South African Journal for Research in Sport, Physical Education and Recreation, 2018, 40(2): 23 - 40.
Suid-Afrikaanse Joernaal vir Navorsing in Sport, Liggaamlike Opvoedkunde en Ontspanning, 2018, 40(2): 23 - 40.
ISBN: 0379-9069

LESSONS LEARNED FROM GAMIFICATION OF A LEARNING EXPERIENCE: A CASE STUDY

Chrisna BOTHA-RAVYSE[1,2], Anita LENNOX[2], Dawid JORDAAN[3]
[1] *Physical Activity, Sport and Recreation research entity, Faculty of Health Sciences, North-West University, Potchefstroom, Rep. of South Africa.*
[2] *School of Management Sciences, Faculty of Economic and Management Sciences, North-West University, Vaal Triangle Campus, Vanderbijlpark, Rep. of South Africa.*
[3] *TELIT-SA, North-West University, Vaal Triangle Campus, Vanderbijlpark, Rep. of South Africa.*

ABSTRACT

The use of gamification principles can be valuable to motivate students and enhance their learning experience. A gamification initiative making use of a mobile app to prepare students for their summative assessment was evaluated for its usefulness and successful application to meet the objective. At the time of the study it was the second year that this learning activity was incorporated into the course. Hundred and three students (N=103) enrolled for a degree and diploma in Sport and Recreation Management and Sport Science at a residential university in South Africa participated. Students were divided in teams of no more than five. Participation was voluntary, most students participated (85%). The app was quantitatively evaluated for ease of use. Students found the app easy to use. The gamification approach was qualitatively evaluated. Three themes emerged; usefulness of app, examination preparation and enjoyment. Valuable lessons were learned regarding designing and developing of game-based learning activities and the incorporation of technology. It is concluded that the further development of this initiative should be nested in a solid design framework and the use of technology must be carefully considered.

Keywords: Gamification; Qualitative analysis; Adventure education mobile applications; Learning; Game-based learning.

INTRODUCTION

Adventure education refers to a learning activity or a series of activities with a specific theme for participants from which they learn through the process of reflection of the learning experiences. This would allow participants to think and internalise the lessons learned and apply them in everyday life practices (Ewert & Sibthorp, 2014). Examples of activities vary from games, arts, sports, music to rock climbing. Adventure education practices often include rope-based or team-building activities that train the cognitive abilities, thinking and reasoning skills of the participants. These skills are essential for life-long learning relating to *inter alia* leadership, communication, problem-solving, cooperation and interpersonal interactions (Chang, 2005).

The strategies employed in adventure education practices relate directly to gamification. Gamification is defined as "the use of game design elements in non-game contexts" (Deterding *et al*., 2015:2422). Educational Gamification (EG) and Game-based Learning (GBL), Simulation, or Serious Games (SG) should not be confused. Serious games focus on the creation of games that have an educational benefit and at times include simulations. Serious games constitutes the direct opposite of EG, which add game-like or play-like concepts to a learning process (Glover, 2013). Gamification typically enhances the competition drive of most people that motivate and encourage *productive* behaviour and simultaneously discourage unproductive conduct.

Competitive education is not new and has been widely used in other areas. The awarding of badges or ranks in the military provided the foundation for gamification. During early Soviet times, the Soviet Union leaders used game elements as a substitute for monetary incentives for work performance (Deterding *et al*., 2015). Lately, gamification is used as rapid application (as a learning method or an incentive method) in business, marketing, corporate management and wellness initiatives. It is also evident as commercial reward programmes of shops and medical aid funds (Glover, 2013).

The idea that purposeful activity encourages motivation and engagement is fundamental to gamification (Deterding *et al*., 2015), which is based on extrinsic motivation. Therefore, motivation to excel in a task does not come from a personal desire to participate, but stems from external sources and rewards. External motivators comprise rewards like badges, points or sometimes monetary rewards (Nicholson, 2015). Supporters of gamification advocate the use of external motivators to increase intrinsic motivation to improve the meaningful learning experience of the learner, which will ultimately motivate them to learn more and improve their effort regardless of rewards (Deterding *et al*., 2015; Nicholson, 2015; Morschheuser *et al*., 2016).

This paper reports on a gamification approach designed by lecturers to suit the needs of students enrolled in sport-related studies. The majority of sport-related modules/subjects in this programme are classroom-based and include little or no physical activities. The current way of lecturing does not appeal to students to try to master specific intellectual and physical outcomes and to prepare for the assessments of these outcomes (Botha-Ravyse, 2016). As such, students enrolled for Sport Studies are not motivated to prepare adequately for summative assessments. Evidence that gamification aids to motivate learning (Aubusson *et al*., 2014), encouraged lecturers to develop an adventure race designed to prepare Sport and Leisure Studies students for their summative assessment, as the concept of gamification is well-known in adventure and leisure studies (Ewert & Sibthorpe, 2014).

PURPOSE OF RESEARCH

This study addresses two related issues: (1) What are the lessons learned from using a gamification approach in Sport and Recreation Management? (2) How does the use of a mobile app add value to the execution and experience of students in an adventure gamification approach during the learning of content knowledge?

METHODOLOGY

The research methodology used during this investigation included a survey and self-reporting of students' perception of the value of the gamification approach. The students gave informed consent to use the data for research and publication purposes. Ethical clearance was obtained with number ECONIT-2016-007.

Intervention

A lecturer of the Sport and Recreation Department initiated the AMA-Zing (Academic Maintenance Aid with Zing [Fun]) race with the rationale to gamify examination preparation for students enrolled in the programmes. Activities, based on the well-known television series, The Amazing Race®, a reality television game show where teams race around the world in competition with one another, were developed. Clues for each section of the game that lead teams to a next destination or directed them to perform a task as a team or as an individual was provided along the way. These challenges vaguely relate to the culture or country of origin of the team. Teams were eliminated gradually until only three were left and at that point, the team who completed the final task was awarded the grand prize. The name of the lecturers' activity was adapted and localised in order to comply with international copyright legislation. The respective lecturers for each subject in a specific study year initially compiled the questions that were used during the race as examination preparation, themselves. Students started off by answering academic questions correctly, performing a task and then receiving a clue as to where the next station would be where the process would repeat itself.

The students enjoyed the first race, but it was extremely labour intensive for the lecturers. Not only did they have to prepare the clues and place them into envelopes for each team, but they also had to calculate manually how the teams would progress from one station to the next and ensure that the clues corresponded to the next activities planned at various points. The multiple choice questions (MCQs) at a specific station had to be assessed immediately and feedback provided before a team could continue. This first experience of the gamified activity prompted the lecturers to develop a mobile application (app) to be used for clues and questions, since a mobile app could link to a test bank of questions and present questions randomly, provide immediate feedback and allow analysis of the test items afterwards. They also felt that it will add value to the gamified experience as these students are mainly Generation Y students and technology driven.

The app was developed using Android Studio for university Android tablets. Tablets instead of cell phones were used as more information could be displayed on the larger screens of tablets. The app comprised two components: (1) an administrative component where lecturers were able to add, change or delete data; and (2) a race component where the participants could activate the app and answer the questions at a specific station. When students arrived at a wrong station, they received a message, indicating that they were at the incorrect station.

The app worked in the following manner:

Step 1: When a team arrived at a station they had to activate the app for their team by selecting the race button (Figure 1).

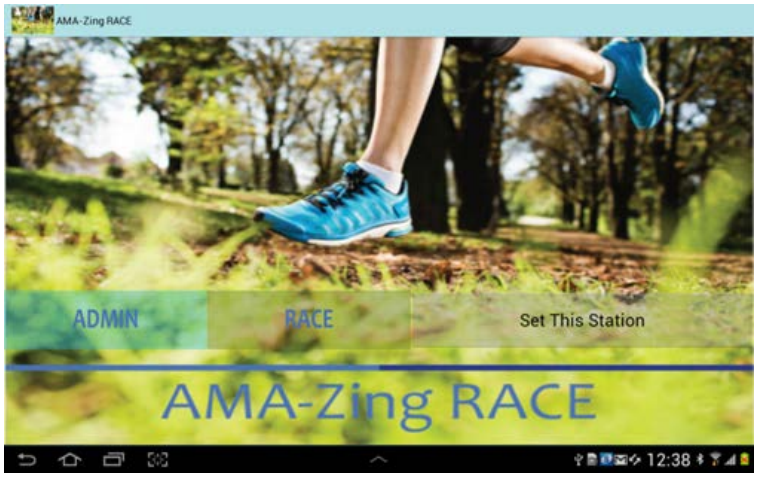

***Figure 1*. ACTIVATION OF APP**

Step 2: The team then had to identify themselves by typing the team name and correct password that was created earlier.

Step 3: After correctly identifying the team, the clue received from the previous station was chosen. This step was included for logistical reasons to ensure that the team visited the correct station in the correct order.

Should a team provide an incorrect response to the MCQs, password or playing questions, a time penalty was awarded. The team then had to wait for penalty time to pass before they could continue to use the app again. Figure 2 illustrates an example of a penalty screen.

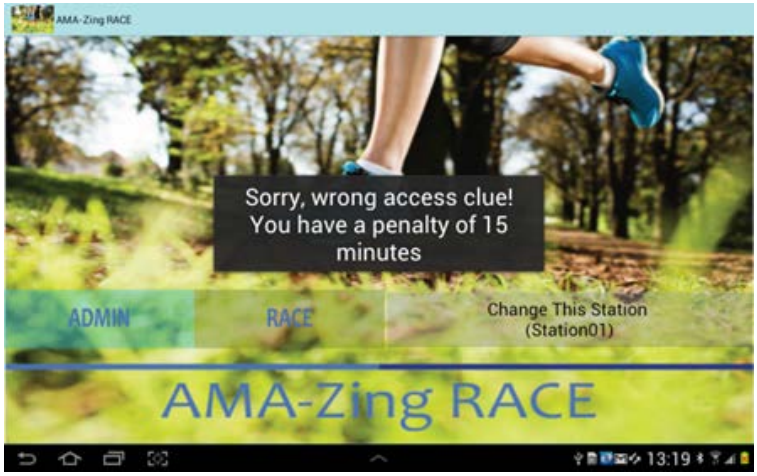

***Figure 2*. PENALTY FOR WRONG INFORMATION PROVIDED**

After completing the task, students were required to respond on the app to receive a clue on how to proceed to the next station. The application allows for locus of control by the lecturer as students cannot proceed with the game when they provided wrong answers. This allowed for more fair play by all. It also provided an opportunity for the students to interact with technology (app) aimed to provide lecturers with control over the race and use a less labour-intensive process, while providing students with a familiar interface on their own mobile devices.

Research setting

Participants

The student cohort comprised 103 Sport students (n=103) from first to third years, enrolled either for a diploma in Sport Science or a degree in Sport and Recreation Management at a rural residential university in South Africa. Students were instructed to form teams of five members per team. Although participation was voluntary, most students (85%) participated in the race. The majority of students (59.2%) who participated were in their second year of study; 22.3% were in their third year of study; and 16% related to enrolments beyond three years of study. Sixty-two percent (62%) of the students who participated did not use digital technology the previous year.

Procedures

The mobile app guaranteed that students selected their year of study and enrolled in programmes correctly to ensure that they receive the appropriate MCQs on the appropriate Blooms Revised Taxonomy levels. The activities comprised fifteen different stations with diverse physical activities at each one and they also had to answer a subject related question. The lecturers of the respective modules compiled a databank of questions, categorised per qualification to cater for the students across the three study years. The MCQs focused on examination preparation and related mostly to Blooms Revised Taxonomy levels 1 to 3. Once students had correctly answered their question at a station, they were allowed to continue with the activity, which ranged from creative play to team-building activities. After completion of the activity they received a clue that guided them to the next activity and station.

On completion of the 15 activities, the winning, second and third teams received gifts. All competing students were asked to complete a questionnaire including demographic information, questions on usability and the effectiveness of a mobile app in the participation of this game. Students also reported on their perceptions of the usefulness and value added by the gamification approach to examination preparation of Sport and Recreation subjects.

Walkthrough of mobile application

The technical designer, together with the faculty members did a walk-through evaluation on the mobile application that indicated whether the application performed well and the display was pleasing.

Questionnaire on mobile application

For this questionnaire a five-point Likert scale was applied starting at ‘strongly disagree’ (1) to ‘strongly agree’ (5). The questions were based on users’ experience of the ease of use and effectiveness of the app in executing the tasks (Chittaro & Sioni, 2014:58). The data were

analysed using IBM®SPSS® version 23 and a summary of response frequencies is presented in Table 1.

Students' perceived value-add of gamification approach

The data, comprising open-ended questions on the experience of the gamification approach, learning experience of students, and the usefulness of the app, were analysed using ATLAS.ti™ version 7, computer-assisted qualitative data analysis software. The investigation used a thematic content analysis inductive approach to coding (Boeije, 2002). Similar categories were collated under specific themes (Saldana, 2009).

***Table 1*. FREQUENCY OF EASE OF USE OF QUESTIONNAIRE RESPONSES**

Question	Agree (Scale 4 and 5)	Disagree (Scale 1 and 2)	No opinion (Scale 3)
App was pleasant to use	74 (71.8%)	19 (18.4%)	10 (9.7%)
It was easy to follow the instructions on the app	72 (69.9%)	19 (9.7%)	12 (11.7%)
App is effective for multiple choice questions	84 (81.5%)	10 (9.7%)	9 (8.7%)
App is effective in giving the next clues	69 (67.0%)	18 (17.5%)	16 (15.5%)
App added to the enjoyment of the day	15 (14.5%)	81 (78.6%)	7 (6.8%)

Themes emerged as the coding progressed. The co-coders evaluated each theme at significant milestones during the coding process, causing the themes to undergo continuous evolution until all coders reached consensus. The themes remained unchanged during the last three coding sessions, giving the co-coders confidence that data saturation had been attained. The final coding system revealed three main themes: added value of the mobile application, examination preparation and enjoyment (Table 2). Each of these themes included three to four categories that emerged from sixteen codes.

Table 2. **THEME CATEGORY AND COUNT OF RESPONSES**

Theme	**Count of responses**
Added value of app (n=85)	
Hampered flow	23 (27%)
Useful	10 (12%)
Technical issues	52 (61%)
Examination preparation (n=176)	
Question difficulty	55 (31%)
Practical application	34 (19%)
Prior preparation	62 (35%)
Examination preparedness	25 (14%)
Enjoyment (n=101)	
Enjoyment	45 (44%)
Repeat activity	30 (29%)
Physical enjoyment	10 (9%)
Extrinsic motivation	16 (15%)
Total number of responses (N=362)	

DISCUSSION OF FINDINGS

Walkthrough of mobile application

The focus of the walkthrough was to judge the aesthetic appeal and if the app performed well. We neglected to investigate the actual activity of populating the database that initially had to be typed in manually. Before the event started, lecturers were instructed to capture all information regarding teams, questions and clues as a Word™ document. The intention was to electronically transfer this data to the database of the app. Due to technical limitations, the information had to be added manually to the database *via* the application interface to resolve the issue. Although this caused additional development, it presented the lecturers with the opportunity to add questions to the question bank without the assistance of a programmer. Another advantage of increasing the question bank was that it was less likely that questions would be repeated.

Lecturer experience and feedback

Some minor issues emerged during the event. The sequence of stations did not work according to plan for one group. The app was developed to allow each group a different sequence to follow to complete the race. Apart from needing to manually override the sequence for this group, the app functioned well. When a group answered a question incorrectly, the same question was immediately shown again. Repeating the same question promoted multiple guessing, rather than multiple choice of the learning content. The groups did not have to really reconsider their answers in a scientific way, since there was no consequence for an incorrect choice.

The app also only provided multiple choice and true or false questions. However, typical examination assessments also comprise case studies, drawing of diagrams and other knowledge application type questions. Since the questions on the app did not represent the usual formal assessments, the app questions were inadequate for full preparation for examination assessments. The task sequence for each station and team also proved to be flawed. After answering the questions, the app gave the clue to progress to the next station. This meant that the physical activity part of the challenge still had to be completed, while the students have already received their clues. As a result, some of the groups bypassed the physical activity as there was no reward to complete it.

The rationale for redesigning indicated that a time-out period will have to be enforced when students answered a question incorrect, so the team must wait for two minutes before trying again to answer the question correctly. In order to implement this, an extensive question bank for each station would be advisable to ensure that the team receives different and more questions to answer in the second round. Furthermore, the use of different types of questions should be utilised to better prepare students for formal assessments, such as written examinations. Another recommendation would be to enforce better control over the physical activities students have to complete.

Ease of use and usefulness of mobile application

The results from the ease of use questionnaire indicated that students found the application pleasant to use, it had easy-to-follow instructions, effectively presented the MCQs and gave clues in a comprehensible manner. In short, the app was effective and easy to use. However, the students rated the app very low for value added to the enjoyment of the day. This concurs with literature stating that, even though an application is easy to use, it does not mean that it is useful (Bates & Poole, 2003). When comparing the Likert scale questionnaire results with the open-ended qualitative student feedback, the reasons why teams feel that the app did not add value became clear. The majority of the comments of the teams related to technical issues (61%) and 27% to complaints that the app hampered the flow of the game and activities. Other comments indicated that there should have been more tablets per station so that all the individual students in a team could use the app. Since there was only one tablet per station, only one person per team got to use the app with the result that the rest of the team was excluded from using the app. This reflected in feelings of exclusion that curtailed the enjoyment of using the app. Some commented as follows:

> *The app didn't work the way it should.*
>
> *We were not able to get to the questions.*
>
> *Our team was not loaded properly and we got the wrong questions.*
>
> *There should be more tablets as only one person got to answer the questions; some of us got no benefit for exam prep.*

These comments are in line with a review study by Khalid *et al*. (2015), who studied 6,390 low-rated user reviews for twenty free-to-download iOS apps qualitatively. Twelve types of user complaints were identified, with functional errors and feature requests being the most frequent.

During the usability testing of mobile applications, it is important to consider: (1) its ability to reduce the time it takes for a particular task (or efficiency); (2) how intuitive (or easy to learn) the app is; and (3) how user expectations could be met (Nayebi *et al*., 2012). In this case, it seems as if the application was not very efficient. In essence, the app itself is efficient and effective in asking questions and providing clues, but in the overall scheme of the gamified activity, it did not lend itself to swifter task completion. On the contrary, it appears to have hampered the flow of the event. The app also did not appear to be intuitive since some user comments pointed out that the app required lecturer instruction, before it became easy to use:

> *Initially we were not sure how to use the app, but once the lecturer showed us it was easy.*
>
> *The beginning was complicated but the rest was easy enough.*

Lastly, given the low user satisfaction that the app provided, it can be assumed that sufficient meet user expectation was not met. Hence, only 12% of the participants claimed that the app was useful. In the next section this conjecture is continued by arguing that the question difficulty played a major role, in spite of its ease of use.

Students' perceived effectiveness of the gamified assessment preparation

The aim of the gamified activity was to prepare students for examinations. During the qualitative analyses, the category that contributed most to the theme "exam preparation" was question difficulty. Students indicated that if they want to use it for examination preparation, they wanted the questions to be more difficult, and also more in line with the type of questions usually asked within the examination setting.

> *I did this last year as well and the questions here and what is in the exam are not the same.*
>
> *These questions are easy and not at all challenging. The clues are difficult but the questions, you can guess the answer and if you don't get it right you keep on guessing until you do.*
>
> *For this to be really useful as exam prep, the questions need to be in line with what is asked in the exam.*

These comments may shed more light on why the mobile application was received poorly. As students progressed through the game, they encountered non-useful preparation questions at every station. As delivering these non-useful questions (on level 1-3 of Blooms Revised Taxonomy) was the primary purpose of the app, the app (by association) was therefore perceived as useless. The motivation to use the app dropped with the perception of diminished usefulness, notwithstanding its high usability (Kucukusta *et al*., 2015). As the motivation to use the app continues to drop at every station, the app became an increasing hindrance to the flow of activities.

Another category that 35% commented on was the students' pre-preparation for the race. Fourteen per cent (14%) indicated their perception of being prepared for the exam after the activity. This links closely to the category about the difficulty of the questions:

> *If you expect me to come prepared then I expect the questions to mean something.*
>
> *This is a fun activity and I like doing it, but I do not see how this will prepare me for the exam.*
>
> *I forgot to prepare, but it turned out okay, we guessed the questions and still came second.*

The interrelationship between exam preparation, difficulty of questions and practical application was clear in this category. Quite a few students (19%) questioned the activities linked to the different stations.

> *It was fun building a boat from margarine containers, but I don't see the use.*
>
> *I thought this will also have a practical application to my work.*
>
> *All this is great fun and I got wet looking for fish, but I thought it was out of place.*
>
> *As a recreation student, I can see the activities are supposed to be fun but surely they should have a purpose as well? Like last year, we had to physically work hard and think as a team to get those boats across the pond. Here some did it while others just looked. There was no team work.*

The aim of this activity was indeed exam preparation and it was clear from the students' comments that this aim was not met. When investigating gamification of an activity, every activity has to have an outcome or must be linked to an outcome (Pivec *et al*., 2003). Even though the exam questions linked to learning outcomes and the lecturers thought that this would be sufficient, the literature and the students concur that there should be more structure around the activities, linked to module outcomes.

The implementation of games in a classroom has the instructional potential to offer learning experiences that are motivating, engaging and enjoyable for learners (Malone & Lepper, 1987; Garris *et al*., 2002; Papastergiou, 2009). This gamification approach envisioned to impact student learning by making it enjoyable for students to learn and engage them in the content in a fun game-based setting. The enjoyment factor seemed to have succeeded as 40% of students reported on it being a fun day and that they enjoyed it very much, while 29% indicated that they want to repeat the activity. It was interesting that only 9% commented on

the enjoyment and the role that physical activity played in the enjoyment of the day. However, the responses are contradictory with some indicating that they enjoyed it and others complaining about it.

> *It is great fun, much better than sitting in class.*
> *I am not sure why we do it, but it is fun.*
> *I like this, we should do it more often.*
> *I think we should all skip class and do this all the time, especially if there's food.*
> *It is way too hot to run around.*
> *I don't like to have to run everywhere. I get sweaty too easily.*
> *I love that we have to run all over campus.*

The use of collaborative group work is a dominant aspect of the teachers' evaluation of those factors that most impact student learning and enjoyment (Aubusson *et al*., 2014). Some students commented on this.

> *I learned better when I worked in a group.*
> *It was fun to do things together figuring stuff out.*
> *Yes the clues, some would tackle the multiple choices and some of us will start on the activity.*

The motivation category developed through the recurring ideas that some of the students only participated because of the external factors being present. Some indicated that they enjoyed participating in the event, but if it was not for the food or the extra marks, they would not have participated. Some indicated that they did not see the benefit apart from getting a free meal. It was clear that these extrinsic motivators were a primary driver of enjoyment. All motivation comments (15% of the enjoyment theme) were extrinsic with no explicit or implied comments eluding to intrinsic motivation to participate in the day's activities.

> *I would want food earlier in the day as it would motivate me to work harder.*
> *I only do this because I get extra marks.*
> *I do this to get out of the class and we get marks for participating.*
> *The food and gifts at the end of the race is great.*
> *There should be more food and drink then people will enjoy it more and more people will do it.*
> *A lot of my friends only came for to get food at the end.*

Lessons learned and solutions

The findings clearly indicate that the aim of preparing students for a summative assessment by means of a gamification approach, with the aid of a mobile app, was not met. The primary reasons for not meeting this objective are summarised in Figure 3.

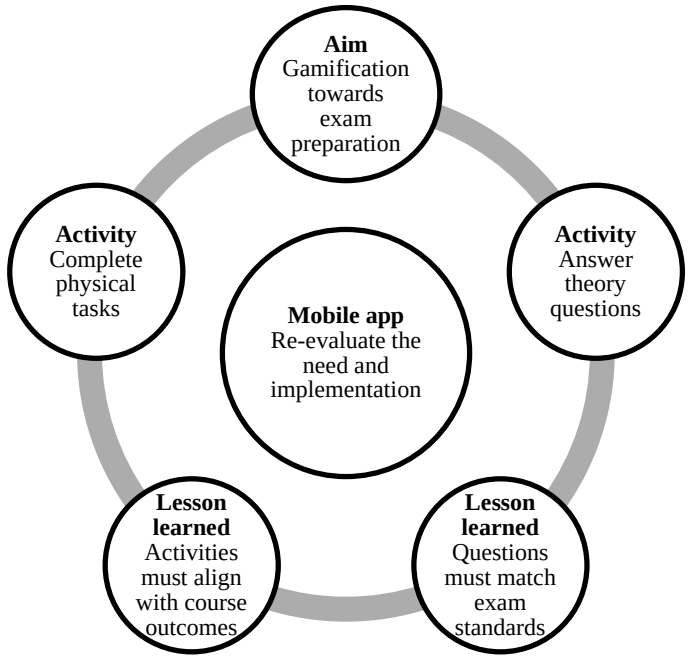

Figure 3. **LESSONS LEARNED FOR EXAMINATION PREPARATION**

The reason for not successfully preparing students for their exam can be divided into two very distinct lessons learned: (1) the physical tasks were not in line with the course outcomes; and (2) the theoretical questions were not comparable to the type and difficulty level of those asked in the examination. It was concluded that adding technology without carefully considering and testing the implementation carries the risk of hampering the enjoyment levels of the participants. More importantly, questioning the actual value added by something like a mobile application to an activity should be prioritised before resources are allocated to the development of such a custom built application.

The practical part of the activity should be recreated so that it is aligned with the outcomes. Decades ago, Slavin (1980) already indicated that learning methodology, such as Collaborative-based Learning (CBL), can be used for GBL. CBL methodology focuses on activities that maximise the collaboration among students, either in pairs or small groups, to improve their learning activities and results. Furthermore, this approach will also allow for incorporation of Problem-based Learning (PBL), a student-centred instructional strategy in which students collaboratively solve problems and reflect on their experiences. In PBL, learning is driven by providing open-ended problems, where students usually work in small collaborative teams and they are encouraged to take the responsibility for organising their team and managing the learning process with specific support (Doppelt, 2003). The idea is to enhance the exchange of information and knowledge among the students to motivate their own learning and a common reinforcement.

The gamification approach for these students lent itself perfectly for this approach because of the number of practical components in the course. An example of how one could approach such an activity is to let each station be a practical component of work. For instance, let them bowl in the correct way for cricket with one student instructing the action, while another one performs the batting action. One student provides instruction on the correct batting technique, others do the fieldwork and where the success of completion of the station would either be hitting a six or taking the wickets of the one batting.

The theoretical part of the activity needs to be carefully thought through. One will have to design the questions in line with the appropriate Blooms Revised Taxonomy for the year of study and make sure that questions from all the appropriate levels are incorporated. Multiple questions per station need to be asked and correctly answered before they are able to move on to do the activity. The questions can remain MQCs as there is enough evidence that such questions could relate to all levels of Bloom's Revised Taxonomy (Brady, 2005; Simkin & Kuechler, 2005; Gaytan & McEwen, 2007). The application can be redesigned, with the information gained from students in mind, to allow for more types of questions, maybe drag and drop to identify core elements and name figures, as well as pair column A to B type questions.

The use of the mobile application to enhance the experience for the students seems to have potential, but at this stage, it seemed to be more a case of incorporating technology for the sake of technology. Furthermore, the app should be able to allow students to select their year and field of study and then the questions should be selected randomly from a test databank. In order to extend the notion of relevance beyond aligning the activities with the course outcomes, the theory questions can be linked to the station's activity. However, this does imply that the students should be presented with a means to select the current station where they are busy with the activity. From a gamification perspective, this also has the added benefit of presenting the students with a visual progress indicator – showing all stations on the heads-up-display and colouring the completed ones green. Visual progress indicators add to the overall excitement and intrinsic motivation of participants (Garris *et al*., 2002; Felicia, 2012), which were both lacking in this event. Features such as these that are necessary for a successful gamification-with-technology application will significantly increase the programming and database complexity, making it imperative for a cost-benefit analysis of implementing a mobile app for this type of event.

During reflection on the design of the event and data analysis, the question arose as to *who* would be the most suitable designers, developers and implementers of this event. Given that this is fundamentally a recreational event, it is evident that recreation specialists would be ideal candidates. Seeing that one of the career paths of the BCom Sport and Recreation programme is recreation, it prompted the need to review the third year Recreation course and noted that its outcomes must address the needs of the event. Furthermore, instead of an activity designed, developed and implemented by the researchers, it should become a student project. The students have to investigate and create activities that are aligned with the outcomes of the subjects of the first and second year students. Each small team can be in charge of one activity and as a group (including all teams) they would have to organise the whole event. They would then be evaluated using a rubric on their own outcomes of their

module. The theoretical questions for the test databanks (that can be randomly selected) will still be compiled by the lecturers.

Project-based learning (PjBL) is a well-known approach that provides complex tasks based on challenging questions or problems that involve the students' problem solving, decision making, investigative skills, and reflection that are supported also by a tutor that provides facilitation. This type of project is intended to bring a deep learning in issues related with their education (Carlile *et al*., 1998). The difference between PBL and PjBL is that in PBL the teacher specifies the task to be performed at a basic granularity level, while in PjBL the teacher specifies a greater task and allows the student to organise the subtask division themselves (Thomas, 2000). In addition to enhancing student learning, there is also the added benefit that students will create activities, rules and implementation details that appeal to them and as such, to their peers who participate in the event thereby promoting overall enjoyment.

Framework for designing gamification of the classroom

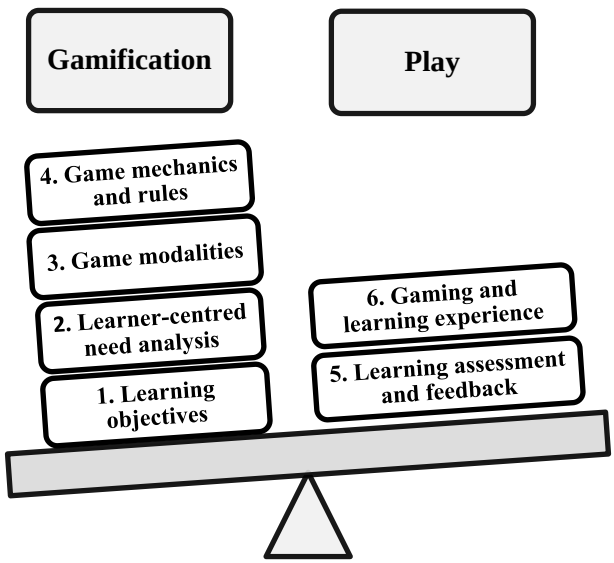

Figure 4. **HEXA-GBL** (Adapted from Romero, 2015:117)

The experience and backed up by literature, it was clear that a haphazard approach to gamifying-with-technology for exam preparation is bound to be ineffective. Making use of an appropriate framework for the development of the project would be helpful. A framework, designed and developed by Romero (2015), would have been suitable for the development of this initiative. This framework, called HEXA-GBL, is a six-phase methodology for designing and evaluating GBL activities from a learner-centred perspective. Although this framework is aimed at GBL rather than gamification, it does fit the current initiative. The overall event certainly falls within the parameters of gamification, but each individual station requires that students learn through playing or participating in some activity. In other words, the gamified exam preparation comprises mini-GBL activities.

The HEXA-GBL design and evaluation is organised in six phases. The first four phases focus on the design of the game activity, starting from defining the learning objectives, analysing the learner-centred need and defining the game modalities, mechanics and rules. The final two phases focus on the play activity evaluation from the perspective of the learning outcomes, assessment and feedback, but also from the learners' gaming and learning experience during the GBL activity. In order to best apply the HEXA-GBL framework for the current initiative each of the stations (mini-GBL) would be assigned to a team of four to five students enrolled for the third year Recreation course. A separate student team (or the group as a whole) would be responsible for the logical flow between stations and overall mechanics of the event. For the further design and development of each GBL activity, the lecturers would be guided by the HEXA-GBL framework, the needs analysis information obtained from this pilot study and the student learning assessment resulting from the current initiative. It would provide valuable answers to ensure that this initiative is taken to the next level and applied correctly.

CONCLUSIONS AND RECOMMENDATIONS

The design and use of the mobile application were both successful and unsuccessful.

- The application was easy to use;
- The instructions were easy to follow;
- The multiple choice questioning worked well;
- The application had some technical issues that needs some attention;
- The application can be implemented in a more constructive way;
- Redesign will be necessary for successful implementation that adds value;
- Question banks need to be created;
- The use of different types of questioning needs to be investigated.

From the researchers point of view *usefulness* is an important factor when applications are being incorporated into the teaching approach. It seems that the students concurred that the ease of the application had no relationship with its usefulness. This may indicate that an application may be easy to use, but if it is not useful or the usability is lacking, a student may not want to use it. The testing of an application even if used for a teaching experience should be tested by the end-user.

Based on the positive outcome of the students' experience of the gamification, it is evident that an activity like this does have value, however, the implementation needs to be reconsidered in order to ensure the future success of this approach. It is clear that to be truly a fun and constructive event to help students prepare for examination, the questions used to test knowledge need to be in line with the outcomes of the examination paper and the respective Blooms levels. The recreational and creative play activities also need to be aligned with the outcomes from the modules. This would add value to the learning experience of the students and would also improve the academic underpinning of this event. Incorporating a project-based learning activity by evaluating the senior students on their application of skills acquired in the classroom, the whole approach would be more valuable. Utilising an existing framework to guide the redesign and development of the activity would be useful.

This study contributes to the scholarship of teaching and learning approaches that focuses on the enhancement of student's learning experience and also emphasises that the use of technology, even though well designed, can be unnecessary if not implemented correctly or if not tested in the exact setting. The results found in this study are completely objective and will hopefully aid in improving the activity.

Acknowledgements

This research study was conducted based on an activity designed by lecturers. We appreciate their time and effort to make it possible to conduct this study.

REFERENCES

AUBUSSON, P.; BURKE, P.; SCHUCK, S.; KEARNEY, M. & FRISCHKNECHT, B. (2014). Teachers choosing rich tasks: The moderating impact of technology on student learning, enjoyment, and preparation. *Educational Researcher,* 43(5): 219-229.

BATES, A.W. & POOLE, G. (2003). *Effective teaching with technology in higher education: Foundations for success* (1st ed.). San Francisco, CA: Jossey-Bass.

BOEIJE, H. (2002). A purposeful approach to the constant comparative method in the analysis of qualitative interviews. *Quality and Quantitiy,* 36(4): 391-409.

BOTHA-RAVYSE, C.R. (2016). "Be the change you want to see in your classroom". Unpublished paper presented at ITEA (Institutional Teaching Excellence Awards) Lecturer Colloquium, North-West University, Vaal Triangle Campus, Vanderbijlpark, Rep. of South Africa, 18 April.

BRADY, A-M. (2005). Assessment of learning with multiple-choice questions. *Nurse Education in Practice,* 5(4): 238-242.

CARLILE, S.; BARNET, S.; SEFTON, A. & UTHER, J. (1998). Medical problem based learning supported by intranet technology: A natural student centred approach. *International Journal of Medical Informatics,* 50(1-3): 225-233.

CHANG, M-M. (2005). Applying self-regulated learning strategies in a web-based instuction: An investigation of motivation perception, computer assisted language learning. *Computer Assisted Language Learning,* 18(3): 217-230.

CHITTARO, L. & SIONI, R. (2014). Evaluating mobile apps for breathing training: The effectiveness of visualization. *Computers in Human Behavior,* 40(5): 56-63.

DETERDING, S.; CANOSSA, A.; HARTEVELD, C.; COOPER, S.; NACKE, L.E. & WHITSON, J.R. (2015). Gamifying research: Strategies, opportunities, challenges, ethics. In B. Begole, J. Kim, K. Inkpen, W. Woo (Eds.), *Proceedings of the 33rd Annual Association for Computing Machinery Conference Extended Abstracts on Human Factors in Computing Systems* (pp. 2421-2424). Seoul, Republic of Korea: ACM (Association for Computing Machinery).

DOPPELT, Y. (2003). Implementation and assessment of project-based learning in a flexible environment. *International Journal of Technology and Design Education,* 13(3): 255-272.

EWERT, A.W. & SIBTHORP, J. (2014). *Outdoor adventure education: Foundations, theory, and research*. Champaign, IL: Human Kinetics.

FELICIA, P. (2012). Motivation in games: A literature review. *Internation Journal of Computer Science in Sport,* 11(1): 4-14.

GARRIS, R.; AHLERS, R. & DRISKELL, J.E. (2002). Games, motivation, and learning: A research and practice model. *Simulation and Gaming,* 33(4): 441-467.

GAYTAN, J. & MCEWEN, B.C. (2007). Effective online instructional and assessment strategies. *American Journal of Distance Education,* 21(3): 117-132.

GLOVER, I. (2013). Play as you learn: Gamification as a technique for motivating learners. In J. Herrington, A. Couros & V. Irvine (Eds.), *Proceedings of World Conference on educational multimedia, hypermedia and telecommunications* (pp. 1999-2008). Victoria, Canada: Chesapeake, VA: AACE (American Association of Cost Engineers).

KHALID, H.; SHIHAB, E.; NAGAPPAN, M. & HASSAN, A.E. (2015). What do mobile app users complain about? *IEEE (Institute of Electrical and Electronics Engineers) Software,* 32(3): 70-77.

KUCUKUSTA, D.; LAW, R.; BESBES, A. & LEGOHÉREL, P. (2015). Re-examining perceived usefulness and ease of use in online booking: The case of Hong Kong online users. *International Journal of Contemporary Hospitality Management,* 27(2): 185-198.

MALONE, T.W. & LEPPER, M.R. (1987). Making learning fun: A taxonomy of intrinsic motivations for learning. In R.E. Snow & M.J. Farr (Eds.) *Aptitude, learning and instruction: Volume 3: Conative and affective process analyses* (1st ed.). London, UK: Routledge.

MORSCHHEUSER, B.; HAMARI, J. & KOIVISTO, J. (2016). Gamification in crowdsourcing: A review.In T.X. Bui & R.H. Sprague, Jr. (Eds.), *Proceedings of 49th Hawaii International Conference on System Sciences (HICSS)* (pp. 4375-4384). Koloa, HI: USA IEEE (Institute of Electrical and Electronics Engineers).

NAYEBI, F.; DESHARNAIS, J.-M. & ABRAN, A. (2012). The state of the art of mobile application usability evaluation. In *Canadian* Conference *on Electrical and Computer Engineering (CCECE)*, (pp. 1-4). Montreal, QC: Canada IEEE (Institute of Electrical and Electronics Engineers).

NICHOLSON, S. (2015). A RECIPE for meaningful gamification. In L. Wood & T. Reiners (Eds.), *Gamification in education and business* (pp.1-20). Basel, Switzerland: Springer International Publishing Switzerland.

PAPASTERGIOU, M. (2009). Digital game-based learning in high school computer science education: Impact on educational effectiveness and student motivation. *Computers and Education,* 52(1): 1-12.

PIVEC, M.; DZIABENKO, O. & SCHINNERL, I. (2003). Aspects of game-based learning. In *Proceedings of 3rd International Conference on Knowledge Management* (pp. 216-225). Graz, Austria, 2-4 July.

ROMERO, M. (2015). Work, games and lifelong learning in the 21st Century. *Procedia-Social and Behavioral Sciences,* 174(February): 115-121.

SALDANA, J. (2009). *The coding manual for qualitative researchers.* London, UK:, Sage.

SIMKIN, M.G. & KUECHLER, W.L. (2005). Multiple-choice tests and student understanding: What is the connection? *Decision Sciences Journal of Innovative Education,* 3(1): 73-98.

SLAVIN, R.E. (1980) Cooperative learning. *Review of Educational Research,* 50(2): 315-342.

THOMAS, J.W. (2000) A review of research on project-based learning. San Rafael, CA: Autodesk Foundation.

Corresponding author: Dr. Chrisna Ravyse; **Email**: chrisna.botha@nwu.ac.za

(Subject editor: Prof. Melainie Cameron)