The PiSA (Plagiarism in Statistics Assessment) project

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Introduction

Plagiarism, defined in the Oxford English Dictionary as “To take and use as one’s own the thoughts, writings or inventions of another” is unfortunately a growing problem in Higher Education (HE) institutions. Within the Mathematics, Statistics and Operational Research (MSOR) disciplines it occurs most frequently in “take-home” assignments, whether group or individual, where the main form is collusion or copying and in third year projects, where students can use the internet and other sources.

In Statistics, it is important to allow students opportunities to analyse data and present a report on their findings, in written and/or oral form. This is appropriate in exploratory data analysis and in statistical modelling and therefore features in both service and specialist courses. Despite the plagiarism issues involved with such coursework, students would be disadvantaged if these elements, which reflect the applied nature of the discipline, were not included in their assessed work.

The Royal Statistical Society Centre for Statistical Education (RSSCSE) and the Maths, Stats & OR Network (MSOR Network) jointly funded the PiSA (Plagiarism in Statistics Assessment) project, which surveyed HE Statistics lecturers to:

i) investigate what methods of assessment were being used;

ii) discover whether and how these might have been affected by attempts to deter plagiarism; and,

iii) to identify and disseminate good practice in this area.

Evidence Gathering

Evidence was gathered from several sources, with the greatest contribution coming from a (non-random) survey of 50 staff from 23 universities. This exercise gathered information on 96 taught modules - 53 in Mathematics/Statistics, 26 in Business/Economics and the remainder in Health Sciences, Psychology, Biosciences or Computing – as well as issues concerning plagiarism in project work.

Other sources were an article in MSOR Connections Feb 2007 [1] asking for sharing of good practice in plagiarism detection or deterrence, a website established under the mathstore address, a Jiscmail discussion list and a widely circulated email request which was sent out to lecturers who teach Statistics through the HE Academies in Bioscience, Business, Economics, Geography, Health and Psychology.
Key findings

1. Plagiarism, or more specifically collusion, is a significant problem within large Statistics service modules.

Typically, Statistics service modules are large, which gives rise to some plagiarism issues just through size. For example, one lecturer in Business commented on the difficulties of detecting collusion in a module of 800 students, all taking the same coursework but on different campuses.

Several lecturers, from a variety of degree disciplines, agreed that if students were engaged with the assessment task, the chances of collusion and copying were reduced considerably. This might mean greater effort in the design and development of assessments, including using appropriate data. Generally, it was felt that increased engagement is helped by using a variety of assessment methods.

One way to engage students was to run tutorial classes in which contributions, such as presenting group solutions to the rest of the class, are expected. In this example: “Any student who fails to attend at least 70%... or to participate adequately... is declared “non-complete”…and therefore fails the course”.

2. The majority of Statistics lecturers are well aware of plagiarism issues and are taking action, however small, to combat it.

Several lecturers gave some simple ideas that aim to prevent students from simply handing in a photocopy of a fellow-student’s work. For example, requiring students to include their ID number in the header of every page of their word-processed reports or within the names of the variables used in their analysis or as a caption inside every graph produced.

There were a number of instances where assessment tasks counted for so little towards the final grade that it was felt not worthwhile for the students to cheat. Those who do so are identified early and dealt with before it becomes a major issue.

Several respondents used posters, which typically are produced by a group of students, in assessing Statistics. However, each individual must be present to “defend” the poster at a special viewing session.

Plagiarism can occur across the years, as some lecturers set what is essentially the same assignment each year. This can be overcome by asking for students’ work to be presented in a different format. For example, one respondent requires a written report-style format every year but varies the “client”. One year the report must be written as a newspaper article, another year as a research paper, yet another year as a briefing document for the local MP, and so on.

3. It is quite common for Statistics lecturers to fail to apply institutional procedures in “minor” cases of plagiarism. In contrast, some lecturers make every effort to demonstrate how the regulations and penalties might apply to Statistics assessments, giving examples of cases detected in previous years.

Many universities require students to sign declarations that their submitted work is entirely their own. The publication of clear, institutional procedures can be valuable both in informing students about what is (and is not) acceptable, and as a strong deterrent to plagiarism. Several lecturers stated that it was their policy to tell students about cases that had been prosecuted in previous years.

Where university procedures were complicated or time-consuming, some lecturers reported that when they had found evidence of copying or collusion they dealt with it informally by warning students against future misconduct. This was generally for first year students who, it was felt, had not understood the difference between collaboration and collusion or had not realised that they must reference their work correctly. However, such informal warnings may not deter some students from future academic misconduct and can be seen as unfair.

It seems to be generally accepted that if formal disciplinary procedures are clear, consistently applied, with a graduated scale of penalties, and with minimal bureaucracy, then staff will be inclined to apply them and students will in turn be inclined not to breach them. A good example is the handbook issued to statistics students at UCL which gives clear guidelines about what is not acceptable with previous examples of plagiarism and the consequent penalties.

4. Plagiarism often goes undetected on large service modules due to a multiplicity of assessors. It is most likely to be detected when one person assesses all the students.

We noted a marked difference in responses concerning specialist statistics courses, which are typically quite small, and very large service modules, with a greater propensity for plagiarism in the latter, simply because of the size of the cohorts.

In the former, many lecturers reported that they did not perceive plagiarism as a problem since they taught small groups, knew their students well, marked all the work themselves and hence would be able to detect collusion and copying quickly. Two respondents said that they looked especially closely at work submitted by students who gained very good coursework marks but did badly in tests.

Ideally all students’ work should be marked by the same staff to give prompt feedback, this is often not feasible. One solution is for different markers to each assess one part of all students’ work, although this has its own organisational problems. Generally, it was considered to be a good idea, when there are multiple markers, to allocate marking at random, rather than, say, by tutorial
group, as this avoids the simple option of a student copying the work of someone in a different group.

5. There is much innovative work taking place in the area of individualised assessment, but also some duplication of effort.

Many statistics lecturers have developed ways of personalising assessments. More information on these can be found in the project report [2]. Some examples are:

- Using the assessment tool within a virtual learning environment to create randomised computer-marked online quizzes. Although this type of assessment fails to address some important learning outcomes, it was seen as a pragmatic response to very large class sizes.
- Creating sets of different multiple choice questions each sharing the same list of possible numerical answers, so that a student who copies an answer is easily detected.
- Using the ISCUS (Individualized Statistics Coursework Using Spreadsheets) tool developed at Coventry University [3]. ISCUS enables a lecturer to create an assignment generator spreadsheet into which students enter their ID number to obtain data and/or tasks.
- Using the digits of the student’s ID number. For example, if the last digit is represented by X, students might be asked to calculate a 9X% confidence interval.
- Setting an assignment where the data for each question is randomly chosen from six available datasets. This reduces copying as the chances of finding other students with the same data for each of the questions is very small.
- Giving all students the same research scenario and associated questions, and then using an online simulator which produces datasets based on the students ID numbers.
- Designing worksheets to ask for numerical answers only, which are submitted on a personalised HTML form or spreadsheet via e-mail. A further refinement is to allocate partial marks for incorrect answers that are nonetheless consistent with earlier submitted wrong answers.
- Using DRUID (Dynamic Resources Using Interesting Data) [4] allows the lecturer to generate a unique worksheet and data set for each member of the class. A solution sheet, with guided instructions, is generated for each worksheet.

However, some respondents thought that individualising assessments was unnecessarily complicated, as they placed little weight on the actual calculations involved and much more on interpretation and constructive criticism. Alternatively, some lecturers reported that they used data and tasks that are so “rich” that there is no good reason why two students should follow the same line of thinking or method of analysis.

6. Assessments that require students to collect their own data, either individually or in small groups, are widely employed.

In many statistics modules students are required to collect their own data. The risk is that the chosen dataset may be one for which some analysis is already available. This can be avoided by requiring students to inform the lecturer of the source of their data so that it can be checked for suitability well in advance of the submission date.

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Further, students can be restricted in the data they collect, for example, the most recently available set for that series (avoiding direct copying from previous students); data must be drawn from any issue of a particular periodical in the current year; allocating each student a different broad topic area, such as unemployment.

Some specific examples reported to us were:

- In a medical statistics module, students have to find their own example of a medical case study, so there is little scope for cheating.
- In a module on time series, students (in small groups) are required to find their own data from “Economagic”. No two groups are allowed to use the same dataset.
- In a service module to Sports Science, students collect data on their own fellow students, e.g. on heart rates or use of supplements.
- FAME (Financial Analysis Made Easy) is a public sector database containing detailed information on 2.4 million companies in the UK and Ireland. Students are allocated variables for two different contexts, so that no two students have the same sets of variables.
- Where a large dataset is available, students can be allocated a different country or a different pair of US States, from which they collect their own data on a particular theme.
- Similarly, students are required to make comparisons between different sets of subgroups within a large database.

7. Many Statistics lecturers have moved away from take-home assignments to in-class supervised computer-based assessments, often based on a previously circulated data set, case study or research paper.

Partly as a response to plagiarism, several lecturers reported a move away from take-home assignments
towards supervised “hands-on” practical assessment in a computer laboratory. Typically, the student is given a data set and a sheet of accompanying questions which require some form of calculation or analysis using a specified computer package.

Another approach is a “seen” examination. An example is to give students a small amount of data and a numerical question one week in advance of the actual examination, enabling them to gain some understanding of the nature of the data. All students receive the same full data set in the formal examination, when they have to perform the required analysis. Clearly, students are able to discuss the data and appropriate analysis in advance of the examination, but the work they present is their own.

Several variations on this approach were reported. Some issue a published paper for students to review in advance of an examination. Another lecturer issues students with case studies throughout the year, which they are free to discuss with each other, but the assessment is in the form of a supervised test.

Another idea is that each student, having completed a common written assignment, gives a brief presentation where they may be questioned or required to replicate some of their analysis. Again, students can discuss the assignment with each other, but the assessment is in the form of a supervised test.

8. In some universities, in-class tests are exposed to a high risk of cheating by unsuitable accommodation, inadequate invigilation, failure to check student identities, and naïve organisation.

Some lecturers expressed concern about lax arrangements for supervised in-class tests. For example, due to resource constraints, tests often took place in crowded lecture theatres with too few invigilators. Not only did this prevent adequate separation of students, but it was impossible to move among the students to examine their ID cards or check for any unauthorised material in their possession.

This is clearly more of a problem in large service modules. Also, in such modules the same test might be sat by different groups at different times, allowing the possibility of information being passed from one group to another.

Several lecturers reported using multiple versions of a test in the same room, arranged in such a way that adjacent students were given different tests. For ease of administration, the different versions would normally be on different coloured paper.

9. The TURNITIN electronic plagiarism detection software is increasingly being used and is giving lecturers greater confidence in the integrity of their coursework assessments.

Electronic submission of assignments opens up a number of possibilities for plagiarism checking. For example, some lecturers scrutinise the properties of each student’s electronic submission, which details the author and location of the file, together with the times of its creation, last modification and last access.

TURNITIN is the online electronic plagiarism detection software recommended by JISC. Currently, it is being used in almost 90% of UK universities at a cost of approximately £5000 per annum for a university of 10,000 students.

Many respondents said they had heard of TURNITIN and were planning to use it in the future, although some thought that it only checked for Internet plagiarism and did not realise that it can be used to check for collusion within a cohort or between cohorts. One lecturer expressed the view that although electronic detection was not in itself very useful, the threat of it was an effective deterrent; another intended to increase the weighting of coursework in the light of TURNITIN, having confidence in its deterrent effect.

TURNITIN greatly assists those lecturers who like students to collect their own data for analysis, as it allays the fear that students will simply download a ready-made analysis from the Internet or will use the work of a student from a previous cohort.

However, a problem in using TURNITIN in statistics assessments is that students are encouraged by their lecturers to use standard forms of technical language in their reporting. This means that almost every student will have a significant percentage of their work reported as plagiarism. The lecturer may have to set a threshold percentage similarity below which they will not investigate.

10. In final year extended project assessments it is good practice to include an element that assesses the student’s working method and, ideally, an oral examination to check that the project is genuinely the student’s own work.

Typically, final year student projects are individual pieces of work which are equivalent, in credit terms, to one or two taught modules. Given this weighting, the potential for plagiarism needs to be taken very seriously; in particular, this is an area where TURNITIN may be helpful.

At several universities, part of the project assessment is for “development” or “ability to progress the project along appropriate lines” or “time management”, as judged by the project supervisor. Thus, in order to do well in this section, students need to show progress in regular meetings with their supervisors and cannot just submit the final written report.

In some universities, each student is given a viva by their supervisor and at least one other member of staff, which has proved a useful way to detect plagiarism.
11. Online cheating companies openly offer an easily accessible, if expensive, way for students to obtain professional individual help with Statistics assignments.

On-line cheating companies provide coursework and dissertation writing services at a range of costs depending on the quality, length and urgency of the work.

We have no knowledge of the quality of statistics work that is supplied, nor the extent to which these types of services are utilised by statistics students. However, such services cannot be trusted to provide a unique piece of coursework. A case was encountered where identical coursework had been submitted by two students who had never met each other. When questioned they admitted that they had both independently used such a service, but thought that they were purchasing a personalised piece of work.

Conclusions

Throughout the past year, we have gathered “evidence” from a number of lecturers on the problems that plagiarism brings and how they combat them. We would like to thank all contributors for the information they supplied and for sharing their ideas. It is apparent that most of us face the same sort of issues and that many of the methods of deterring plagiarism are inventive. This article gives an overview of our findings, and a more detailed report can be found at [2].

References


