World Academy of Science, Engineering and Technology
International Journal of Educational and Pedagogical Sciences
Vol:11, No:7, 2017

An Analysis of Gamification in the Post-Secondary Classroom

F. Saccucci

***Abstract*—**Gamification has now started to take root in the post-secondary classroom. Educators have learned much about gamification to date but there is still a great deal to learn. One definition of gamification is the ability to engage post-secondary students with games that are fun and correlate to class room curriculum. There is no shortage of literature illustrating the advantages of gamification in the class room. This study is an extension of similar thought as well as an extension of a previous study where in class testing proved with the used of paired T-test that gamification did significantly improve the students' understanding of subject material. Gamification itself in the class room can range from high end computer simulated software to paper based games of which both have advantages and disadvantages. This analysis used a paper based game to highlight certain qualitative advantages of gamification. The paper based game in this analysis was inexpensive, required low preparation time for the faculty member and consumed approximately 20 minutes of class room time. Data for the study was collected through in class student feedback surveys and narrative from the faculty member moderating the game. Students were randomly selected into groups of four. Qualitative advantages identified in this analysis included: 1. Students had a chance to meet, connect and know other students. 2. Students enjoyed the gamification process given there was a sense of fun and competition. 3. The post assessment that followed the simulation game was not part of their grade calculation therefore it was an opportunity to participate in a low risk activity whereby students could subsequently self-assess their understanding of the subject material. 4. In the view of the student, content knowledge did increase after the gamification process. These qualitative advantages identified in this analysis contribute to the argument that there should be an attempt to use gamification in today's post-secondary class room. The analysis also highlighted that eighty (80) percent of the respondents believe twenty minutes devoted to the gamification process was appropriate, however twenty (20) percentage of respondents believed that rather than scheduling a gamification process and its post quiz in the last week, a review for the final exam may have been more useful. An additional study to this hopes to determine if the scheduling of the gamification had any correlation to a percentage of the students not wanting to be engaged in the process. As well, the additional study hopes to determine at what incremental level of time invested in class room gamification produce no material incremental benefits to the student as well as determine if any correlation exist between respondents preferring not to have it at the end of the semester to students not believing the gamification process added to the increase of their curricular knowledge.

***Keywords*—**Gamification, inexpensive, qualitative advantages, post-secondary.

Prof F. Saccucci is an Associate Professor at Macewan University in Edmonton, Alberta, Canada (e-mail: saccuccif@macewan.ca).

I. Literature Review

KATE Salen, an Executive Director of the Institute of Plan, describes great games as dynamic, immersive, and empowering: "Great games require participation and interaction from the players and simultaneously give players immediate and constant feedback on how they are doing" [2]. One drawback to gamification is an interest in the game would most likely need to exist by the learner for the above-mentioned feedback to have a positive effect. A percentage of students may have a preconceived notion that playing games in the classroom is a waste of time. "An ideal interest curve would have a high level of interest at the beginning to immediately draw in learners. This would occur by doing something to grab the learner and get him/her excited. Once the initial hook is set, the next step is to settle down to business, at which time the interest level will drop slightly from the initial high level. If the learning experience is well-crafted, the learner's interest will then rise again, temporarily peaking at different points. Finally, at the end, there is the climax, and then the learning is over and learners leave the instruction with interest left over and the knowledge gained by the carefully sequenced instruction" [6]. Kapp's process model was used in this study. As well this study will attempt to assess whether twenty (20) minutes of gamification is the appropriate time allotment committed in the classroom in order to maintain a high level of interest while using a paper based game. The classroom setting here is defined as two sections of an introductory managerial accounting class in a post-secondary commerce degree program. It is important to note here, that introductory managerial accounting is a mandatory class in the vast majority of business degree programs. In an open informal survey conducted in the classroom, one third of the day time students indicated an interest in pursuing a Charted Professional Accountant designation. An assumption may be made that this one third was very motivated in knowing the course curriculum in order to do well in their future professional designation exams. As a residual, the remaining two thirds were only taking the course as a program requirement.

"We find that gamified learning interventions have a positive impact on student learning. Our results show that while generally positive, the impact of gamified interventions on student participation varies depending on whether the student is motivated intrinsically or extrinsically" [3]. Another study showed that games can motivate even for those who do not normally study for class [7]. This study will take both Buckley's and Robinson's study and further examine the following question: Can the timing/scheduling of the

gamification in the semester contribute to the student's motivation and engagement. "The instantaneous nature of student and player feedback is one of the most compelling arguments for the gamification of education. Life often offers people erratic, inconsistent and unreliable feedback on their actions. In an educational setting that feedback often becomes more focused, but not necessarily faster. An on the ground student may have to wait a week or more to get feedback on an assignment, presentation or even a thought. An online student usually waits 24 to 48 hours. In a game setting, feedback is almost always immediate, targeted and designed to enable the player to alter their approach for better, more desirable results" [1]. In this study the effect of gamification is tested with a post assessment. The respondents are also surveyed and asked if the gamification increased their content knowledge.

"Don't overcomplicate the experience. The best games are those you can describe in one or two sentences, or play intuitively. Make it accessible: "Gaming" seemed intimidating, and in fact prohibitive in the past." [8]. The game used in this study was explained in two to three minutes and was completed in less than 20 minutes. A second advantage to being able to explain a game in a short period is the accelerated adoption rate the game will have with other educators. Other educators will be willing to try the game in their class room if such a game can be quickly understood by themselves first. The post-game survey was completed in approximately 5 to 6 minutes. "Gamification is the application of concepts and techniques from games to other activities. While gamification is often used in business marketing activities, classroom activities can also benefit from this process. Today's learners often view traditional classroom activities as boring or routine. Incorporating game-like elements into class activities can generate excitement, anticipation and engagement with both course content and other learners. This is especially important in an era when students have greater expectations of being engaged or even entertained. Recent studies in neuroscience show that adding an element of chance and risk to classroom learning games can have a positive influence on learning" [7]. The gamification in this study used a sense of competition to create an excitement of which team would finish first. This study did not direct test if such competition contributed to student engagement and motivation, however personal interview notes from the instructor/moderator of the gamification indicated there was a sense of excitement when the student groups were competing to finish the gamification process first. As well, moderator's ethnographic field notes illustrate that the students appeared very relaxed during the pre-test and post-test, possibly due to such test results not being part of their final mark calculation.

II. The Study's Gamification Tool

The educational tool used in this study was adopted from a previous study whereby paired T-test were used with pre-quiz and post-quiz to determine the effectiveness of gamification [5]. This study's gamification tool was designed in a way to make it easy for the faculty member to use and complete in a 20-minute period. It is based on using a house design on an 11 by 8 inch sheet of paper, tape, and scissors to complete the task (the pieces of tape requested by the student and the design of the house represent direct material). The required game components such as paper and scissors was purposely used because such components would normally be easily acquired by anyone, therefore one less restriction to using the game in the classroom. Students receive one 11 by 17 inch sheet of paper that allows them to record their estimated direct material, direct labour and indirect/overhead cost. The later sheet allows them to compare the estimated cost to the actual cost for variance analysis. Figs. 1 and 2 shows a sample of the house layout which represents the project for the students. The template the students used to estimate the project costs and record actual cost plus variances is included in Appendix II. Students worked in groups of four, where two students would be imitating the role of workers (who are going to build the model using the material provided) another student would be a timekeeper (where each minute is calculated at a certain dollar payroll amount), and the last student would be a warehouse controller/foreman. Prior to the end of the class, additional information on overheads rates (utilities, security …etc.) are provided to students. After they build the house model, students are asked to calculate the cost of the model built and to perform a variance analysis between the different cost concepts. By this time in the semester, the students already had the theoretical exposure needed to play the game well.

III. Developing of Hypothesis

In this analysis students completed the gamification process in the last week of the semester. There were no further chapters or content needed to be discussed/taught. In this last week of classes there was a Monday, Wednesday and Friday class. Each class was for 50 minutes in length. On the Monday, we had a 25-minute pre-test plus explaining the gamification process. On the Wednesday class, we started and completed the gamification process and completed the post test. No marks were calculated for the pre-test and post-test. On Friday, we used the student answers to the post-test to act as a review plus utilized what would be considered normal review session. This subsequent review session may be considered brief, at fifteen (15) minutes. The reason, this review process may have been considered brief is that that the norm for a semester end review at the campus the day time students attend was fifty (50) minutes.

$H1_0$: In the student's view, the paper based gamification process did not increase their content knowledge. The students in this hypothesis were enrolled in an introductory managerial accounting class from a Canadian university. In this analysis, the day time students were full time students who are pursuing a degree and have yet to start their career. Evening students were working during normal business hours and taking evening courses to complete a certificate in management. The day time and evening students were from different universities but both Canadian universities were from the same Canadian

city. For both day time and evening cohorts the above mentioned managerial accounting class was a required class.

$H1_a$: In the student's view, the paper based gamification process did increase their content knowledge. The students in this hypothesis were enrolled in an introductory managerial accounting class from a Canadian university.

The second question in the student feedback survey read as follows: Did your content knowledge increase with the use of this gamification?

TABLE I
RESPONSES/PERCENTAGE EQUIVALENTS TO SECOND QUESTION

	Day Time	Evening
Yes	37 (72%)	20 (100%)
No	14 (28%)	0 (0%)
N	51	20

Given most the respondents answered "yes", $H1_0$ is rejected and the alternative hypothesis $H1_a$ is accepted which states "In the student's view, the paper base gamification process did increase their content knowledge.

$H2_0$: Twenty (20) minutes for a paper based class room gamification is not an appropriate period. The same respondents as $H1_0$. Which were, enrolled in an introductory managerial accounting class from a Canadian university. The students were full time students who are pursuing a degree and have yet to start their career. Evening students were working during normal business hours and taking evening courses to complete a certificate in management. The day time and evening students were from different universities but both Canadian universities were from the same Canadian city. For both day time and evening cohorts the above mentioned managerial accounting class was a required class.

$H2_a$: Twenty (20) minutes for a paper based class room gamification is an appropriate period.

The third question in the student feedback survey read as follows: "Was the time of 20 minutes allotted to the gamification process appropriate? Responses this question is given in Table II:

TABLE II
RESPONSES/PERCENTAGE EQUIVALENTS TO THIRD QUESTION

	Day Time	Evening
Yes	41 (80%)	19 (95%)
No	10 (20%)	1 (5%)
N	51	20

Given most the respondents answered "yes", $H2_0$ is rejected and the alternative hypothesis $H2_a$ is accepted which states "Twenty (20) minutes for a paper based class room gamification is an appropriate period. Why is testing a hypothesis such as this necessary? Per Greg Comline, senior manager at Deloitte South Africa, the value in gamification is in finding the right balance of gaming mechanics that will resonate with the intended audience. "Too much 'game' and your audience will be playing and no value added. Too little 'game' and it becomes another tedious process that your audience needs to be engaged in because they have to be and not because they want to be" [4]. This is the rationale behind using and testing a paper based game which can be completed in 20 minutes. Since respondents in the survey were not identified by name or number there isn't the ability to correlate question two (2) and three (3). Identifying students by random selected numbers will be a consideration for the following study.

In the fifth (5) and last question of the student feedback survey, the respondents had an opportunity to answer the following question: "What did you like or dislike about the class room gamification"? The following are themes of the responses:

Likes:

- Nice review
- Put content into a real-life example
- Interacted with other students.
- Had the opportunity to meet other students.
- It was a fun experience.
- I see the practical side of accounting more now than I did before.

Dislikes:

- Did not help me with the final exam.
- Could have been more complex (evening class)
- Could have used the last week for review questions to help with the final exam.
- It was a waste of time.
- It was too simple (evening class)

IV. CONCLUSION

Based on the above testing of hypothesis $H1_0$ and H1a it is evident that most students believe the use of gamification did increase their content knowledge. Although over seventy (70) percent of the day time students and hundred (100) percent of the evening students indicated "yes" to this second question of "Did your content knowledge increase with the use of this gamification", it is interesting to note that twenty-eight (28) percent of the day time students indicated no to this same question. The evening class average age was higher than the day time class. This higher average age may contribute to a greater level of maturity. This higher level of maturity may in turn contribute to a greater appreciation for gamification opportunities bringing forward real world applications. The additional study to this study will hope to validate this maturity assumption as well as provide additional reasons in further understanding the difference in responses from day time and evening class.

In the responses tabulated in the Table II found in Section III, it is also evident that twenty (20) minutes is an appropriate period for a paper based gamification process. Again, a further study is needed to determine if there is any correlation between the respondents (twenty-eight) percent in Table I who believed the gamification process did not contribute to the increase of content knowledge and the respondents who believed that a gamification process should not be scheduled for the last week of class. In other words, did the scheduling of the gamification process have any influence on hampering the

student's engagement and opportunity to have content knowledge increase? Were a percentage of the students only focused on the upcoming exam and did not see the correlation of the gamification assisting with understanding curriculum content? By most accounts, the sample used in this analysis is considered small. It is intended to continue circulating the student feedback surveys to additional student populations. The hope, is to circulate the surveys to ten (10) additional classes whereby, each class would have a student population of approximately 40 students. This is planned to be done at three different universities/colleges in western Canada.

Some of the above mentioned dislikes were: 1. Did not help me with the final exam. 2. Could have used the last week for review questions to help with the final exam. 3. It was too simple. 4. Could have been more complex. As previously mentioned above, the additional analysis will attempt to determine if the scheduling of the gamification in the last week of the semester contributed to any of the dislikes from the smaller population of the students.

This additional testing will also attempt to investigate any change that may exist with the listing of likes to survey question number five. Perhaps, regardless of when the gamification was schedule a percentage of the likes would remain the same such as: 1. Put content into real life examples. 2. Interacted with other students. 3. Had the opportunity to meet other students. 4. It was a fun experience. There will be an attempt to validate this in the next study.

The gamification process was exercised in the last week of the semester. In reading the narrative type question of likes and dislikes, a percentage of students may have been simply preoccupied with the upcoming final exams and may have preferred to use the last week of class for specific review type questions. In this case is timing everything? Will these themes of likes and dislikes be repeated with future student populations or are these themes unique to this small sample? The next subsequent analysis hopes to determine if such dislikes are repeated and if so, was it in a material volume?

It is important to note that the gamification process was used in an introductory managerial accounting class. This class is a mandatory class in most business degree programs. Is there any correlation to the students who are simply taking this class as a requirement and the above mentioned dislikes? It may be fair to assume that a student hoping to obtain the Chartered Professional Accountant designation would take this introductory managerial accounting class more seriously and therefore would take the gamification process in this class more seriously which would produce more likes than dislikes for this group of students.

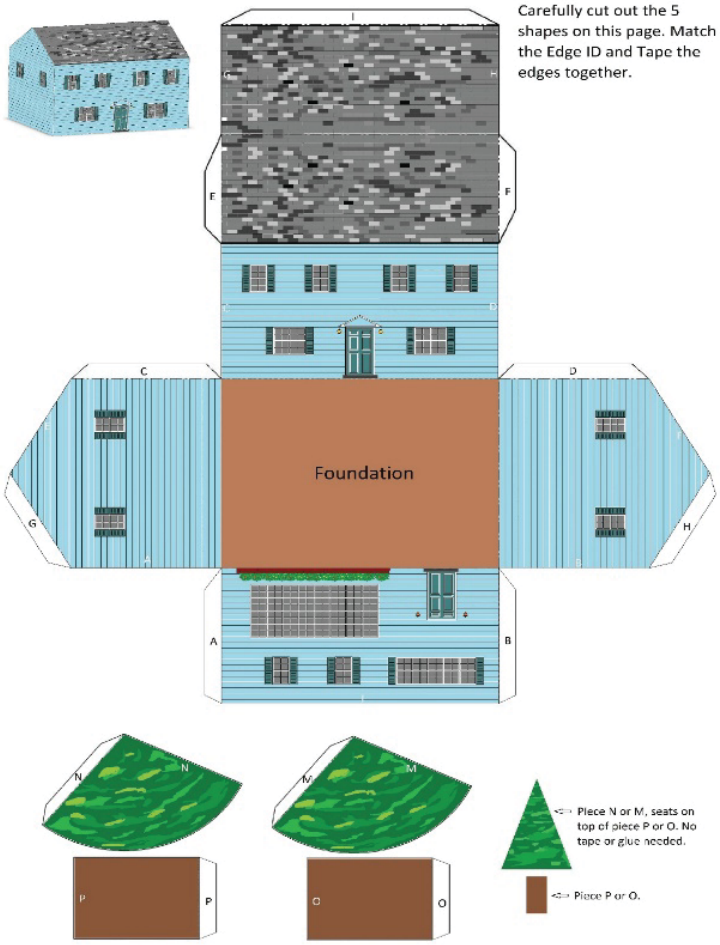

Fig. 1 Layout of house design which needed to be cut and assembled

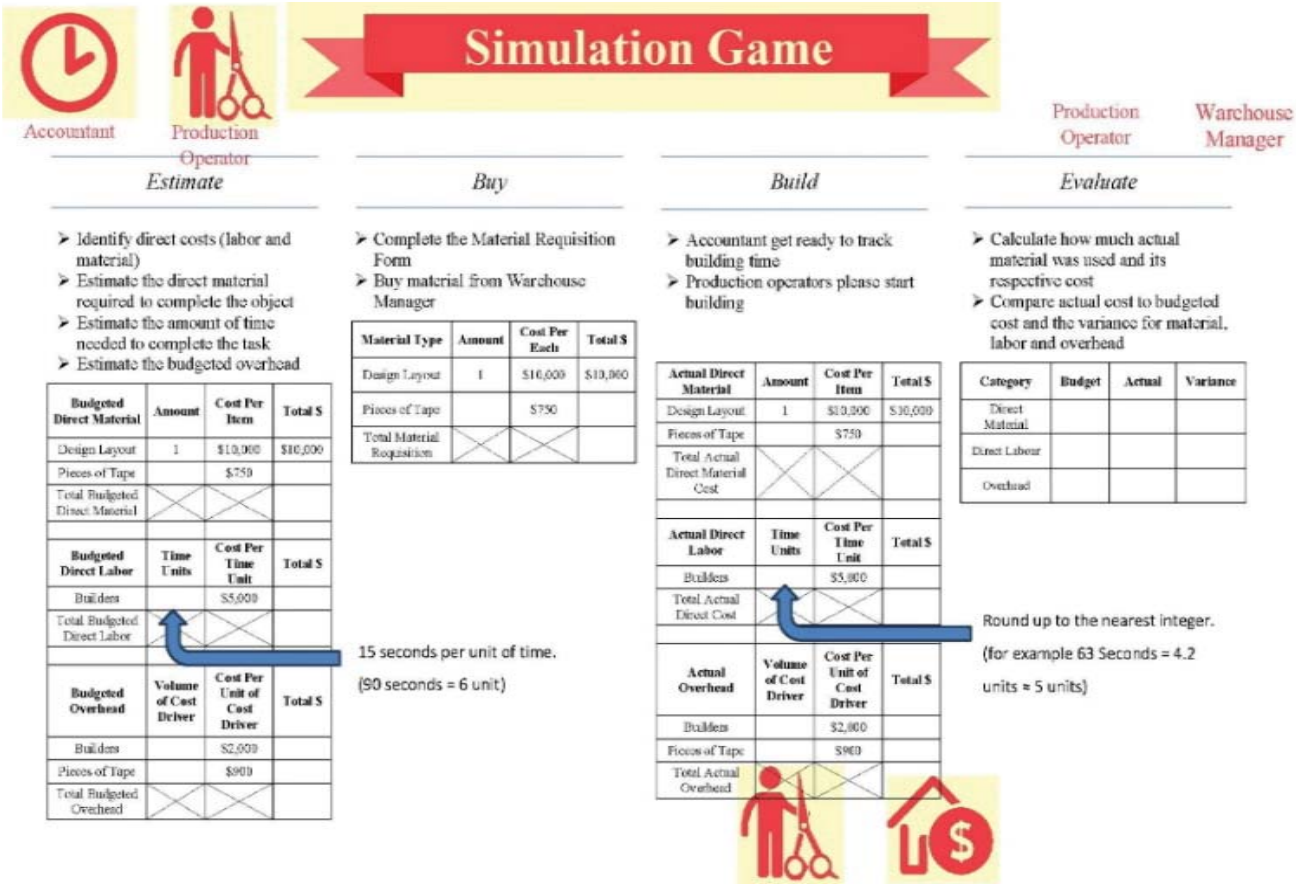

Fig. 2 Game worksheet were estimates were compared to actuals to calculate variances

In conclusion, regardless if the students were or were not pursuing a Chartered Professional Accountant designation there were more students believing the gamification process did contribute to the increase of their curriculum content than students not believing such. Also, twenty minutes devoted to the gamification process appeared to be the appropriate period to the clear majority of students. The additional following study may extend the game by 10 minutes and test if 30 minutes was viewed by respondents to be an appropriate period of the time.

ACKNOWLEDGMENT

The paper gamification process used in this analysis was from a project sponsored by a granted provided by the Chartered Professional Accountants Educational Foundation (CPAEF) of Alberta, Canada.

REFERENCES

[1] Arnold, B. (2014). Gamification in Education. *American Society of Business and Behavioural Sciences. February 2014*, 32-39.
[2] Bruder, P. (2014). Game On: Gamification in the Classroom. *New Jersey Education Association. May 2014,* 36-38.
[3] Buckley, P., & Doyle, E. (2016). Gamification and Student Motivation. *Interactive Learning Environment. September 2016*, Vol. 24 Issue 6, 1162-1175.
[4] Comline, G., (2012, June) Deloitte's Tech Trends. Retrieved from URL: http://www.itweb.co.za/index.php?option=com_content&view=article&id=55808
[5] Elbarrad, E., Saccuccif, F. (2016). The Effectiveness of Using Educational Tool to Enhance Undergraduate Students Learning Experience to Cost Accounting Principles. An Applied Study, *Turkish Online Journal of Education and Technology*
[6] Kapp, K. (2012). Games, Gamification, and the Quest for Learner Engagement. American Society for Training & Development. June 2012, 64-68.
[7] Robinson, S. (2006). Using Games And Clickers To Encourage Students To Study And Participate, *11*(2).
[8] Wise, M. (2011), Seven Rules of Getting Started in Gamification. Penton Business Media, Inc and Penton Media, Inc. December 2011.