A gamified and mystery-driven approach for facilitating problem based learning in a postgraduate strength and conditioning module

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Abstract

This study examined students' experience of a gamified, mystery-driven problem based learning (PBL) approach in a postgraduate strength and conditioning module. Few studies have documented how hybrid teaching and learning methods employing aspects of mystery and gamification within PBL are experience by postgraduate students. This paper documents the student experiences of such an approach within a module in an MSc programme in strength and conditioning in an English University. Within a 10 week,

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20 credit, module, students were introduced to an organisation they believed to be real and asked to compile a presentation for that organisation providing suggestions in relation of athlete development. A series of mystery packages were then delivered to the students over a four week period, as the central element of the module, providing information that was potentially relevant to their problem scenario. This was followed by two tutorial sessions prior to presentation of the student work. Following completion of the module, students participated in focus group interviews. Focus group interviews, analysed using thematic analysis, revealed that students believed the approach was interesting, interactive, developed new skills and was vocationally relevant. However, students felt confused by the approach, perceiving this to be negative, unaware that the confusing elements were designed to prompt deeper learning. These results seem to indicate that a PBL approach, using some aspects of gamification, via role play and mystery, via receiving 'mystery' packages can add value to the postgraduate experience. Despite this, the approach trialled in this study can be challenging to employ. Academics and practitioners need to be aware that the student perception of confusion the process can create is initially negative but is an important element to better answer causal questions, diagnose and solve problems, and demonstrate application of acquired knowledge.

Introduction

The use of Problem-based learning (PBL) in Higher Education as a means to foster motivation, promote problem solving abilities and to encourage student interaction and independent learning is well established (Savin-Baden, 2003; Willis, Jones, Bundy, Burdett, Whitehouse & O'Neill, 2002; Camp, 1996; Duncan, Smith, & Cook, 2013). Over the last decade there has been an increased use of PBL techniques within the sport and exercise sciences (Smith & Cook, 2012; Duncan, & Lyons, 2008; Duncan & Al-Nakeeb, 2006; Duncan, et al., 2013), with such approaches leading to a more student-centred focus in learning (Duncan & Lyons, 2008) and one where student's perceive the approach to be useful in enhancing the student experience and fostering group cohesion (Robinson, 2011).

Consistent with constructivist perspectives and the concept of social justice in learning (Savin-Baden, & Howell-Major, 2004), PBL and PBL assessment tasks place students in positions where participating in a challenging, collaborative effort which is time flexible and adapts their efforts to their other academic, professional, and personal obligations is a positive factor (Duncan, et al., 2013; Spinello, & Fischbach, 2008). This process is also considered to provide a more motivating pedagogical experience for students who engage in PBL (Harun, Yusof, Jamaludin, & Hassan, 2012). Additionally, the use of PBL, particularly in postgraduate education, has often been seen as well aligned to the needs of potential future employers and the demands of particular professions or jobs (Yorke, & Knight, 2006; Yorke, 2004; Smith, & Cook, 2011; Duncan et al., 2013). Overwhelmingly, the use of PBL has been considered as more positive for students compared to traditional didactic delivery (See Savin-Baden, 2003 & Savin-Baden, 2007 for reviews of the topic).

However, PBL is not without its criticisms. Studies have suggested that some students may be fearful of expressing ideas, as required in PBL, to their group members, which in turn can lead to overall anxiety about the process of PBL, irrespective of subject area or whether delivery is using traditional or online means (Duncan, & Lyons, 2008; Duncan, et al., 2013; Vigentini, 2008; Robinson, 2011). Furthermore, although aligned with future employment, the examples of PBL that have been previously reported have also been open to criticism for not being fully congruent with the requirements of future employment (Spinello, & Fischbach, 2008; Duncan, & Lyons, 2008), with authors suggesting a need for researchers to evaluate different ways of linking PBL with future employment needs (Duncan, et al., 2013).

Evaluating and exploring the different ways in which PBL might impact the student experience in higher education is important for academics and researchers to better understand what types of PBL activities might work better for particular student outcomes. It is also now commonplace that different pedagogical approaches are integrated with PBL on the assumption that they augment the positive effects reported for single approaches. For example, this has been seen with the integration of PBL and online delivery (Duncan, et al., 2013; Robinson, 2011).

One pedagogic approach that is becoming more commonplace within Higher Education and one that, at least on face value, appears to be well aligned to PBL is gamification.

Gamification is an emergent approach to instruction/education with the use of game mechanics/gameful approach making the objectives of and the learning process easier, more student-centred, fun, interesting and overall more effective (Lepper, & Malone 1987; Papastergiou, 2009; Prensky, 2003; Rieber, 1996; Rosas, et al. 2003; Deterding, et al 2011). As gameful education has become more popular it is however important to continue to evaluate the experiences of students who undertake different configurations of this form of learning. The use of gameful techniques is employed in education since they support multisensory, active and problem-based learning and are often considered more motivational than traditional learning based approaches (Papastergiou, 2009) in a wide range of subjects (see Hamari, Koivisto, & Sarsa, 2014).

Gamified approaches also promote logical and critical thinking and the development of personal and social skills, language abilities, communication and collaboration skills (Pesare, Roselli, Corriero, & Rossano, 2016). As a consequence, the integration of game mechanics within PBL would seem well aligned and theoretically could amplify the positive impacts previously reported when gamification or PBL are used in isolation. Given recent changes to the Higher Education landscape such as the Teaching Excellence Framework, focus on graduate employment and the National Student Survey, employing and evaluating novel delivery methods is important in providing an evidence base establishing whether such methods are worthwhile. For example, Teaching Excellence Framework metrics relating to 'Teaching on my course' and, in the longer term, metrics relating to employment and further study, may be directly influenced by impacted by PBL approaches This study presents the student experience of a gamified and mystery-driven approach for facilitating problem based learning in a postgraduate strength and conditioning module.

Method

Following institutional ethics approval, the impact of PBL on the student learning experience was examined using a single module blended approach (Savin-Baden, 2007) within the institution's MSc Strength and Conditioning course in a module titled 'Client profiling and needs analysis'. The module was associated with 20 credits in the institution's MSc provision where the whole MSc comprises 180 credits. The module

lasted 10 weeks in duration and comprised 200 hours total student study hours. There were 20 students undertaking the module in question, 80% (n = 16) were male with this gender split being broadly indicative of the strength and conditioning industry.

The learning objectives of the modules are to: Employ evidence-based reasoning to appraise the roles of the multi-disciplinary team in identifying the needs of the client(s); Demonstrate expert knowledge of how to apply appropriate screening and assessment methods to profile the client(s) and to; demonstrate a comprehensive understanding of practical techniques applicable to strength and conditioning and/or the sports scientist in the understanding of the needs of the client(s).

The module was delivered on campus and was designed using the model suggested by Boud (1985) which employs one problem scenario as the central component of the module for each group of students (n = 4 per group, ie each PBL group comprised 20% of the overall module cohort).

Module structure and assessment

The problem scenario began with the students signing a non-disclosure agreement for the organisation that was working in tandem with the university on their module. The students were informed that the module team were working with the 'British Martial Arts Institute' (BMAI) a fictional organisation but one where credible evidence was available as to its real existence. For example, students could phone the telephone number of the organisation which would be answered by an associate who was pre-primed regarding the module running and would answer questions etc regarding the BMAI as if it were a real organisation. The students were not informed of the fictional nature of the organisation until after the module had been completed. At this point, but before module evaluation, students were debriefed as to the fictional nature of the organisation in the module. The students were informed by the University lecturer that they would be asked to develop a training programme for a Muay Thai athlete who would be preparing for competition in four months' time and that, as part of their module assessment, they would be required to present (20min duration) their proposed training plan to the University assessors and members of the BMAI. The choice of Muay Thai as the stimulus sport was also deliberate as, culturally it was likely to be distinct from anything the cohort of students had experienced previously, it has particular and wide ranging physical demands that

linked to the aims of the module well but also would require students to draw information from different disciplines both in terms of sports and scientific background.

This served to introduce the students to the module and coursework requirements. This was then followed by four taught sessions. Two sessions were taught semi-lecture style focused on systematically reviewing literature and what a needs analysis is and a further two were practical workshops designed to introduce the students to practical ways to measure various physiological and biomechanical parameters that might or might not have been useful in their coursework. These sessions were employed to provide an implicit framework for the students in relation to their assessment, to ensure all elements of the module's indicative content were included in the module and also to provide the students with some practical experiences of measurement which were required as part of their overall course. Care was taken to ensure that any information presented by the tutors was not explicitly related or linked to the problem scenario they were working on. At this point the students were allocated into groups of four (six groups in total) for their coursework tasks. With the process we employed, we tried to incorporate different constellations of PBL within the one scenario and in particular PBL for practical capability and PBL for critical understanding. A discussion of PBL constellations is beyond the scope of the current manuscript (for a full outline of PBL constellations see Savin-Baden, 2007) but, in brief, PBL constellations describes the grouping of PBL approaches in relation to the focus of learning and acknowledges that the PBL activity shares characteristics in terms of emphasis rather than subject specific knowledge.

From this point, the module was constructed to provide the students with sufficient information to produce high quality coursework but also to implicitly create moral/ethical dilemmas, to require students to actively screen and validate the information they were receiving and to enable deconstruction and reconstruction of a problem solution using constructivist principles. Within the next four timetabled sessions, students were timetabled in their groups in different rooms and without explicit university staff attending (staff covertly monitored attendance). This part of the module we considered as the mystery-driven element and were seeking to empower the students to use the 'data' and other stimuli to make a variety of possible readings and to create a climate where the 'mystery' of the different packages and the role playing type scenario could encourage challenging and rethinking of established theory and assumptions that data only point in

one direction. This is congruent with suggestions made by Alvesson and Karreman (2011) regarding the use of mystery as method.

The following week the students were timetabled for their coursework launch session. However, each group was timetabled in a different classroom. On arrival at each classroom the group found that the room was empty and a package was placed on a desk. The package had been posted to the University and had the module leader's address on the top. The package contained a letter from the BMAI thanking the University for partnering with them and enclosing details of the athlete they wanted us to work with. This comprised real data relating to body composition, various measurements related to fitness and a functional movement screen. The letter also informed the reader that a partner company 'Power Prime Labs' would be sending a further package with nutritional data relevant to the athlete in the coming weeks.

The following week, each group attended the same classroom again and found another addressed package. Within the package there was a USB memory stick with a post it note stuck to it. The words 'watch me' were written on the post it. The USB contained two movie files. One was a video of a Muay Thai fight for the athlete in question and the other was a video of the athlete engaged in sparring/training. On the third week a third package was available. This contained a letter from 'Power Prime Labs' detailing some hormonal analysis for the athlete in questions (testosterone/cortisol ratios taken post training for the last three months). The package also contained promotional material for a new to market nutritional supplement called 'Nitro Train' and a request that the athlete consume the product as part of their nutritional plan associated with the training programme. In additional a supply of 'Nitro Train' was provided. In the current instance, the students were actually provided with individual bags of dextrose weighed out in proportion to the athlete's body mass. In the final week a further USB was provided which contained a video of the athlete being interviewed by his coach. The video was taken in a non-sport surrounding and involved the athlete exploring their emotions/mood before and after a fight, examined confidence and attributions related to fight performance.

On completion of this period, module staff were made available for two tutorial sessions for each group. Here the focus was on the tutor facilitating discussion, providing supportive, non-leading feedback as suggested by Savin-Baden (2007). These sessions served to provide a specific point within the contact hours of the module where each

group could reflect, focus thought collectively and work towards the overall group objective required for module assessment. In regard to facilitation of PBL, the common approach is to use staff to facilitate discussion and enquiry within each session (Savin-Baden, 2003). In order to utilise the package type approach and instil a role playing game aspect within module delivery traditional PBL facilitation methods were not employed. Instead the sessions, described earlier, prior to the package element, and the tutorial sessions following the package element served to act as points where facilitation could be effectively integrated within the module. The final session of the module comprised formal presentations from each group.

Assessment Tasks

The assessment task used in the module adhered to guidelines for the assessment of PBL (Macdonald & Savin-Baden, 2003) and so consequently was based in a practice context (i.e. a real scenario taken from the workplace). Like previously reported tasks for PBL assessment (See Duncan et al., 2013), it also assessed process based activity (i.e. it focused on what procedures could be employed in the context of the scenario) and necessitated working with people in a way similar to that they would experience in the workplace. Likewise, the presentation did not simply assess the student's ability to provide knowledge but rather assessed the students' application of evidence, the ability to reflect on problem solutions and their ability to evaluate the way in which they came to their solution with emphasis on the specific context in which their problem was set.

Evaluation of the gamified approach

In order to examine the student's experience of the module focus group interviews were conducted in groups of four students (i.e. in their PBL teams) at the end of the module. Focus group interviews were chosen as they allow respondents to build upon the responses of other group members and the relatively free flow of talk can provide an excellent opportunity for hearing the language and experiences of the respondents' (Wilkinson, 2004). The focus group interviews were also conducted by a member of University staff who was not involved in delivery of the module in question.. Data from the focus group interviews was analysed using thematic analysis following guidelines proposed by Braun and Clarke (2006) and, in this way, sought to describe patterns within

the module. Recorded data was transcribed before thematic analysis took place. The guidelines proposed by Braun and Clarke (2006) were used for analysis. This ensured a methodological manner was followed throughout analysis (Attride-Stirling 2001). This involved firstly, the primary researcher immersing themselves into the data in an active way through repeated reading of the data whilst searching for patterns (Braun & Clarke 2006). Secondly, initial themes/codes were generated by tagging and naming selections of text within each data item. Coding was conducted systematically, and per focus group, according to the guidelines suggested by Bowen (2008). Themes within the data were then identified using an inductive approach and at the semantic/explicit level as the process was not seeking to go beyond what the participant had said (Braun and Clarke, 2006). The entire data set was then re-read to establish if the themes were coherent and to code for any additional data that could have been missed (Braun & Clarke 2006).

Results

The results from the focus group interviews revealed a number of themes within the student experience of the mystery driven gamified approach to PBL. Consistent across all focus groups were: 1) The approach itself; 2) Organisation of the learning experience; 3) relevance of the learning experience to future employment and; 4) development of new skills. In a number of cases the student responses straddled more than one of these themes at the same time. The central theme raised by students was the approach to the learning experience with the other three themes prompting fewer comments in comparison.

The approach

In regard to the approach to the learning experience, the students felt that the approach used was 'interesting' but also 'different' and 'confusing'. The comments related to confusion were also interpreted both positively and negatively by the students.

One student remarked of the whole approach:

> *Different to what we're used to, I've not had the experience of doing something like that before. So, thrown in the deep end straight away and with it being of high importance, it's not like it's a simple*

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> *task that you can just fly through and go on to the next one, it carries a lot of weight for the module. (Student 2, Group B)*

With another stating:

> *I like the interactiveness of it, instead of being stuck behind a computer just typing up, being able to watch the video, note down, work together as a group collectively and bring ideas together. (Student1, Group F).*

Other students aligned with this view and highlighted the vocational relevant of the approach:

> *Thought it was good, different, never done anything like this before. Very appropriate for the industry that we'll be going into after the course, so yeah, overall good, good idea, like the thought of it, and enjoyed the work. (Student 1, Group D)*

The mystery element and the arrival of packages was also identified as an important part of the process. The students seemed to enjoy this aspect of the module and seemed to consider this holistically in terms of their overall learning experience and development. For example:

> *I think it made it interesting, it was interesting to receive that and to sort of have to decide what we were going to do with it, do some research on it ourselves, I found that quite interesting. Whether that really affected what we were going to do, I don't really think it did. But obviously, we had to think about what were we going to implement that [the nutritional supplement], think about the pros and cons of doing it, think about whether we're the right people to do it. And I guess like I said you don't really know, but you might get that sort of thing in the real…like real-life element of it, you have to make that sort of decision so it did help with the decision-based environment. (Student 2, Group A)*

Another student from the same group commented:

> *I just think it was a good little extra thought to put in process. I think it made the coursework look a bit more interesting when you receive the packages, everyone was sort of like "what on earth is this?" and then you open it and like "what is going on?" So, it was an interesting element to the coursework (Student 1, Group A)*

One main element that the students in every group expressed was that the approach prompted some confusion but also led to use of initiative and problem solving capabilities. Students stated that the approach was 'a little bit confusing' (Student 1, Group B) and 'I was just a bit confused by it all' (Student 2, Group E). This aspect is exemplified by the interchange of the following 2 students:

> *To be honest, I was a little bit confused when I got the packages.* (Student1, Group D)
> *Because it was a bit out of nowhere, I think, so I was a little bit confused and..*
> (Student 2, Group D)

> *Didn't know where to go from there, it was a little bit surprising. But then, again it's up to us to get out there, research, and find out more about it, which is what we've got to do in the future.*
> (Student1, Group D)

This initial confusion was not necessarily interpreted in a positive way by the students and across all of the focus groups the students expressed a want for more structure and guidance due to being unsure about what was right/wrong. For example Student 1, Group B stated:

> *Some more structure would have been good, in terms of maybe a little bit of guidance on how to interpret the, not even a set structure saying 'do this do this do this', because everyone's needs analysis may be slightly different, which is a given.*

This was supported by the following:

> *It's not going to be spoon fed, I understand that, but having some form of guidance or structure to follow, like other coursework we have, just to allow for more of a practical or scientific approach to it, instead of being like "ooookayy what do we do?"* (Student 2, Group C).

This feeling was also expressed by Student 1, Group D, who stated:

> *At first I thought it was quite sort of intimidating I guess, I don't know if that's the correct term but I was a bit worried to think "Where do we go from here?". We're in a group, which is good; I think I can speak for a lot of us when I say that we enjoy group work. Working together as a team, again that's what we'll have to do when we're in the S&C industry, but yeah it was quite daunting thinking "ok we've got this data, it's real data; what now, where to go".*

Another student also suggested:

Before we got all the data, I think maybe we should have a little lecture and maybe have just said "you're going to get this package, you're going to get that package, make what you think of it", rather than just getting the packages. (Student 3, Group D)

Organisation and New Skills

From the students' discussion around the overall approach to the module also came several comments relating to their own organisation and then the new skills that they felt they developed as a consequence of the experience. When asked what they thought the module had developed Student 1, Group D suggested:

I think, organisation, who's doing what, so as far as what part of the work we're working on. So, for example, we go hopefully into a career where we are working with multiple disciplines, can take that organisation and set a structure and stick to it.

Student 1, Group E also added to this by stating:

There's no real "this is what you've got to find out, this is what you've got to give", it was just "here's a fight, tell him what to do, between now and then" basically which is good, because I guess in real life that's your profession.

The students also felt the module assisted a range of different skills including analysis, problem-solving, and communication. This is evidenced by the quotes below

I think it looked at our analysis skills, our ability to do it all together, research and critique the research, and compare that with the real data and the athlete, for me those were the main bits. (Student 2, Group A)

Yeah, that problem-solving capacity is really good, I think it's sparked a lot of people's interest as well, as we were just given a problem and we had to solve it. There wasn't any guidance we just had to figure it out on our own where we were going with it, what we were doing. (Student 1, Group A)

Communication skills, because, we've got 2 contact days a week and the other 3 days most of us are really busy and we live apart, we have placement and coursework, so we've had to work on verbal communication and logistically how we're going to manage it (Student 2, Group B)

And:

> *We're actually thinking about it rather than going right search for a paper and go "yep that's what they did, that's what I'll do". So, it was a good way to challenge ourselves to think of a new process, rather than just going that process works, we'll do that. (Student, 1, Group F)*

Employment

The link to future employment was also consistently highlighted as an outcome of the module and the approach taken with students aligning the experience to what they might experience in real life or in work life. One student stated:

> *For me it's given me more confidence about actually going into that world of work. Because if you'd have just given us a piece of paper with some data on and said "here's your work go and do it", I wouldn't have felt like I was doing something applicable to the industry as much as "oh we have an athlete, we have all this information about them, we can see them training, we can see them doing all these things." It's given me more confidence to go out and do that in the world of work rather than just having numbers on a piece of paper. (Student 3, Group A).*

Other students added to this stating in relation to the experience *'it helps you develop more as a coach'* (Student 1, Group A) and *'with a job you'd get the supplements, the athlete, the data, so this has simulated that'* (Student 2, Group B).

This was echoed by Student 2, Group A, who explained:

> *It's like we've been saying, I feel like it added that real life element to it and you feel like you're progressing as you would in real…like when we come out of university we want to go work in this field, we know what we're going to do when we get into a situation like this, because we've had real data and a real athlete and a real experience.*

And Student 1, Group C, who added:

> *So good, it's applied, it's real-life, you can very easily have that in real-life when you've got to look at someone's data, analyse them, give them feedback*

The focus of the module on a more minor sport, coupled with the approach used also seemed to develop a climate which prepared students for new experiences. This is expressed by the following:

> *I feel like because we've done this on Muay Thai boxing, which is something I didn't have a clue about, I could go into a sport now, knowing the fundamentals, could break it down, and could still write a program for that sport. (Student 3, Group E)*

This concept was also supported by Student 3, Group D who reported:

> *It's finding the research isn't it, maybe like football, tennis, etc. are a bit more widely available but with Muay Thai, it's harder to find the research, it's helping us find new techniques of finding research that's not as available as other sports. And because Muay Thai's a combat sport, it'll aid us in other things we might come into as well after we finish the degree.*

Discussion

The results of this study suggest that the gamified and mystery-driven approach for facilitating problem based is a useful approach for postgraduate students and can have a positive influence on the student experience. In some ways this is not surprising as a PBL approach has been previously documents as more student-centred and been received positively by undergraduate (Duncan, & Al-Nakeeb, 2006) and postgraduate (Duncan, et al., 2013) education within the sport and exercise sciences. The themes that emerged from the focus group interviews in the current study also align well in its applicability with the aforementioned other work that has used traditional type PBL, in that the students were clear how the module activities related to future employment/vocation.

Of note, the quality and scope of outputs produced for the assessment task by the students varied with no consistent pattern of approach being evident in how the groups tackled the packages and assessment task. In some instances, groups used the nutritional supplement package as the core tenant of their presentation, while in others the video package featuring the interview with the athlete appeared to be the main stimulus with other aspects feeding into and from this. This is unlike more traditional assessment methods where a 'model' type of answer is expected and instead the

students' bring their own understanding to the task and combine this with the various stimuli to produce a coherent response using peer knowledge and support in their individual assessment groups.

The findings of the current study are therefore consistent with constructivist perspectives of learning and the concept of social justice in learning given the added ethical dimension of the scenario employed here (Savin-Baden, & Howell-Major, 2004). The gamified and mystery driven approach employed in the present study may have amplified this process. By using a staggered approach, via use of multiple packages over four weeks, and with the mystery-driven element that was anchored in a set task (presenting to the BMAI in this instance), the students were placed in a position where they had to work on a strategy as to how investigate a particular issue, actually investigate it, work collaboratively constructing their own understanding from their own knowledge and skills base to produce a presentation on deadline. This process implicitly aligns with the concept of agile project management (Highsmith, 1999), where the imperative is on customer focus (in this case the athlete and their organisation) and requires team interaction and adapting solutions to the reality of a business or situation. As a consequence the approach used in this study appears to be positive for the student experience and in preparing them for their future.

Despite this, the mystery-driven and gamified approach in the current study is potentially a challenging process to employ. Within the thematic analysis, students acknowledged that the approach taken was interesting, good and developed a range of skills but, an equally large number of students were clear that the approach prompted confusion, at least initially. The student perception of this aspect seemed to be negative in that they did not like feeling confused. Within the thematic analysis, organisation, also emerged as a key theme and within this the students expressed a want for greater organisation and structure, more detail relating to 'what they were meant to do'. The students also perceived this to be a negative element of the approach undertaken. The two aspects of confusion and organisation overlap and may be symptomatic of the same cause, the mystery-driven, gamified approach used in the module. This is an important point as although the students may have felt these elements were not exactly what they expected or meeting their perceived ideal in terms of module delivery, the confusion and lack of structure was deliberate and structured by the module delivery team.

The common instructional strategy when a student gets confused is to quickly identify the source of the confusion and provide explanation to alleviate the confusion with common wisdom holding that confusion should be avoided during learning (D'Mello, Lehman, Pekrun, & Graesser, 2014). However, this strategy is unlikely to be useful for more complex learning tasks. Complex learning requires learners to generate inferences, answer causal questions, diagnose and solve problems, make conceptual comparisons and demonstrate application and transfer of acquired knowledge (Graesser, Ozuru, & Sullins, 2010). This has also been referred to as deep learning, the type of approach PBL is postulated to foster (Savin-Baden, 2003). In such circumstances confusion is expected to be the norm more than the exception and, on such tasks, confusion is likely to promote learning at deeper levels of comprehension (D'Mello, et al., 2014). We therefore interpret the reported confusion by the students who undertook the module as a positive. The process of receiving multiple packages with only initial guidelines on the module assessment task was designed in such a way to create an ongoing mismatch between incoming information over the four week period and prior knowledge that cannot be resolved right away. The conditions and structure of the module instigated cognitive disequilibrium (Limon, 2001) but in such a manner that the students could construct their understanding progressively and collaboratively over the four week period of the mystery package deliveries using a problem-based approach. The overall positive impact of this is exemplified by comments across all of the themes identified within the focus group interviews and the students, at least implicitly, acknowledge that the process, including the confusion element, added to the overall positive experience they reported. From a practical perspective this aspect also has important implications. In a Higher Education climate which is metric driven and responsive to the perceptions of students (e.g., the National Student Survey in England is an example), deliberately structuring the learning experience where it will initially be met less positively by students needs to be balanced against the potential longer term and more far reaching benefit of developing deep learning in students. The present study relates to postgraduate students however, if employed in other types of delivery, such as undergraduate education, building opportunities for confusion early into programmes might better ensure students are more comfortable with the experience and are more cognisant of the longer term benefits of such a pedagogical approach.

Looking forwards, there is perhaps a need for researchers and practitioners to help develop strategies in their students for them to deal more effectively when confusion or confusing situations arise. That is not to suggest that the confusion created was not needed or useful. The predominant paradigm within the study of strength and conditioning is one of empiricism where 'data' are seen to direct decisions in a scientific manner. That assumption is potentially erroneous and our conceptualisation of the mystery-driven, package element of this study was developed to empower students to challenge theory and assumptions regarding what data signpost to (Alvesson & Karreman, 2011). Hence, the confusion experience by students may be necessary in creating new thinking regarding a particular topic. In addition, the approach employed in the current study also encapsulated Abbott's approach for identifying and constructing mysteries for theory development including familiarisation, enacting a breakdown (via introductory sessions), elevating a breakdown (via receiving the multiple packages), solving that mystery (via group discussion over the 4 week package period) and developing a resolution (as a consequence of group discussion and via tutorial sessions subsequent to the package element).

There are of course limitations in the current study. We are conscious that this approach was trialled in a relatively small group of students. Although this approach demonstrated benefits in this group, development of learning materials is time and labour intensive and there is a requirement for use of physical spaces that goes beyond that normally used in Higher Education. For example, there is a need to ensure packages are placed in empty classrooms prior to each timetabled session. If practitioners and academics intended to utilise this approach with large groups the time and space demands to run this approach effectively may prohibit its use. It is also important to note that the PBL facilitation approach employed in the current study was not the same as commonly used in PBL. The mystery driven approach required students to receive packages and discuss these without direct facilitation. This also formed part of the gamified nature of the process where we sought to embed real time role playing type game mechanics into the module. Although we sandwiched this aspect with opportunities for facilitation before and after the package element, this should not be considered true PBL facilitation. This aspect is also worthy of consideration, and possibly development, by researchers who are interested in adopting this approach. Likewise, the current study adapted elements of gamification but is not wholly gamified in the sense that student groups needed to complete a stage before progressing onto the next package. We attempted to use a gamified approach by

employing elements of role playing game type mechanics in the establishment of an organisation and the student groups playing a specific role to achieve an end goal (producing a presentation relevant to that organisation). The approach taken in the current study also only trials the mystery-driven and gamified approach in one module, with one particular type of student (postgraduate, strength and conditioning students). We are aware that the applicability and efficacy of this type of approach with other types of student and from other subject areas needs to be undertaken to validate the results reported here. The results of this approach suggest it does offer benefit to the student experience, however, academics wishing to employ this form of approach need to be mindful that it will create confusion, and that such confusion is meaningful and positive in the longer term, but students may view it negatively during the PBL type activities. Seeking ways to prepare students for this element of the approach is therefore key. Being mindful of the time and labour intensive nature of preparation for this approach is also important when making decisions about its use in teaching and learning, particularly if large numbers of students are involved. Potentially integrating a more traditional PBL facilitation approach, rather than the type of facilitation employed in the current study, would also be useful in future.

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