International Journal for Educational Integrity

An assessment strategy that pre-empts plagiarism

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Keywords: plagiarism, pre-emption, assignment, physiology, learning outcomes

Abstract

Undergraduate courses in human physiology and pathophysiology often include an essay as part of the continuous assessment, with the intention of giving students experience in independently researching and writing, as well as increasing their understanding of a particular topic. Unfortunately, many of these essay questions may actually foster plagiarism because they can be answered by providing a factual explanation, which is readily available in texts and on the Internet. We describe a strategy for pre-empting such plagiarism, called the 'hypothetical condition' essay, where the instructor invents a fictitious but entirely plausible physiological condition or concept which students must evaluate and discuss. Since no specific background material is available, the student has to research the relevant normal and abnormal physiology and then use their knowledge to logically speculate on the effects of the fictitious condition, so the opportunities for plagiarism are greatly reduced. The hypothetical condition essay was trialled with a second level undergraduate human pathophysiology class in 2007. No cases of plagiarism were detected in the bulk of the essay where students presented their logical arguments on the effects of the new condition. Nor did students appear to be disadvantaged, since there was no significant difference in either the mean, or the variance, of marks among years before and after the new assessment was used. The hypothetical condition essay also appeared to foster originality and critical thought, and we suggest the concept of this type of assessment could be applied in many fields.

Introduction

There is growing concern in tertiary education worldwide about the increasing incidence of plagiarism, especially in written work submitted for assessment by undergraduate students (e.g. Walker, 1998; Darab, 2006). This has frequently been attributed to the availability of material on the Internet which can be easily downloaded or cut and pasted into a new document (e.g. Hansen, 2003).

Initially the discussion about plagiarism concentrated on methods for its detection (e.g. Lancaster & Culwin, 2001), but this has now broadened to include strategies for discouraging it, including educating students about what plagiarism is and the penalties that apply (Barrett & Malcolm, 2005; Darab, 2006; Jackson, 2006). There have been strong calls for devising forms of assessment that reduce the opportunities to plagiarise (e.g. Whitley & Keith-Spiegel, 2002; Yeo, 2005) and Harris (2004) has

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listed several strategies for doing so. These include setting very specific or unusual topics; requiring the inclusion of references written within the past year to reduce the use of commercially available papers; including 'process steps' where students must provide evidence of the construction of their essay (such as annotated photocopies of reference articles); oral presentations to demonstrate their understanding of material, and even making students write a second essay in-class describing what they have learned from their assignment (Harris, 2004). Informing students that their papers will be specifically checked for plagiarism is another (Burke, 2005).

Some of these strategies, such as requiring process steps and oral presentations, can be time-consuming and therefore unsuitable for larger classes. Limiting the sources available to students by specifying a topic for which little reference material is available can be very effective (Murray, 2002; Darab, 2006) and creates little or no extra work for the instructor. Nevertheless, it is still necessary to change topics to prevent sharing of material from previous terms or years (Harris, 2004), and some may be too specialised, or deal with complex concepts unsuitable for first or second year undergraduates.

There appears to be a need for more methods of assessment that pre-empt plagiarism. Here we describe one strategy which was trialled with a second level undergraduate class in human pathophysiology. It is likely to be far more widely applicable and to have other positive learning outcomes.

Types of plagiarism

The meaning of 'plagiarism' is very broad. It can range from large scale theft of previously published material to submission of the same (including original) material by two or more individuals. 'Self-plagiarism' occurs when an author produces multiple versions of the same material. We suggest it may be helpful to define four broad categories of the theft or use of the work of others, and have listed these below in order of what we consider to be decreasing severity.

Slabbing plagiarism is the cutting and pasting of entire paragraphs and even whole sections (e.g. an introduction to a published research paper) of material written by another person into a piece of work without acknowledgement, and with little or no change.

Skipping plagiarism is taking every second or third sentence from one or more textual sources and assembling the sentences in order, thereby constructing what may superficially appear to be a coherent document. We have found this type of plagiarism by students (including postgraduates) who were having difficulty understanding complex concepts.

Sharing plagiarism is when two or more students submit the same or very similar material, which may be their original work. If, however, the shared material has been slabbed or skipped from elsewhere, the severity of the plagiarism is obviously much greater.

Snipping plagiarism is taking a sentence here and there from one or more sources and incorporating these into a piece of work. This may sometimes be inadvertent in that it is very easy for a person's writing style to be coloured by what they have recently read. Nevertheless, we suspect what appears to be snipping may often be the end result of slabbing followed by rewriting, since several students have told us their writing technique is to slab paragraphs of previously published material into a document and then 'do a major rewrite on them'. Essentially this process, which has been called 'patchwriting' by Howard (1993), may produce work that appears to be the rewriter's own words about existing ideas, but it is perhaps not surprising that

some sentences and snippets survive. There is also evidence that academics patchwrite (Roig, 2001).

The motivation to devise a method of assessment that pre-empted plagiarism

Undergraduate courses in human physiology and pathophysiology for the health sciences often include an essay as part or all of the continuous assessment. The intentions are to give students practice and feedback about how to write clearly, succinctly and coherently; to give them experience in independently researching a topic, and increase their understanding of an area or concept of particular importance. Typical examples are, "Explain the major mechanisms by which blood pressure is controlled in humans" and "Compare and contrast Type 1 and Type 2 diabetes. Include a discussion of the causes of each". Unfortunately, such essays may actually foster plagiarism, because the topic only calls for an explanation, of which there are many available in textbooks and on the Internet. We set these types of essays for first year undergraduate courses prior to 2002 and detected major slabbing in 1% of submissions, which was penalised by giving a mark of zero. Almost 40% showed skipping (which was penalised by reducing the mark by up to 20%) and 55% showed snipping plagiarism (which was not penalised). No cases of sharing plagiarism were found.

In 2002 we modified the essay topics used in two human pathophysiology courses in an attempt to reduce the three types of plagiarism we had detected. A researched explanation of normal physiology was still required but students were also given two conflicting points of view about the topic, asked to evaluate these and then logically argue which they thought was correct. Very little pre-packaged material was available for the latter, so this part of the assignment was essentially a case of a topic where little reference material was available (Murray, 2002; Darab, 2006). We called this the *controversial case* essay and the following question about osteoporosis in humans is an example:

> 'The popular and well established view is that the causes of osteoporosis are multi-factorial and probably a combination of insufficient dietary calcium, insufficient weight bearing exercise, low levels of vitamin D, and reduced levels of oestrogen in females and testosterone in males. Very recently, however, a radically different mechanism has been proposed. It has been suggested that the excessive long-term consumption of 'acid forming' foods may be one of the major causes of osteoporosis.
>
> Please compare and contrast both the established view and the 'acid food' view of the causes of osteoporosis. Do you think the new view is plausible? Why? Why not?
>
> There is not a great deal of 'hard copy' literature available on the new view of osteoporosis. A starting reference is provided. You will find some material on the Internet but you should read it critically because it may be of dubious quality.'

The essays submitted by students from the Rockhampton campus of Central Queensland University were all marked by the same lecturer, who had set the topic and was very familiar with it. Essays that contained sentences or phrases the lecturer remembered from the literature, and any that appeared particularly well written, or had internal inconsistencies in font size, layout, grammar or style, were set aside for comparison with the literature, including Internet searches for matching material. Detection of sharing plagiarism relied on the lecturer's memory, but since class sizes were less than sixty and the essays were marked over three consecutive days, this is likely to have been effective. These types of questions appeared to be an improvement over the simple 'explanation' essay topic, in that from 2002 to 2006 we did not detect any type of plagiarism in the section where students had to argue their

own opinion. Nevertheless, we did detect some major slabbing in the initial discussion about normal function. In relation to the osteoporosis question described above, three of a total of five students in a (very small) second level biomedical science class, and one student in another second level class of thirty-five students, were penalised for major slabbing, but since this only occurred in the 'normal function' part of the essay and the topic also required discussion of the new disease, students were given a percentage within the fail ('F' in Table 1) range of 0-40%. Twenty-four percent of the essays showed some skipping plagiarism (penalised by a reduction in mark by up to 10%) and 57% showed some snipping (which was not penalised). This prompted us to seek other means of assessment that more effectively pre-empted plagiarism.

An assignment that pre-empts plagiarism

We call this type of assignment question the *hypothetical condition* essay because the lecturer invents a fictitious but entirely plausible physiological condition which students must evaluate and discuss. Since it is an invention, there is no background material available so the student has to research the relevant normal physiological function and then use their knowledge to logically speculate about the effects of the fictitious condition. The opportunities for plagiarism (apart from sharing) are greatly reduced because students are not asked to describe or rework existing material. We invented the following topic and question and used them in Term 1, 2007:

Mosquito borne venous nodulation

> At the January 2007 World Conference on Emerging Infectious Diseases, Dr Klaus Weilebaum and Professor Werner Hortebort described a new viral disease transmitted among humans by mosquitoes. The disease, reported in thirty-five people from three locations in South America, has been provisionally called 'Mosquito Borne Venous Nodulation (MBVN)'. Infection occurs after being bitten by a mosquito that is carrying the virus. Once in a person's bloodstream, the virus invades cells of the endothelium (the inner lining) of the veins, and only reproduces in these cells. Infected cells rupture within a few hours, releasing millions of virus particles into the bloodstream which can infect further cells. The endothelium of the veins becomes inflamed, and after two to three days undergoes dysplastic cell division, forming large numbers of nodular masses which protrude into the vein. The inside of a badly affected vein has been described by Werner Hortebort as 'looking like it has many heads of cauliflower growing out from the endothelium and protruding into the vein'. The growths remain in place and do not detach.
>
> From your knowledge of normal and abnormal physiology, please describe the likely consequences of being infected with MBVN. Start by speculating on what general effect these attached nodular masses will have on the normal function of veins. Then, speculate on the likely effects of this condition on the functioning of (a) the heart, (b) the lungs, and (c) the liver. Finally, please give your reasons for agreeing or disagreeing with the statement by Klaus Weilebaum 'Being growths in a vein it is not likely to affect the person's health. If they happened in an artery it would be life threatening'.

It is important that the name of the hypothetical condition and the researchers are not on the Internet, otherwise they (or their organisation) may receive a considerable number of emails from your class. To prevent this, the names Hortebort and Weilebaum in the essay question were generated by single letter mutations of existing names, until no hits were obtained using the search engine Google.

The learning outcomes were listed in the course profile, which students could access before term started. An outcome particularly relevant to the assessment was, “On successful completion of the course students should be aware that our understanding of physiological processes in both health and disease is incomplete, subject to error and likely to change in the light of new research findings”. The assessment criteria used (which were also given in the course profile) are in Table 1. It was emphasised in class (where lectures were video streamed and available on the Internet) that students should concentrate on the new disease and that reference to normal function was only required where it was necessary to explain the effects of the new disease.

Table 1:
Assessment criteria for the essay provided to students in the course profile

HD (85% or higher): Original style, explaining concepts clearly and logically in the student’s own words without unexplained technical terms or great slabs of quotation. Extremely well-argued and appropriate criticism, including integrated, original, sustained arguments. Very well written—no ‘there’ where ‘their’ is appropriate, ‘it’s’ where ‘its’ should be, etc. with few or no grammatical errors. Referencing consistent in format throughout.
D (75–84%): Original style but not always argued clearly and logically, or written in the student’s own words. Well written, but with less originality than the HD standard discussed above. Well argued and appropriate criticism. No great slabs of quotation. Some grammatical errors. Referencing consistent in format throughout.
C (65–74%): Argument and discussion less clear, less original or poorly integrated. Perhaps some unexplained technical terms, or poorer explanation. Grammatical errors. Less obvious originality and more reliance on quotations. Referencing consistent in format throughout.
P (50–64%): Discussion and argument sketchy, with little evidence of understanding. Poorly written. Unexplained technical/physiological terms. A lot of direct quotes rather than use of own words. Poorer grammar. Referencing inconsistent and/or incomplete.
F+ (40–49%): Essay poorly written, excessive use of quotation and technical/physiological terms. Scanty treatment in general. Few or no references.
F (less than 40%): Obvious plagiarism.

The intentions of the essay question were (a) to increase understanding of normal circulatory physiology, (b) foster logical, original thought by requiring students to speculate about the consequences of the hypothetical condition, and (c) encourage the awareness that new diseases or unusual medical conditions may be encountered in clinical practice. We deliberately did not initially reveal that the disease was ‘fictitious’ or ‘hypothetical’ because previous experience had shown that students in the health sciences tend to dismiss anything not immediately relevant to ‘learning about physiology’ as a waste of their time.

Results

The essay question was made available before the start of term via the electronic course content management system used by Central Queensland University. Students also had access to a course website which used the Blackboard™ Academic Suite and included a virtual class discussion board on which students and the lecturer could post comments.

One very early outcome was a telephone call to us from the science librarian at Central Queensland University, who had been approached by a student whose search strategy had been to cut and paste the entire two paragraph essay question into a Google search. After finding nothing of relevance the student said, with considerable surprise, 'This is the first time I've needed to talk to a librarian in my two years at university'.

Evolution of the student discussion

Examination of the comments posted on the discussion board revealed three distinct phases, which were (a) disbelief, (b) understanding, and (c) enthusiastic technical discussion. Before the start of term, there was disbelief that no information on the condition was available. One student queried the spelling of the names of the researchers, saying they had to be wrong because "*Nothing came up on Google*". A second commented "*Google must be having an off-day. I'll try again tomorrow*". Four others asked for references to more information about the disease. When told this was not available or necessary, they responded with, "*Yes, but I want to know more about it!*" Another reported "*I have looked up the World Health Organisation website for more information on the world conference on infectious diseases regarding MBVN and have not had any luck. Do you think this is unnecessary?*" During the first week of term another said "*I caught your first lecture and I think I heard you comment that it would not be easy to find information on this subject. Was I hearing things? I have searched Blackwell Synergy and not come up trumps either. Any assistance with direction would be appreciated*".

After several comments had been posted by the lecturer about the hypothetical nature of the disease, together with some guidance about the need for students to argue their own opinion about something entirely new, the tone of the discussion changed. One student commented:

> *Considering that the course profile was released in January (i.e. possibly even before the conference occurred) and from hints given by the lecturer, I have the impression there may be no such disease and the information is purely hypothetical. If it is totally hypothetical, then the conference, Dr and Professor Whateverhisname seem to be irrelevant to the learning outcome stated in Part A of the course profile. We need to concentrate on these'*

Another said '*I'm assuming that he wants us to focus on the effects of MBVN on the veins, then expand to include the effects on the heart, lungs and liver, then argue about the statement by the Klaus Weilebaum dude as to whether we agree or not*'. A third agreed:

> *My understanding of the assignment is that the lecturer wants us to explain the effects on the body of MBVN, not actual research on the condition. The only information we need to explain is what effect the virus has on the veins, lungs, etc. is explained in the course profile (that the nodules protrude into the vein and that they do not detach). Apart from the information the lecturer has given us, I don't think we need to know*

© International Journal for Educational Integrity Vol. 3 No. 2 December 2007 pp. 18-26 ISSN 1833-2595

any more about the condition than we already do... we're explaining the effects, not the actual condition.

Finally, after the first two weeks of term, there was detailed and enthusiastic discussion where students showed evidence of considerable research into normal physiology and the likely effects of the new disease. For example, one student commented:

You could go on and on about this topic. There may be the need for increased cardiac output but if the pulmonary circuit is compromised and the pulmonary vein is shot then there won't be much blood getting through to cope with the need for increased cardiac output. Plus the veins of the heart are affected too so the heart muscle will be having a hard time of it anyway.

Another said '*If cauliflower growths developed in the coronary veins, is it possible they might reduce flow in the coronary artery, causing ischaemia and an infarction? I'm not sure if I'm on the right track with this one...any ideas?*' The most impressive question was '*Would this condition have the same effect as endothelium blebbing and tylosis and be affected by Virchow's triad?*' and the lecturer had to do some additional reading before responding. Considering the class discussion, it appears that a particularly worthwhile consequence of this form of assessment is the development of analytical thinking and originality.

Several unsolicited comments were made when the essay was submitted. Five students said '*This has really helped me understand and appreciate how the circulatory system actually functions'* and one said '*This essay is a brilliantly composed test of student understanding of the systemic implications of disease*'.

Outcomes in relation to plagiarism

As described previously for the question about osteoporosis, the essays were all marked by the lecturer who had set the topic, who also scrutinised for plagiarism. We did not detect any cases of slabbing, skipping, snipping or sharing plagiarism in the discussion of the possible effects of MBVN and there was only slight snipping evident in reference to normal function in 12% of essays. Very pleasingly, there was evidence of logical, original thought, the clever use of analogy, and even some humour. The majority of students concentrated on MBVN, but some included unnecessary descriptions of the life cycle of mosquitoes and others offered irrelevant arguments about why the condition did not affect arteries.

From 2002-2003 and from 2005-2007 inclusive, the same lecturer taught human pathophysiology and marked all the essays submitted by students in this course at the Rockhampton campus of Central Queensland University, so data for different years were not confounded by differences among markers. Over 90% of the class passed the course on their first attempt. Data for subsequent attempts by repeating students were excluded, thus giving five independent samples for four years (2002, $n = 50$; 2003, $n = 48$; 2005, $n = 43$; 2006, $n = 47$) for the controversial topic essay, and one year (2007, $n = 57$) for the hypothetical condition. The mean mark for the essay was 3% higher in 2007 compared to the mean for the four other years, but a single factor analysis of variance showed no significant difference in this statistic among years ($F_{4, 240} = 1.714$, $P > 0.05$), nor was there a significant difference in the variance (Levene's test: ($F_{4, 240} = 1.185$, $P > 0.05$)). In hindsight, these results are somewhat surprising, since the lack of students penalised for plagiarism in 2007 should have reduced the proportion of marks in the lower tail of the distribution, thereby increasing the mean and decreasing the variance. First, however, it is possible that any increase in the mean as a result of pre-emption of plagiarism in 2007 was counteracted by the more

challenging requirement for logical thought and originality compared to previous years. Second, any decrease in the variance may have been counteracted by some students who appeared to relish the opportunity of developing their own logical arguments and thus received extremely high marks, while others appeared to find this very difficult and received only a passing grade. These explanations are consistent with the perception of the marker who commented, 'A small group has done extraordinarily well, but another seems to have really struggled. I have the impression it has spread the marks out more than in previous years'. Overall, the group did not appear to be disadvantaged, and this form of assessment may also provide welcome encouragement and stimulation for students who are original thinkers.

Conclusion

By providing an essay topic on a fictitious condition, we succeeded in virtually eliminating slabbing and skipping plagiarism from established sources. Essentially, the hypothetical condition essay could be considered an extreme case of using a topic so unique that little material was available to support it, as recommended by Harris (2004) since in this case there was nothing at all. Furthermore, the minor snipping plagiarism detected was only in the mention of normal function, and the essay assessment criteria concentrated on the students' discussion of the hypothetical condition. Importantly, the lack of any significant change in either the mean or the variance of the mark after the introduction of the hypothetical condition topic in 2007 suggested students were not disadvantaged. Since all of the assignments were marked by the same person (SM) we cannot exclude the possibility of unintentional stabilisation of the marks among years, but this is unlikely since the assessment criteria were the same for each year and the decision to make this comparison occurred after all the marks for the 2007 course had been finalised.

The hypothetical condition essay about mosquito borne venous nodulation retains the benefits of getting students to research and establish a good understanding of normal cardiovascular physiology and to write clearly about it. It also fosters originality and critical thought, which we suggest is particularly beneficial for students. Furthermore, although the example given here is physiological, we suggest the concept of assessment based on a hypothetical condition is far more widely applicable. For example, it is likely to be relatively easy to invent a piece of prose for critical analysis, a new finding in psychology or sociology, a new effect of anthropogenic pollution upon an ecosystem, or a hypothetical structural material in engineering. Our only caution is that the example needs to be logical, robust and plausible.

For large classes of several hundred or more, a hypothetical condition topic may also result in fairer assessment, since marking is often distributed among several staff or graduate students, who may not have the time, experience or motivation to detect slabbing, skipping or snipping, especially if they are paid by the hour or the number of items marked. Another disadvantage of distributed marking is that assignments written by sharing may not be detected because they are read by different people, but the hypothetical condition topic will not improve this. One strategy for detecting (and discouraging) sharing would be to require electronic submission so that the content could be compared among assignments using anti-plagiarism software. It is impossible to prevent another person doing an unsupervised assessment for the student, but commercially available pre-written essays would not be available for the first offering of an hypothetical topic, and the cost of having one written is likely to be prohibitive.

Although the hypothetical condition assignment appears to have distinct advantages in both reducing plagiarism and fostering original thought, this strategy for pre-emption should not be used exclusively, since it is clearly necessary to educate students about dealing fairly with the work of others. We have used this report on the hypothetical condition essay as an entertaining and non-threatening way of

stimulating debate about plagiarism and fair dealing with a much wider range of students, including a group of commencing postgraduates and a second year biostatistics class. One outcome was some very frank admissions about how students wrote, which we noted when defining types of plagiarism earlier in this paper.

Finally, the challenge of trying to pre-empt plagiarism has made us critically consider what learning outcomes we were trying to achieve by setting an essay as an assessment item. A topic that can be answered by a summary of facts, or the reworking of readily available explanations, has less value for students than one which fosters critical and original thought (e.g. see Yanowitz & Hahs-Vaughn, 2007). We suggest that many assessment items are only set because it has been traditional to do so. It may be timely for instructors to review their assessment practices with the intention of providing learning outcomes more beneficial for their students, as well as pre-empting plagiarism.

Author biography

Steve McKillup and Ruth McKillup are in the Faculty of Sciences, Engineering and Health at Central Queensland University. Their primary research interest is marine ecology. Ruth is also a professional proofreader and member of the Queensland Society of Editors. Steve developed and taught the human pathophysiology course in which the 'hypothetical condition' essay was trialled and also teaches biostatistics and experimental design, about which he has written a textbook.

References

Barrett, R., & Malcolm, J. (2005). Embedding plagiarism education in the assessment process. In *Educational Integrity: Values in Teaching, Learning and Research: Proceedings of the 2nd Asia-Pacific Educational Integrity Conference, University of Newcastle,* 19-25.

Burke, M. (2005). Deterring plagiarism: A new role for librarians. *Library Philosophy and Practice, 6*(2), 1-9.

Darab, S. (2006). A preventative approach to plagiarism: An empirical study of a first-year unit for undergraduates. *International Journal for Educational Integrity, 2* (2), 100-112.

Hansen, B. (2003). Combating plagiarism. *The CQ Researcher, 13*(32), 773-796.

Harris, R. (2004). Anti-plagiarism strategies for research papers. Retrieved 8 August 2007 from http://www.virtualsalt.com/evalu8it/

Howard, R.M. (1993). A plagiarism pentimento. *Journal of Teaching and Writing, 11*, 233-246.

Jackson, P.A. (2006). Plagiarism instruction online: Assessing undergraduate students' ability to avoid plagiarism. *College and Research Libraries, 67*(5), 418-428.

Lancaster, T., & Culwin, F. (2001). Towards an error free plagiarism detection process. *ACM SIGCSE Bulletin, 33*(3), 57-60.

Murray, B. (2002). Keeping plagiarism at bay in the Internet age. *Monitor on Psychology, 33*(2), 5p.

Roig, M. (2001). Plagiarism and paraphrasing criteria of college and university professors. *Ethics and Behavior, 11*(3), 307-323.

Walker, J. (1998). Student plagiarism in universities. What are we doing about it? *Higher Education Research and Development, 17* (1), 89-106.

Whitley, B.E., & Keith-Spiegel, P. (2002). *Academic dishonesty: An educator's guide.* Mahwah, NJ: Lawrence Erlbaum.

Yanowitz, K.L., & Hahs-Vaughn, D.L. (2007). Changes in student-centred assessment by postsecondary science and non-science faculty. *Teaching in Higher Education, 12*(2), 171-184.

Yeo, S. (2005). *Minimising student plagiarism through assessment design.* Perth, W.A.: Learning Support Network, Curtin University of Technology.