiarism and assessment

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Student Projects: Plagiarism and Assessment

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Abstract

Within the Information Technology degree programme of the University of Reading, the students undertake a major project in their final year. The module is both a hurdle to an honours degree and significant in terms of assessment weighting. The two year history so far has shown that bad citation and plagiarism are issues, and in one case called for the due referral of a project report. In the light of experience to date, we are focusing firstly on plagiarism prevention, giving generic advice on report writing and citation practice, and secondly on detection. In the longer term, I believe we need to reflect on what capabilities we should be creating in our undergraduates and therefore what and how we should be assessing them.

1 Introduction

It is February 22nd, and I have just attended a retirement party in the department of Mathematics instead of starting this paper. I smile as the first two self-referential sentences suggest themselves to me while listening to the retiree's anecdotes of the good (and apparently better) old days. He recalls the respected, much loved and quite eccentric Professor Rado chairing an examiner's meeting with the opening words "The list of candidates is on the board. Now I think X should get a 2-1, and Y despite their performance in the examination should get a 1st." The somewhat bemused external examiner suggests that perhaps they should be guided by the examination marks, at which a debate breaks out about whether the rules were necessary and/or sufficient to achieve what the aims of assessment should have been. I shall return to these topics later.

This paper describes the Student Project module on a degree programme, the experience of submitting the student reports to the TURNITINUK Advisory Service (JISC, 2006), and the action taken as a result of that experience. It also reflects on the issue of what we are, or should be, trying to assess.

2 The Student Project Module

The University of Reading degree programme in Information Technology was first taught in 2002-3 and the first cohort graduated in 2005. As with many such degree programmes, the final year includes a module (Reading, 2005) in which the students manage and execute a major project to demonstrate their overall capability. This is a significant challenge for the students, being relatively student-driven and free-format, and being in assessment terms some 22% of their degree by weight, four times that of all but two other modules studied.

Professional bodies such as the British Computer Society (BCS, 2006) require for accelerated membership that students undertake and pass a *major project* module. In most computing-based degrees passing the project is therefore a hurdle for honours. For our Information Technology B.Sc., the project module is such a hurdle as well as a nominal 400-hour item of work.

The regime in which the work is done is, as far as academic requirements allow, a virtual company. The students are assessed at the start of, and during the project on the basis of initial and interim plans and presentations, but the major marks, some 85%, are awarded on the basis of the final project report. Our intention is that the students will tell their own story of the project while citing good, relevant sources.

The University considers plagiarism to be a form of cheating and defines it (Reading, 2006a) as follows:

"Plagiarism is the fraudulent representation of another's work as one's own. This applies whatever the source of the material (for example, a published source, the web, or the work of another student), whether the material is copied word for word or paraphrased, and whatever the extent of the material used."

Clearly, it is possible to fail the project module, and thereby fail to earn an honours degree, by an act of plagiarism. The School therefore makes it particularly clear (Reading SSE, 2006a/b) what plagiarism is, and the students sign, in the usual way at Reading, to say they have cited the sources they have used.

3 Use of the TURNITINUK Service

One particularly incongruous phrase in a 2005 report from student *X* came to my attention, and to my great disappointment, I discovered with one google that an uncited source had been used. Without this smoking gun, the report might have passed scrutiny although I already had an impression, q.v. Carroll (2002), that the content was somewhat generic, and the references only semi-related to the content. A few more searches showed that great swathes of this report had been lifted from this one source. The report was scored at zero, and the matter referred, in accordance with University regulations (Reading, 2006b), to the Head of School and thence to the School Director of Teaching and Learning.

This event led me to use the TURNITINUK service[1] which was on trial at the University: the School of Systems Engineering (SSE) had no official policy to use it. The Originality Report for *X* is R1 in Figure 1 and the statistics were worse than I expected. Although I had few to no concerns about the other three project reports I was marking, I decided to put them all through the service on the grounds that I would rather submit work systematically than on the basis of my personal judgment: they are R4, R10 and R12 in Figure 1. Later, for survey purposes, I submitted to TURNITINUK all electronically available reports, including the appendices.

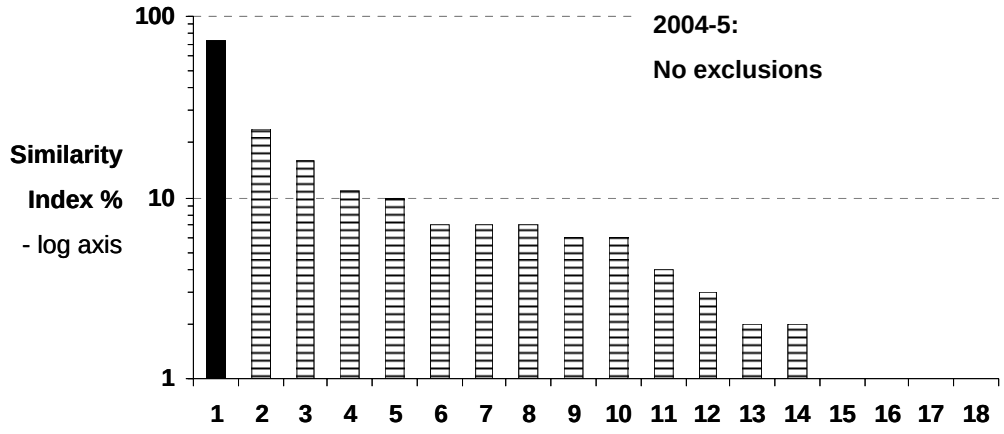

Figure 1. Similarity indices for the 2004-5 cohort's 18 project reports.

A first observation is that it is possible to get a low Similarity Index (SI) despite all the reasons why there might legitimately be matched texts (MTs) in a piece of work. So far, the background radiation in this universe does not appear to be high on the basis of these statistics. The good students with plenty to say tend to have low SIs.

After *X's* examinations, they attended a meeting with the School Director of T&L and the Study Programme Director. It was determined that *X* had been a promising student with no previous disciplinary record, and that there were extenuating circumstances. The report was set aside, and the student was given two weeks to write a second report which was marked without prejudice as if the first had not been submitted. This report was submitted to TURNITINUK and is R2 in Figure 1. It was found to be highly reliant on extensive quotations but not actually plagiarised. The originality report reminded me of my house surveyor's report on a garage: "made by an amateur from second-hand materials and deriving most of its strength from an adjacent wall".

[1] Then misnamed *The JISC Plagiarism Detection Service*, overstating what can be achieved without human judgement.

In pre-emptive mode, to avoid a recurrence of this extreme situation, to support the authoring process and to minimize plagiarism with the 2005-6 cohort, we:

- underlined the benefits of using and drawing and building on good sources as appropriate,
- reminded students of their responsibilities to cite their sources clearly and correctly,
- suggested that the core report should focus on the student's own story and be in their voice with …
- major quotations from sources and supplementary detail relegated to the appendices,
- provided more guidance on the structure of the project report,
- anticipated routine use of TURNITINUK in 'metal detector' mode,
- requested that the core report be submitted without the appendices as a single file, with …
- the appendices in a second single file.

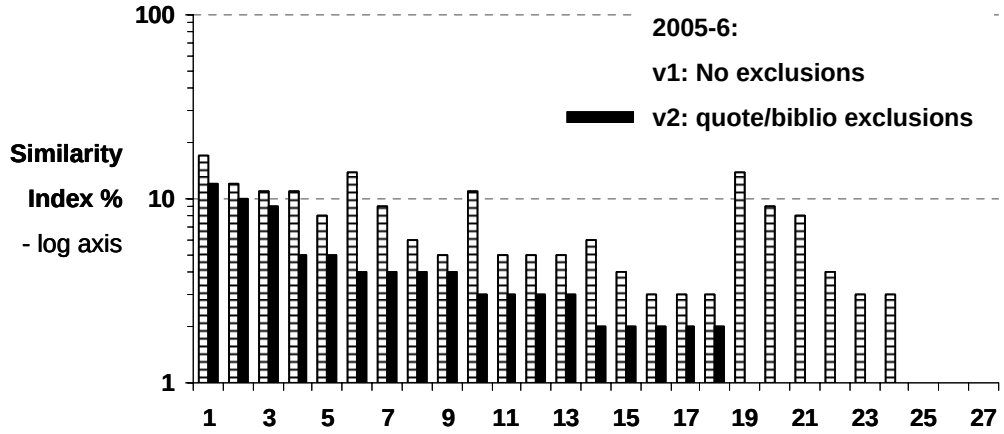

Figure 2. Similarity indices for the 2005-6 cohort's 27 project reports.

This time, the core reports without appendices were submitted to TURNITINUK, and therefore the statistics, as in Figure 2, are not exactly comparable to those of the previous year where the appendices were included. To get a better benchmark, the set of 2005 reports, excluding that corresponding to R1, were resubmitted in May 2006, both as they were in 2005 and without appendices. This enabled three comparisons:

- the 2005 reports, excluding X's, averaged an SI of 6.4% in 2005, but 12.9% in 2006
- the 2005 core-reports (without appendices), excluding X's, averaged an SI of 10.6% in 2006
- the 2006 core-reports (without appendices), including all students, averaged an SI of 6.9%
- after invoking TURNITIN'S facilities to exclude text in quotes and/or associated with referenced texts:
  the 2005 core-reports' average 2006-SI was down from 10.6% to 7.2%, a 32.1% reduction, and
  the 2006 core-reports' average SI was down from 6.9% to 3.3%, a 52.2% reduction.

The main observation is that the 2005 student work's increase in SI from 6.4% (2005) to 12.9% (2006) is a concern. Although the TURNITIN algorithm is not known and may have changed, this and a perusal of the reports seems to provide first evidence that the level of false positives is rising rapidly, reducing the value of the service. This raises questions about the current TURNITINUK service as an enduring solution, and suggests that a more sophisticated approach would be useful.

The 2006 cohort showed a clear improvement in student writing: no student was referred for academic misconduct. The aggregate SI encouragingly reduced from 10.6% (2005) to 6.9% (2006) and, more meaningfully, the assessors reported that the level of derivative writing and bad citation had reduced.

4 Observations on the JISC Plagiarism Advisory Service

On the efficiency front, the TURNITINUK service performs. There have not been any significant difficulties with document submission or turnround. Perhaps, as the system becomes more used, indications of load-factor and a 'share system', incentivising early submission and relaxed deadlines, will become more important.

On the effectiveness front, there are some reservations. It seems increasingly necessary to trawl through a sea of false-positive matches in order to discount the likelihood of actual plagiarism. Figure 2 for example in fact indicates no significant case of plagiarism in 2006. Some sort of user-controlled filter to cut out background radiation may be needed to reduce the noise and increase the signal from the TURNITINUK reports.

The TURNITINUK originality-% figure *S* for matched text is of course several removes from a %-figure for plagiarism. TURNITINUK is actually a *Similarity Advisory Service*. TURNITINUK, in some cases reasonably, does not recognise the following as not necessarily plagiarised:

- text in a relationship, possibly (semi-)detached, with a reference to a source,
- text which comes some way after a source reference, but which is from the same source,
- mandated boilerplate or guideline text from a coursework-specific template or guideline document,
  e.g., "The University of Reading … School of Systems Engineering … Information Systems Group",
- slab-quotes, especially in Appendices, where the source is often clear from the context,
- text which perhaps derives from collaborative work which is encouraged on the module,
- common use of English and domain-language, perhaps emanating from the course's learning resources,
- standard code, particularly systems-integration glueware, which has to be exactly to a recipe to work.

TURNITINUK features two concepts, the *sources* and the *MTs*, and both need to be managed. It can be argued that the software should allow not only individual sources to be discounted but also individual MTs to be 'de matched' as insignificant. First, a source may be matched to both significant and insignificant MTs. Secondly, further sources can be substituted for a deleted source, and a text may be acceptable, whatever external sources it matches.

The level of false positives could be reduced by pre-filtering submissions with an appropriate *lingua franca* dictionary of acceptable phrases encountered and/or to be expected in the subject domain, and incremented by 'dematched' MTs when an Originality Report was scanned. TURNITIN could in this way be made more context-sensitive and user-oriented.

Amazon (2006) have demonstrated that Statistically Improbable Phrases (SIPs) can be identified. An MT that is four times as long as another is likely to be statistically more improbable and therefore seems more than four times as significant. However, the TURNITINUK score *S*, being linear in the length of the MTs, does not include any consideration of granularity or improbability. There would appear to be a case for a scoring system *T* which:

- is non-linear in the length of the MTs
- is equal to *S* if all MTs are the minimum length (defined to be length '1') recognized by TURNITINUK, and
- is greater than *S* if any MT is greater than this minimum length

The requirements suggest that an MT of length n should be given a score of say n^k with $k > 1$, and the recommendation here is $n^{1.5}$. Perhaps there is an informed argument for a different k but this does not seem a critical decision. Then $T/S \geq 1$ will give an indication of the granularity of the plagiarism.

If two adjacent MTs are associated with the same source, this in itself is significant. The intervening text, especially if short, may perhaps have been edited from the same source. Therefore, a facility to indicate that these two MTs should be considered as one would be useful and would affect *T*.

Finally, the significance of 'derivative' work, and therefore the judgment as to whether a piece of work is overly derivative or not, varies from subject to subject, and perhaps from institution to institution. Dr. David Stirling, the Science Faculty's Director of Teaching and Learning and another mathematician, points out that the faithful reproduction of proofs in mathematics is taken to be a measure of understanding, albeit an increasingly unreliable one. In the Information Technology programme, positioned at the applied end of Computer Science, it would similarly be good practice to use the language of Systems Integration, and to cite respected sources on such topics as usability, performance and security. Quite how domain-specific context is input to reduce the false positives from an analytical system is perhaps a research matter for the future.

Notwithstanding these observations, the existence of TURNITINUK has so far been effective as a deterrent, and reasonably informative with its reports. *Overlap-%* ≥ *Non-originality-%* ≥ *Plagiarism-%* and subjective impressions can be compared conveniently with quantified data. Its introduction is therefore very welcome.

5 Reflections

Two factors, not entirely exclusive to Systems Engineering, increase the need for clear advice on assessment aims, good writing and plagiarism-avoidance in our subject:

- *re-use* is taught and practiced as a specific engineering discipline for building Information Systems, and
- we encourage the students to form a self-help community and discuss things together.

Reuse was a discipline in the creation and integration of information systems, even before the practice was further supported by the concept of the *object* in the language SIMULA and the *object-oriented paradigm* became the leading approach to software development. System components, programming languages, software libraries, methods and even frameworks are specifically designed with reuse in mind. There is an Open Source initiative to expedite the quality of open source software, increasingly a genuine competitor to proprietary software today. Our students draw on this software and often could not achieve what they do without it. Major consultancy houses regard their proprietary frameworks as core intellectual property: they are guarded, developed and used with great care. In a world of reusable components, our students have to judge when to adopt and when to build afresh.

It is important that our students also understand that they are not in competition with each other, and that the class of their degree will be entirely based on their own performance. It is important that they realize that they have different strengths and weaknesses and can complement each other within a group. They are encouraged to face down the problems they encounter, but to realise when they need help from others, be they fellow students or University staff.

One could argue that society is becoming more complex if increasingly commoditised and based on standards, and that it therefore requires individuals with integrity who can respect the merits of others and work with them. It may be argued that if the old aims of academia were to create potential researchers with high degrees of independence, creativity and originality, these aims should be rethought in the context of today's requirements for world citizens. This in turn calls for a reappraisal of our pedagogical aims, methods and effectiveness.

In this spirit, our Project Module already requires students, as part of the 'virtual company' ethos, to manage constructive relationships with project customers, mentors, topic advisors, colleagues and the project assurance team. We are aiming to increase the level of interaction and informal co-operation in the future.

Despite our emphasis on the benefits of legitimate reuse and of co-operation within the student community, our stance on plagiarism is clear. What we object to most in an act of plagiarism is not the absence of courtesy in not citing a source, or the apparent laziness, but the dishonesty and the implied attempt to mislead the assessment process. This is reflected in the University's definition of plagiarism which avoids any ambiguities about what the phrase 'own work' means.

Acknowledgments

My thanks go to colleagues Andrew Adams, Anthea West and Shirley Williams for stimulating conversations on use, reuse and the aims of assessment.

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