

Using online assessments to enhance student engagement with biological psychology

Dr Lucy Annett, Dr Sue Anthony & Dr Stefanie Schmeer

School of Psychology,
University of Hertfordshire, College Lane, Hatfield,
Hertfordshire, AL10 9AB

l.e.annett@herts.ac.uk, s.h.anthony@herts.ac.uk, s.schmeer@herts.ac.uk

Abstract

Coursework tasks were introduced for the teaching and assessment of biological psychology modules for cohorts of over 200 Psychology BSc students. Biological psychology is considered “hard” by many psychology students because of new neuroanatomical and pharmacological terms which can be a barrier to learning. Regular online assessments were introduced to encourage the habit of undertaking work related to the lectures each week, so enhancing engagement with the course. Coursework tasks were aligned to the module aims, including writing a glossary to build up familiarity with new terms and producing an electronic “leaflet” on a brain topic of the student’s choice. For the latter task students worked in small groups to encourage discussion and to reduce staff marking load. The best “leaflets” were made available online for all students to view for a competition.

Online quizzes were particularly popular and were the most efficient method of delivering and marking weekly coursework. The multiple choice questions (MCQs) were devised to encourage students to review key points from the preceding lecture and provided practice for the MCQ component (50%) of the final exam.

It is argued that MCQs suitably designed to probe key concepts can be used to assess deeper understanding, not just knowledge of facts. In particular, questions set to be answered in the student’s own time during the week following the lecture can be more complex, requiring further study around the lecture topic, than MCQs as used in a traditional test. Student comments on the online MCQs included: “... they make you search for the actual purpose of things...you get a better idea of how everything slots together”.

Interestingly, performance on MCQs in exams correlated significantly with that on the written exam answers ($r=0.657$ and $r=0.590$ in two modules, $p<0.01$), suggesting both methods assessed similar underlying knowledge/ability.

Keywords

Biological psychology; coursework; multiple choice questions; online assessments; glossary task.

I. Introduction

The study of brain mechanisms underlying psychological processes is an important aspect of modern psychology and is required for recognition of degrees by the British Psychological Society. The first (level 4) and second (level 5) year biological psychology modules are compulsory for the BSc Psychology and Joint Honours Psychology major at the University of Hertfordshire with around 220-250 and 180-220 students taking these modules, respectively, each year. However, students may not appreciate before embarking on a psychology degree that this will involve studying the brain. Biological psychology, involving the use of new neuroanatomical and physiological terms, is considered “hard” by many students and can intimidate even those who have taken science A levels. This barrier to learning is compounded by poor attendance at lectures, a general problem that may be linked to the availability of lecture slides on the virtual learning environment (VLE). Because the lecture slides can be downloaded at any time, some students leave this late into the course, and then find it difficult to understand evidence and grasp concepts when attempting to cram information in a short space of time before the exam, resulting in poor grades and failures. Prior to the changes described here, coursework assessment for the level 4 module was one 2,000 word essay and an in-class test. However, because these tasks were scheduled relatively late in the semester to fit around coursework for other modules, and because for such a large cohort a rapid marking turnaround time was impractical, students typically did not receive feedback on the biological psychology coursework much before the final exam. For the level 5 module there were no coursework assessments as student work was focused on essay assessments for another (non-biological) level 5 module.

In order to encourage engagement with biological psychology, regular online “homework” tasks were introduced for the coursework components of the summative assessment for these two modules, contributing 40% and 20% of the assessment for the first and second year modules, respectively. Online “homework” tasks have been used successfully for teaching psychology students statistics at the University of Hertfordshire. The present project extended this approach by designing coursework tasks for the purpose of building familiarity with biological psychology terms and so that students would develop the habit of undertaking work related to the content of the lectures each week.

2. General principles

In designing the online coursework tasks, we were mindful of the principle of “constructive alignment”, that the assessment should involve learning activities aligned to the desired learning outcomes for the modules (Biggs & Tang, 2007). An important point here is that students learn more effectively by doing a task than by passively listening to an account of a particular topic in a lecture (“... what the student does is actually more important in determining what is learned than what the teacher does”, Shuell, 1986, as cited in Biggs & Tang, 2007, p.52). Even when the content and delivery of a lecture is excellent, learning is not guaranteed if student attention happens to wander and key points are missed. Requiring students to engage in tasks for which key information has to be identified and used, then that information is more likely to be understood and retained. Preparing an answer to an essay question is one way that students engage with key course content, but naturally students expect feedback on their essays and providing this weekly is not practical for large cohorts. Preparing for a small group discussion is another task that supports learning, the incentive being that students can show in front of a tutor they have read and understood the recommended reading, but again staff resources may limit the provision of regular discussion groups. Tasks with no assessment attached can be provided, but (sadly) students rarely complete these unless the mark “counts” towards the module grade; the carrot (or stick?) that ensures coursework tasks are completed is the summative assessment. Therefore, the assessment is *for* learning rather than just for the purpose of measuring learning outcomes. While the principle of constructive alignment may be understood, the challenge is to translate this into practical tasks that can be assessed even with large cohorts. When devising coursework tasks the starting point is to consider the fundamental aims of the module, the core learning outcomes, and design the coursework tasks around these. While the tasks described below are examples of how this was done for biological psychology, the general principle of designing coursework tasks around core learning outcomes can be applied to other disciplines. Indeed, the specific tasks described here could perhaps be adapted for coursework assessments in other disciplines where the key learning outcomes are similar.

3. Glossary task

An important learning outcome for the first year module is that students become familiar with key biological psychology terms. These terms provide the foundation on which knowledge for the second and third year modules is built, and without this knowledge students find it difficult to progress. The first few lectures of the module describe the basic organization of the brain and nervous system and processes such as how neurons conduct action potentials, synaptic transmission, and the actions of drugs on neurotransmitter systems. To compliment the information given in lectures, a coursework task was required in which students had to actively seek key information and note this down for themselves, rather than simply reading about the topic. A task was devised in which 38 key terms were listed (e.g. “limbic system”, “synapse”, “direct agonist drug”) and students were required to provide a definition in no more than 25 words for each term, i.e. create a glossary. Students

were free to use their lecture notes, definitions from text books (including text book glossaries) or internet resources to complete the task, with the warning that definitions should not be copied blindly without thought and to check their definition against more than one source. The definitions were then entered into a template Excel spreadsheet that had been set up to aid marking so that scores entered by the marker (2 for correct, and 1 for a partial definition) were summed automatically. The template also allowed space for the marker to cut and paste a correct definition if needed or the simple feedback “good” for accurate definitions. The completed Excel sheet was submitted and returned, including the feedback, total correct score and grade awarded, electronically via the University of Hertfordshire VLE. While the time taken to mark and return 200+ glossaries should not be underestimated, it is feasible for a single person to mark this in considerably less time than would be required to mark the same number of written assignments. To ease the marking burden, if additional staff hours are available, then the task can be marked by others with some knowledge of biological psychology without necessarily being expert, e.g. graduate students, who have been provided with a list of permissible correct definitions.

Given that definitions of terms are readily available, a reasonable question that may be asked is do all students score 100% correct? The answer is they do not (at least not first year psychology undergraduates; graduates taking an MSc psychology conversion course did have had notably higher average scores). Low scores generally resulted from not following the task instructions, for example not including mention of both location and function in the definitions of brain structures when this was specified in the instructions, using more than 25 words (score 1 rather than 2), blindly copying definitions not relevant to the nervous system (e.g. ventricles of the heart rather than the brain, score 0), or simply leaving some definitions blank. General feedback then included the important messages to take note of and follow task instructions carefully and to not leave completing coursework tasks until close to the submission deadline. Low scores typically identified those students who were not coping well with the course in general. On a brighter note, many students did achieve high scores and the issue then was how to convert (i.e. map) scores to grades that were not out of line with assessments on other modules. This was done by awarding maximum scores (all 38 definitions scored 2) a high first class grade of 80, and scores only just above 50% correct, the minimum pass grade of 40, and mapping scores in between so that grades were reasonably distributed. Reflecting on the task, students commented that having created their own glossary they did not feel so intimidated by new terms. Indeed, for the module following year some students requested that a glossary task be included in the assessment.

4. Brain “leaflet” task

A goal of the first year biological psychology module is to stimulate interest in brain topics and neuroscience discoveries relevant to psychology. Lectures deliberately include topics with a “wow” factor (e.g. memory deficits resulting from brain damage, phantom limbs, split brain cases – two brains in one head?) as a positive way of engaging interest and stimulating discussion. However, first year lectures cannot cover all of the exciting brain topics of potential interest to psychology students, for example brain mechanisms underlying psychiatric disorders and drugs that affect cognition. A coursework task was therefore designed that gave students the opportunity to discover more about such topics by encouraging them to search for information and to share their findings with other students. An assignment was set up in which students worked in groups of 2 or 3 to produce an electronic “leaflet” (1 or 2 slides in a power point file) on a brain topic of their choice, including text and illustrations suitable for introducing the general public to the topic, and including one reference to a scientific article and another reference to an alternative web resource, e.g. newspaper article, radio podcast, or relevant charity website. The Society for Neuroscience web site (<http://www.sfn.org>) was suggested as a useful starting point to find information. A list of around 30 potential topics was provided, although the choice was not limited to topics on the list, and students actively decided on a topic after discussing their joint interests with others in the group. Students submitted the assignment electronically via the VLE, and the grade with feedback was returned by the same route. After marking, a selection of the best “leaflets” was made available online for all students taking the module to view and vote on in a competition for which book token prizes were awarded, thus providing an opportunity for students to learn about other topics beyond the one chosen for investigation by their own group. A relatively simple marking scheme was devised in which points were awarded for content (0-9), clarity of explanations given in the text (0-6), the overall layout and look of the “leaflet” (0-4), and the inclusion and appropriateness of the two references (2 x 0-2). The total points score was then mapped to an appropriate grade, and a couple of sentences added as feedback to explain why the points were awarded, to praise good work and/or suggest ways in which the “leaflet” could have been improved. Since the task was completed in small groups the staff marking load was reduced, and yet students gained more from the group discussions than if the task had been undertaken individually, and said they particularly enjoyed this aspect of the task.

5. Multiple Choice questions in weekly online assessments

Multiple choice questions (MCQs) are perhaps typically thought of as useful for tests that measure learning of facts. The case made here is that MCQs can also be used for coursework that encourages students to engage with the course content, i.e. assessment *for* learning rather than testing *per se* (Nicol, 2007). The same principles apply as for the other coursework tasks described above. Students learn by doing, and a coursework task that requires active searches for answers to quiz questions is a useful tool to compliment learning in lectures. Importantly, the quiz questions should be designed so that students are required to think about key concepts. This in turn requires the teacher to think carefully about the course content and identify the dozen or so key points they would wish students to understand and remember from each lecture. Thus, the MCQs should be designed around the desired learning outcomes, rather than questions simply requiring knowledge of trivial facts (Higgins & Tatham, 2003).

The practical application of these principles to the biological psychology modules involved setting online MCQ quizzes, typically consisting of about 12 questions for the first year and 20 questions for the second year module each week. The quiz opened immediately after the lecture and students had one week to answer the questions, the deadline for submission being one hour before the next lecture. Quizzes were set up in the University of Hertfordshire VLE, StudyNet, however any VLE with an MCQ quiz facility could be used provided the quiz output generates three basic pieces of information downloadable to an Excel file: the student name, number of questions answered correctly, and the date/time the quiz was completed. There is no need for the quiz to become live and then close after a certain time (although some VLE quiz facilities allow this), since it is a simple matter to determine from the date/time information whether the quiz was completed before the specified deadline. A series of straightforward steps was used to transfer the quiz output, listed in date/time order of submissions, to the class mark sheet in Excel. First, quiz entries after the deadline were discarded, then the file was sorted in alphabetical order to match the class list, then any second or further attempts were discarded as only the score from the first attempt was used in the calculation of the coursework grade. Students were encouraged, however, to complete the quiz more than once to work out the correct answer to any questions they may have got wrong the first time around, and for revision before the exam (that also included MCQs). An advantage of providing the quizzes online and allowing students to complete the questions in their own time was that the questions could be more complex than as used in a traditional timed test, even requiring another task, for example reading an article or finding information on a different website (e.g. virtual brain models), in order to answer the question.

As for the glossary task, one might ask why students would not all get full marks given the quizzes were completed as coursework rather than timed tests, with a week allowed to work out the answers to the questions, but they did not. Again, poor performance on these coursework quiz tasks identified students who were not coping well with the course in general. Indeed, students who failed to submit the first two coursework quizzes had below average grades on the exam at the end of the module. Thus, coursework quizzes could potentially be used to provide a very early indicator of those students who would benefit from additional support. The quizzes included a range of questions with respect to question difficulty, nevertheless some students achieved very high scores. The quiz scores were therefore mapped to grades rather than simply using the percent correct as the grade. Multiplying percent correct scores across all the quizzes by 0.8 produced a grade distribution in line with assessments for other modules, for example where 78% would be awarded for a top first class essay and 40% is a minimum pass. Although the quiz questions could be made more difficult for the purpose of using percent correct scores directly as grades, a disadvantage would then be that the adjustment would have to be such that even top students would get around 25% of the answers incorrect, and average students only about 50% correct. This level of failure would be counter to the main purpose of the using the coursework quizzes as assessment *for learning*.

Since the online weekly quizzes were used as coursework, the grade for which did contribute towards the overall module grade (otherwise the majority of students would not have completed the work), a valid concern here is, were students completing the quizzes on their own or with the help of others, i.e. was the work entirely their own? As coursework, the online weekly quizzes are not actually different in this respect to other coursework tasks for which students might co-operate to some extent before submitting as their own work (co-operation for essays might be easier to spot, but not necessarily if several different members of staff mark essays submissions from a large cohort). A discussion point here is how far is co-operation a bad thing given that the purpose of the coursework is to encourage learning, not simply to test? Students learn through discussion with their peers. Provided the coursework quizzes were completed co-operatively, similar to group work, then the benefits of the quizzes supporting learning by encouraging weekly engagement with the coursework material, could be argued to outweigh the disadvantage of some uncertainty regarding who contributed what. Co-operation is only really a problem if answers to questions are copied blindly without any thought as to why the answer is correct. In order to reduce the risk of blind copying, quizzes could be designed so that different versions, including questions in a different order and/or worded in a different way, could be used for sub-groups of students, although this was not done here. Instead, the check was that students were also required to pass an end-of-semester exam in order to pass the biological psychology module overall; high grades for the coursework alone were not sufficient to compensate for failure in the exam.

The online coursework quizzes provided useful practice for the MCQs that comprised 50% of the assessment in the exam, the other 50% being two short answer questions for the first year module, and one longer essay for the second year module. While it might be thought that MCQs are inherently easier than writing exam answers, this was found not to be the case, in the second year exam the average grade for the written essay answer being 48.8% and for the MCQs 45.5% (MCQ correct scores mapped to grades using the 0.8 multiplier). Interestingly, performance on the MCQs correlated significantly with that on the written answers in the same exam ($r=0.657$ for the first year module and $r=0.590$ for the second year module, both $p<0.01$), suggesting both measures assessed similar underlying knowledge/ability.

6. Evaluation

Of the three types of coursework task described here, the online quizzes were by far the most efficient method of delivering and marking weekly coursework. The initial set-up, in particular devising the questions, took some time, however once this had been done then the same quiz set-up and bank of questions could be used in subsequent years. Downloading scores and sorting marks to the class list took a matter of minutes for each quiz. An advantage for students was that feedback on whether or not an answer was correct was instant. In addition to the correct/incorrect score, the quiz facility allowed the provision of additional feedback comments from the teacher when particular answers were chosen, explaining why that answer was correct or incorrect. Even though each quiz contributed only 1-2% to the overall module grade, submission rates were generally high and students welcomed the opportunity to complete the task flexibly in their own time. Student comments included: “the coursework tasks were very well suited for this particular topic and actually helped me get a better understanding of the subject as a whole...”, and “... they make you search for the actual purpose of things ... you get a better idea of how everything slots together”.

7. References

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