Teaching Chemistry in Higher Education

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13 Using PeerWise to support the transition to higher education

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The aim of this work is to encourage and increase student engagement within a Year 1 chemistry module and support students in more meaningful learning of chemistry as they transition to higher education. PeerWise — a freely available online platform for creating and answering multiple choice questions — was implemented as an assignment in Year 1 to produce student-generated content. An initial workshop activity to scaffold question-writing afforded students the opportunity to create, analyse and synthesise questions with the additional challenge of coming up with plausible distractors, which is a new approach to their learning. Engagement with the online system was high with contributions, particularly answering questions, going beyond the minimum requirement.

PeerWise was evaluated from data analytics within the platform and also from student feedback on this activity. There was evidence of deep learning approaches and critical evaluation from students which was supported and enabled through the use of PeerWise. The use of the student-generated repository as a revision tool after the assignment deadline demonstrates the usefulness and value of PeerWise for student learning. Some students did not engage with PeerWise beyond the assignment deadline due to time constraints and the perceived lack of authority in student-generated content. This approach is very versatile and can be used within many contexts.

Influence of Professor Tina Overton
Tina has been a tremendous role model, particularly when I started to explore chemical education in my research activities. Her positivity, enthusiasm, and encouragement helped me to continue with a shared endeavour to make chemistry learning more meaningful for my students and question any approach using the same rigour we demand from scientific research.

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Introduction

Challenges on transition into higher education

The first-year transition into higher education provides a considerable challenge both academically and socially for students. This includes adjusting to living away from home, balancing part-time employment responsibilities and adapting to the newer concepts of becoming independent learners who are responsible for their own personal learning in partnership with academics but without the constant direction from a teacher (Yorke, 2000). The increase in the diversity of the student population has been in place in the UK since the 1990s and similar trends are observed in many other countries. This widening participation encompassing more mature students, international students, students with a disability, students from under-represented groups (such as black and minority ethnic), and students who are first in the family to attend university, has a definite impact on student identity and ultimately on retention. Scanlon *et al*. (2007) propose that the context and process of student identity is formed from the nexus of situated interactions with lecturers and other students.

In the context of the first-year student learning experience, success is best evaluated in terms of how the students (from a variety of diverse backgrounds) adjust to the demands of their first year. This is typically measured by engagement (such as attendance, completion of curriculum requirements) and performance (grades) which can highlight at risk students and stimulate further action, such as meeting with an academic tutor, or completing a reflective action plan (Yorke, 2006). Engagement also encompasses non-academic and social aspects of the student experience. Student engagement is developed from the dynamic interplay between the student and the institution in terms of activities that support learning and also include self-efficacy, well-being, and belonging (Kahu and Nelson, 2018; Krause and Coates, 2008)

Approaches to learning

The level of engagement and the student's approach to learning are linked (Yorke, 2006). Students can adopt strategic, deep, or surface approaches to learning. A surface level approach is one where the student focuses on learning and remembering the contents they study, whereas a deep level approach is one where the student focuses on the message and the meaning of the contents they study. A strategic level approach is one where the student focuses on achieving the best grades possible. Some are motivated by their own competitiveness to do better than their peers, while others are driven by a strong desire to succeed.

A study by Marton and Saljo (1984) showed that such deep and surface approaches relate to the qualitative differences in learning outcomes. The deep approach relates to high quality learning outcomes and the surface approach relates to lower quality outcomes. It is important to consider the approaches to learning when designing assessments so that it is difficult for a learner to adopt a surface approach and perform satisfactorily. This was considered in designing the PeerWise assignment. I asked myself "*how can I ensure that the students must think more deeply and make sense of their chemistry learning within this assessment design?*"

Effective assessment

Assessment in higher education (HE) focuses on challenging students throughout their studies, enabling them to acquire the knowledge, skills, and attributes to equip them for a rapidly changing and complex world and ensure they have the confidence to thrive as global citizens in the 21st century (Boud and Falchikov, 2006). The resulting drive is towards assessments that require more meaningful tasks and help to embed generic employability skills, referred to as authentic assessments (Darling-Hammond and

Snyder, 2000). Within this development, to ensure that students are empowered the feedback cycle as defined by Carless and Boud (2018) is "*a process through which learners make sense of information from various sources and use it to enhance their work or learning strategies*" is highly important. When thinking to adopt PeerWise, I considered how the students would obtain feedback on their work as the feedback cycle promotes meaningful learning. The peer feedback design within PeerWise allows for constructive feedback and places the students centrally in the learning process.

The function of assessment has evolved in HE to include both a summative approach (assessment of learning) and a formative approach (assessment for learning) (see Nicol and Macfarlane-Dick 2006; Carless, 2007; Brown, 2005) to promote and enhance learning. The PeerWise assignment was designed to function as a learning activity as well as an assessment activity.

Bloom's Taxonomy (Bloom and Krathwohl, 1956) is a six-level classification system that uses student learning behaviour to infer the level of cognitive achievement. The levels are considered hierarchical whereby each level is subsumed by the higher levels; therefore, a student functioning at the application level has also mastered the topic at the knowledge and comprehension levels. Although it is a hierarchical framework, it is not a prescriptive model. A revision of Bloom's taxonomy was coordinated in the 1990s with changes in the three broad categories of terminology, structure and emphasis (Anderson and Krathwohl, 2001). Figure 1 illustrates and provides a summary of the six revised levels of Bloom's Taxonomy. The surface approach to learning as described previously demonstrates the lower order level of remembering. The goal for effective assessment design is to promote the higher order levels such as creating, evaluating, and analysing where appropriate. PeerWise enables students to engage beyond simple recall, and this in my opinion is one of the principal attractive features of PeerWise.

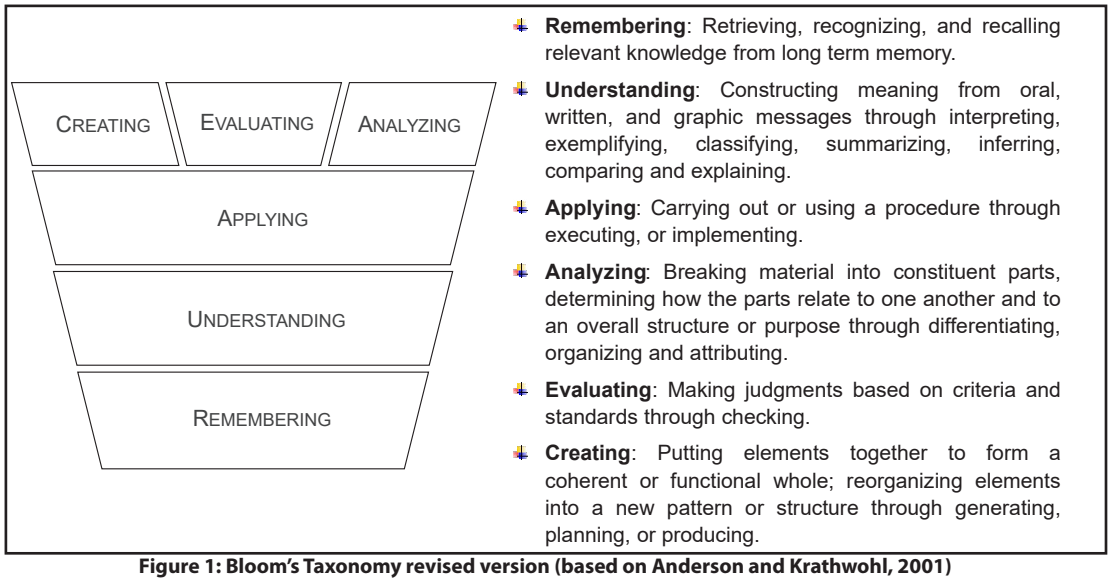

Figure 1: Bloom's Taxonomy revised version (based on Anderson and Krathwohl, 2001)

Multiple-choice questions as a method of assessment

Multiple-choice questions (MCQs) are frequently employed within assessment as an efficient method to provide rapid feedback. There are criticisms that the use of MCQs promotes recall and memorization and does not test for higher level cognitive processes (McCoubrie, 2004). MCQs are constructed with a stem or question followed by a series of answers of which one is correct, and the remainder are incorrect

distractors. It is important that students are introduced to the attributes of a good quality MCQ and how to construct a question that does not focus on simply recognising the correct answer. Creating a good quality MCQ is a challenging task as not only should the question be designed to test profound understanding of course material but it should include incorrect yet plausible distractors that arise due to misconceptions or common mistakes (Galloway and Burns, 2015). A workshop activity as described in the methods section illustrates how I support my students with writing good quality MCQs.

PeerWise

PeerWise is a freely available online tool that enables students to create and produce their own MCQs with appropriate distractors and an explanation to accompany the correct answer (PeerWise, 2018a). This approach facilitates student centred learning reflecting the shift from a transmission didactic mode of learning to active learning with learners taking more responsibility in the learning process (Luxton-Reilly and Denny, 2010). All the questions submitted by the students registered to a PeerWise course are available for all students within that specific learning community. Other students cannot see the contents of a PeerWise course. Students can answer the questions for self-assessment and have access to the explanations provided for their own learning and understanding. They evaluate the questions by rating the quality on a scale from 0–5, categorising the difficulty (easy/medium/difficult), and also posting a comment. This functionality creates an opportunity for peer review and peer feedback. As the PeerWise system requires students to create their own MCQs, which utilises the remembering and understanding of knowledge and applying this information to a question, this was deemed an attractive feature to build into a Year 1 assessment in my institution. Online quizzes (written by staff) provided to students would not develop the higher cognitive skills of peer analysis and evaluation, not to mention the extensive staff resource involved.

One of the concerns I had when considering adopting PeerWise was in relation to students doing a copy and paste of questions and not creating their own. The requirement to generate an explanation helps mitigate such a short cut; even if a student does copy a question from elsewhere, they still need to explain the answer which requires them to think more deeply. Students can flag a question to a staff member if they think it may be incorrect and also flag any inappropriate behaviour. The gamification functionality of PeerWise with the badging system and leader board is an attractive in-built feature to promote student engagement.

Student engagement with PeerWise

Student engagement within PeerWise demonstrated by the number of questions authored, questions answered, and comments written is consistently reported to be well above the minimum requirement. For example, on a first-year computer programming course, with a requirement to create a minimum of two questions and answer a minimum of ten questions, Denny *et al*. (2008) found on average students submitted 2.6 questions, answered 34 questions and provided 707 comments. This is evidence to show that PeerWise facilitates peer discussion and interaction. Similar findings have been established in other studies across a range of disciplines, for example, in chemistry (Galloway and Burns, 2015; Ryan, 2013) in biochemistry (Bottomley and Denny, 2011) in physics (Bates *et al*., 2012), in physics, chemistry and biology (Casey *et al*., 2014) in medicine (Walsh *et al*., 2018) and in veterinary science (Rhind and Pettigrew, 2012).

PeerWise and attainment

In terms of the impact of PeerWise on exam performance, positive correlations between students' PeerWise activity and exam performance are reported (Denny *et al*., 2008; Denny *et al*., 2010; McQueen *et al*., 2014). Comparing PeerWise to other active learning tools, Tatachar and Kominski (2017) found that, despite no significant differences being established between a case-based application group and a PeerWise group

on pre- and post-tests, the PeerWise group exam performance was superior to that of the case-based application group on two of the five individual post-test questions.

A large-scale study in physics, chemistry, and biology across three research-intensive UK universities (Hardy *et al*., 2014) found a modest but statistically significant positive correlation between students' PeerWise activity and their examination performance. Interestingly, students of lower and intermediate ability showed benefit from the online engagement activity in terms of their end of module examination marks. Walsh *et al*. (2018) determined that question writing frequency correlated most strongly with summative examination performance (Spearman's rank: 0.24, $p < 0.001$). Hancock *et al*. (2018) concluded that engagement with PeerWise in a large first year molecular biology course resulted in an average mark improvement of 4%, which was inclusive of all students in the cohort.

Quality of multiple choice questions

Purchase *et al*. (2010) examined the extent to which academic ability influences the quality of questions. Quality was determined in respect of the clarity of the question stem, the feasibility of the distractors, the extent of the explanation and whether the question contained any errors. Students were divided into four quartiles based on prior academic performance and the higher quartiles generally produced better quality questions. Galloway and Burns (2015) and Bates *et al*. (2014) evaluated question quality using the cognitive domain levels of the revised Bloom's taxonomy (see Figure 1). Both studies found that a large number of questions classified were of high quality, requiring more than just a factual recall and used plausible distractors with valid explanations.

Methods

Context for implementing PeerWise

At the University of Hertfordshire, Year 1 students study chemistry as a fundamental topic underpinning the Pharmaceutical Science and Pharmacy degree programmes. A significant number of students struggle with the transition into HE and the previous strategies adopted at A Level (or equivalent for example, foundation course in chemistry) to learn chemistry are often not satisfactory in Year 1 of university. Many students adopt a surface approach that does not promote meaningful learning and I have observed that the priority to memorise leads them being overwhelmed and increased stress. Although there is a prerequisite for A Level chemistry, there are varying levels of competencies within the cohort in terms of their fundamental chemistry knowledge and understanding. Student feedback has highlighted that some students became less engaged during the academic year as they perceived the course content to be very similar to A Level. They fall into the "I know" trap, something that I suggest shuts down their learning where attending to information ceases and hence halts the learning process. The challenge from a learning and teaching perspective is to create an inclusive environment for such a mixed ability cohort, supporting those students who find chemistry a challenge in the first year and stimulating and stretching those students who perceive it to be just like A Level and risk disengaging from the module and becoming bored. PeerWise provides a means to address both, it encourages the stronger performing students to challenge their knowledge and understanding of chemistry concepts through creating good quality MCQs with challenging distractors. PeerWise also provides a resource for students who find chemistry challenging as they can use the repository of MCQs to test their knowledge and understanding and obtain feedback.

Design and implementation of a PeerWise assignment

The PeerWise system was introduced in a Year 1 foundation chemistry module co-taught to pharmaceutical

science and pharmacy undergraduate students, all of whom had studied chemistry previously at A Level. A 1-hour workshop on writing multiple choice questions (MCQs) was delivered to students in weeks 2–4 of the academic year to introduce and scaffold the PeerWise activity. The workshop materials are available in the Supplementary Information. During the workshop, non-chemistry questions were introduced to explore the structure of a good quality MCQ, followed by chemistry specific questions. The final aspect of the workshop involved students working in small groups (2–3 students) creating an MCQ followed by a group evaluation. Together, they discussed suggestions on improving the quality of the MCQ. This format was adopted from Bates *et al*. (2012) in order to adequately support students in using the online collaborative PeerWise platform. A screencast was prepared using Camtasia software to explain the registration process on PeerWise. This was shown to the students during the workshop and was available to view through the in-house VLE platform. Other screencasts on help topics that students may have queries about (for example, including images in questions, searching for questions on PeerWise) are available on the PeerWise web site (PeerWise, 2018b). There is also the PeerWise online community for educators where resources and publications are shared as a potential source of support and information (PeerWise, 2018c). There is some preparation work required by the lecturer in advance of introducing PeerWise. Table 1 summarises the key action points required for lecturer preparation.

Table 1: Lecturer Preparation with PeerWise

Action Point	Further Information
Register for PeerWise Instructor account	Contact PeerWise and request an Instructor account (https://peerwise.cs.auckland.ac.nz/join/). You can check if your institution is registered to PeerWise by searching on the PeerWise homepage.
Set up a course for your students	This is the unique course where your students will be working together on PeerWise. I used the module name and year e.g. MSR 2018 as the course name so it is clear to students.
Populate the course with the student identification numbers	In the Administration view of your course created, select manage "administrator" and "student" access. Then “Edit Student Identifiers” and simply copy and paste your list of identifiers into the text box area.
Decide on the assignment criteria; number of questions that students will author, number of questions that students will answer, and the number of comments required	This information should be clearly indicated to students in the PeerWise assignment information (see Supplementary Information) and explained in the workshop.
Consider if students will create MCQs based on assigned topics or students choose their own topics independently	Identify the topics and allocate specific topics to students. If students can choose their own topics independently, clarify which topics are to be included.

Students were provided with an assignment information guide which is available in the Supplementary Information. Students were required to create two questions, answer five and comment on three questions. I decided to assign students their two chemistry topics. I wanted to ensure that there would be a good spread of MCQs available in the question bank repository and that students could not avoid topics that they might find more challenging, such as hybridisation. Each student was assigned two topics, a numeracy-based option and a chemistry theory-based option, and there was no choice. Due to my programme

regulations, there is a fixed number of summative assignments allowed so the PeerWise assignment was formative and therefore did not contribute to the overall module mark. Others introduce PeerWise as a low-stake assessment with a small proportion of marks (2–5%) associated. With a summative PeerWise assignment, consider how you will assign credit to students. A participation mark (where all students who complete the assignment receive credit) may not be viewed as fair by students as it does not capture the quality of student efforts. The game-like elements (such as badges, points, and leader boards) in PeerWise can be used to assign credit to students. The reputation score which is displayed near the top right corner of the main menu accumulates points as students make their contributions. There is detailed information on the PeerWise community page (PeerWise, 2018d) on how the scoring algorithm works.

Figure 2 illustrates the assessment timeline for the first semester. Students are also provided with an assessment matrix (Supplementary Information) at the beginning of the year which shows the range of assessments and the week of submission to help students manage their workload. The assessment matrix is also highly informative for staff in planning assessments across the semesters and ensures that assessments are not bunched together (for example, multiple assessment submissions across different

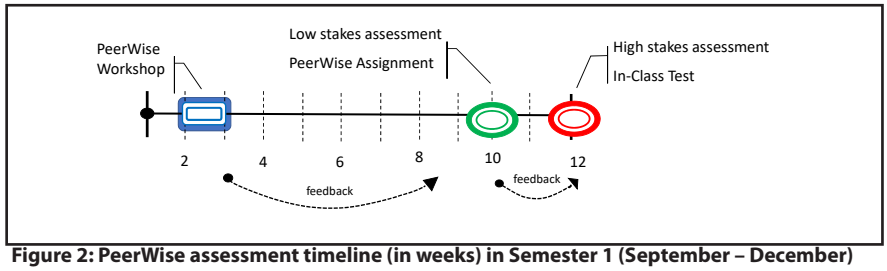

Figure 2: PeerWise assessment timeline (in weeks) in Semester 1 (September – December)

modules or courses in the same week of the semester).

Semester timeplan

The introduction of the PeerWise assignment was considered in relation to the assessment outline for Semester 1 (Weeks 1–12). It is important that students are provided with feedback opportunities from low-stake assessments that feed-forward to subsequent high-stake assessments (as shown in Figure 2). The PeerWise assignment submission was due in Week 10, which provided the students at least seven weeks to register and complete the assignment. Each student was assigned two chemistry theory topics that would be covered in lectures during Weeks 2–11 and would form the content to be assessed in an in-class test in Week 12.

Role of academic staff

In relation to the intervention from academic staff during the PeerWise assignment, the expectation was for staff to assume the role of observer and deal with any administration or academic queries directly. Student engagement on PeerWise was monitored during the 6-week timeframe of the assignment with an email reminder at Week 6 for non-registered students. The registration status of students was checked manually from the instructor view in the PeerWise dashboard and it was important to ascertain if there were any issues that prevented successful registration.

Evaluation of the PeerWise assignment

A mixed-methods approach was adopted to evaluate the PeerWise activity using both quantitative methods (analysis of user data on PeerWise, closed questions in an online questionnaire) and qualitative methods (open questions in an online questionnaire and focus groups). An online questionnaire (see Supplementary Information) was administered focusing on three sections; demographic information,

general perceptions on the use of PeerWise/workshop, and its impact on chemistry learning. As internet surveys suffer from low response rates, participants were emailed regarding the online survey with a follow up reminder after three weeks. The user data on PeerWise can be obtained from the instructor view.

The closed questions were analysed by reporting the percentages and number of responses to each question. The open question comments were read several times to identify broad themes. The work was conducted following ethical approval in line with institutional guidelines.

Presentation and Discussion of Findings

PeerWise engagement with assignment criteria

With the introduction of PeerWise, it was observed that 95% of our cohort engaged successfully. A total of 237 students (cohort A) registered on PeerWise and a summary of the student participation is shown in Table 2. Also shown in Table 2 are two academic cohorts (B and C) for two different academic years on the same programme of study that participated in this PeerWise assignment. Each cohort superseded the expectations of the minimum levels of engagement (writing two questions, answering five and commenting on three) except cohort C as they authored two questions below the expected total number. It is evident that answering questions in each cohort is much higher in comparison to questions authored and comments written. Each cohort answered more than twice the expected number of questions.

Cohort A showed higher overall activity which is attributed to the larger class size. One of the primary objectives with this PeerWise approach is to help increase student engagement within a module and develop an active online community of support. It is clear that the majority of students adhered to the assignment criteria and created the prescribed two questions. This was a very encouraging result as creating MCQs is not a straightforward task even when the topic appears easy.

Table 2: Comparison of the minimum expected levels of PeerWise engagement with actual levels of engagement in each cohort

Cohort/ Population	Questions Authored (Expected/Submitted)	Questions Answered (Expected/Submitted)	Comments Written (Expected/Submitted)
A/237	474 /481	1190/5890	714/1267
B /143	286/292	715/2022	429/605
C /130	260/258	650/1556	390/469

Engagement over the semester

Considering student engagement over the assignment timeline, Figure 3 represents the number of questions contributed per day for cohort A. Not surprisingly, the majority of questions were contributed within the last two days of the assignment deadline. A similar trend was observed with cohorts B and C in different academic years. Student engagement was highest with answering questions. As can be seen from Figure 4, which illustrates when students answered questions; this included periods after the assignment deadline, in the weeks leading up to the in-class test and end of year examinations. This level of activity demonstrates the usefulness of the system as an exam preparation aid.

PeerWise as a revision tool

From the online questionnaire, 56.7% (34 students) indicated using PeerWise for revision whereas 43.3% (26 students) didn't engage. Positive aspects included "*very good, it helped a lot with the week 12 exam*"

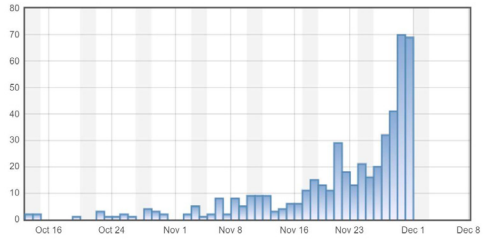

Figure 3: The number of questions contributed on the PeerWise system during the timeline period by students in cohort A (PeerWise assignment deadline was Nov 30th and the in-class test was Dec 13th)

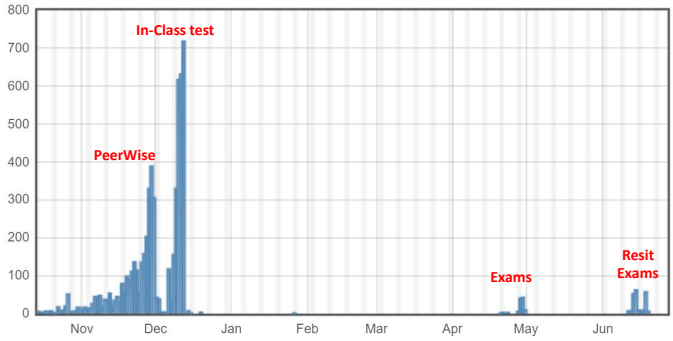

Figure 4: The number of questions answered on the PeerWise system during the academic year by students in cohort A

and "*a great opportunity to test your chemistry knowledge and study progress before the test*". Students could focus on areas that they wanted to practice further and assist their understanding. One commented:

> *For the topics I wasn't sure and confident about my knowledge, I just went to the PeerWise and the questions are categorised, so I could find the questions that I wanted and also the answers have comments, that was really helpful for me because I understood some difficult points.*

There were also comments which recognized the potential of PeerWise as a revision tool but highlighted a lack of available time as a barrier: "*very good and useful, if I had time I would have used it for my in-class test as revision*" and "*it is a great resource for revision. If week 11 and 12 were less busy, I would have used it*". Students also questioned the quality of the work produced by other students. "*I didn't really trust people with the questions so no I didn't really use it*". The students wanted reassurance that the answers and explanations were correct:

> *Because the student made it I wasn't sure was it the correct answer or not...if not many people answered it or the answers were different, I wasn't sure which one was right.*

Challenging aspects of the PeerWise assignment — time commitment and registration

A total of 62 students responded (response rate 26%) to the online questionnaire distributed to cohort A and were identified in the survey response as male (n = 27) and female (n = 35). The aspect indicated as most challenging was creating MCQs (63%). This was also reflected during the preparatory workshop when students expressed their surprise at how creating MCQs on fundamental topics was more difficult than initially expected. The second most challenging aspect indicated was answering questions (17%) followed by commenting on questions (6%). A total of three students indicated registering on PeerWise as the most challenging aspect. A number of students were required to email the lecturer as their student

registration numbers were not included in the identifiers list due to late registration on the course. When these details were updated, no further email requests were received regarding registration. The technological requirements of PeerWise have not been found to be difficult for students. Initially, I used a video to show registration but now the students register in the workshop on their smart phones and we go through the steps together. This has been found to be more efficient and is the approach I would recommend. The challenge in creating questions was also raised in focus group discussions:

> *It wasn't that easy to be honest, it took me 4 or 5 hours, I thought it was easy to write MCQs but it isn't because the alternative answer shouldn't be too easy and that's what took the time.*

Online community and learning

The development of an active online community of support was created from the assignment criteria. During the focus groups, students said that they appreciated the positive feedback and interaction from their peers: "*It was cool when someone appreciates you have put in a lot of effort*". Students commented on the badges functionality in PeerWise that provided motivation to engage further with answering and commenting on questions. The badges and comments directly impacted the online community of support: "*it made me earn more badges as well and then people started commenting about my question and that gave me another badge, it was really good*". The majority of queries or errors were resolved by students themselves within the online community. As the lecturer, I did moderate questions occasionally, but students did not raise flags and there was no inappropriate behaviour.

Effect of the PeerWise assignment on learning chemistry

From the survey, 63% of students selected answering MCQs as the most beneficial aspect of PeerWise. Comments included specific reference to aspects of learning chemistry: "*helped me to think about the concepts that I can use in chemistry*" and "*I really did learn what dipole moment is because of PeerWise*".

Some students answered questions to challenge their strengths and weaknesses whereas for others "*it is easy to just choose the easy questions and not attempt the more challenging ones*". This links to the differences between performance goals where the focus is achieving the required outcomes avoiding any exposure of weaknesses in comparison to learning goals which foster a deep approach that some students have adopted (Dweck, 2000). To optimise the extent to which students challenge themselves, incorporate these aspects in the workshop when introducing PeerWise. Emphasise how you suggest students use PeerWise and give examples of both good and poor practice, so it is clear to students what is expected from them.

Engagement with writing questions

Students were assigned two topics and to ensure fairness, fundamental topics that were covered in detail during A Level (for example, percentage yield calculations) were matched with more challenging topics (for example, resonance). The students commented on having two topics, stating that there was one which they found easier than the other. It is important to consider the prior knowledge of the student cohort and the topics to be covered ahead of implementing the PeerWise assignment.

Benefits of asking MCQ questions

The additional research and reading on topics was reported by a student in relation to writing a good question "*you have to do a lot of research on that certain topic so it not only helps other people it also helps yourself*". This indicates the deeper approach to learning that resulted for some students. Students challenged themselves to create good distractors and this aspect supported their chemistry learning.

Evaluation of workshop and scaffolding implemented
The workshop activity on understanding how to create good quality MCQs and clear information regarding registration were identified as beneficial. This structured approach aligns with good practice in assessment-for-learning (Nicol and Macfarlane-Dick, 2006) whereby students engaged well with the assessment criteria and it was important for managing student expectations.

Findings on self-regulation and the transition to the higher education learning environment
The transition to HE involves the development of independent learners who self-regulate their progression and learning. There was indication that PeerWise did enable some students to consider self-regulation, with one commenting that "*it allows me to identify my own strengths and weaknesses*". There wasn't a high level of interaction beyond the assignment deadline. One reason was that there was no requirement to do this and PeerWise requires an online community to function optimally. Another perceived barrier was confidence regarding the quality and accuracy of the questions and explanations as noted previously.

Implications and Adaptability

When considering how PeerWise could fit within your programme design, the preparatory workshop on writing MCQs (see Supplementary Information) is very important. Although PeerWise is a relatively easy technology to implement, establishing expectations with students and enabling a pre-assessment dialogue is essential. This isn't a case of setting up PeerWise and expecting it to just work for your students on its own. The assessment criteria should capture the outcomes identified for your students. If you are introducing PeerWise as a formative exercise or a low-stake assessment, then clarify the subsequent assignments that the PeerWise activity feed-forwards to. This helps with student motivation and engagement as they can see what is in it for them.

Conclusion

I have successfully implemented PeerWise over a number of iterations to encourage student engagement in Year 1 and this level of engagement has been consistently high. The PeerWise process of creating, answering and commenting on questions supports meaningful learning. The bank of questions generated have been used by students as a revision tool after the assignment deadline. Some students did not engage with PeerWise beyond the assignment due to time constraints and a lack of confidence in student-generated content.

Acknowledgements

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