

Gamified Flipped Learning to Improve Students' Performance in Federal Polytechnic Mubi

Ireti Hope Ajayi¹, Ogah U. S.² and Wadzani A. Gadzama³

^{1&2}Computer Science Department, ³ICT Unit, Federal Polytechnic Mubi, Adamawa State, Nigeria.

Corresponding author: ogahs22@gmail.com

Abstract

In education, keeping students engaged has being a challenge in learning. Meanwhile, one of the ideas introduced by educationists in ensuring better student engagement in learning is flipped learning approach so as to enable students to carefully read their learning materials prior to the conventional class. The researchers proposed a gamified flipped learning to improve student's performance in the Federal Polytechnic Mubi. In achieving the objective, the study examined some of the factors in flipped and gamification that have influence on students' performance. A well-structured questionnaire was designed and used to elicit data. One Hundred and Fifty (150) copies of the questionnaire were distributed to some selected HND students from five different departments of the school to get their responses on how gamified flipped learning has impacted on their performance. The outcome of the investigation showed that reward, competition, collaboration, satisfaction and confidence have great influence on student's performance in flipped classroom. This was recommended for use in schools by the researchers.

Keywords: Gamification, Learning, Performance, Flip, Engagement.

Introduction

Several ideas on teaching and learning have emerged over the past decades. Major emphasis has been on student-focused and active learning where students have access to personalized learning out of the regular classroom through Technology-Aided Instruction (TAI) using computers and internet connectivity as against the traditional learning which is teacher-focused. Though, learning is described in different ways by individuals from different disciplines (Ambrose et al., 2010). Learning refers generally as the acquisition of knowledge and skills to improve performance which could be active or passive in nature. In passive learning, activities revolve round the instructor as students received information from instructor through lecturing. On the contrary, active learning is student-centred with provision for peer interaction and discussions. Thus, active learning promotes critical thinking, creativity and opportunity for personal expression, thorough writing feedback is also an attribute of active learning process which occurred both within and outside the class. Meanwhile, Technology Aided Instruction gave rise to systems such as eLearning, blended learning, flipped learning, and gamification of learning amongst others. E-Learning refers to computer and/or the internet supported online or offline learning (Kabari & Ukpung, 2012). Over time, e-learning has also brought about the development of other technology-based models like blended learning.

In blended learning, traditional face-to-face instruction is combined with technology-based approaches (Debnath, et al., 2014). One of the outstanding advantages of blended learning is its potential to reduce educational expenses, as learning costs are lowered by putting classroom in an online space, hence removing the geographical boundaries between the teacher and students.

According to Kanchanamala & Muppidi, (2016), blended learning revolves round four models; namely station, lab, flipped classroom and individual models. The station model allows students to visit different centers during the cause of studying a specific subject. Students may work with or without a teacher offline as well as online so as to get more knowledge, a situation that provide avenue for discussions among them. In lab model, students learn the subject online from the lab.

Statement of Research Problems

Keeping students engaged in education has being identified as one of the challenges in learning. Meanwhile, an idea introduced by educationists in ensuring better student engagement in learning is flipped learning approach so as to enable students to carefully read their learning materials prior to the conventional class. Hence, the need for a gamified flipped learning in Federal Polytechnic Mubi.

Research Objectives

The aim of this research is to determine the impact of gamified flipped learning on the performance of students in the Federal Polytechnic, Mubi. The specific objectives of the research include:

- i. To investigate the impact of reward in flipped learning on the students' performance.
- ii. To examine the impact of competition in flipped learning on the students' performance.
- iii. To determine how collaboration has impacted on the students' performance in flipped learning.
- iv. To study how confidence in flipped learning has impacted on the students' performance.

Research Questions

- i. Does reward in flipped learning has impact on the students' performance in the Federal Polytechnic?
- ii. Does competition in flipped learning improve the students' performance in the Federal polytechnic Mubi?
- iii. Does collaboration have any impact on the students' performance in flipped learning in the Federal Polytechnic Mubi?
- iv. Does confidence in flipped learning help improve on the students' performance in the Federal Polytechnic Mubi?

Literature Review

Flipped classroom also known as inverted classroom has been an evolving concept in the educational sector in today's world. The concept has reversed teaching from the traditional face to face where teacher was seen as sage on the stage to what we now have as guide on the side (O'Flaherty & Phillips, 2015). The approach has continued to gain vast relevance in education, especially in higher institutions. In flipped learning, teacher made available learning resources for students to learn independently before class (Guan et al., 2015). The diverse advantages of this approach include; providing one-on-one time with teacher, students learning at own pace, leveling the playing field for both slow and fast learners, addressing absenteeism, providing an excellent diagnostic tool, and students teaching students (Anger & Roulet, 2012).

Gamification is one of the technological support-based learning concepts that has continue to gain ground in recent times following the attention that has been drawn to the game-informed education. Deterding, et al., (2011); Lamprinou & Paraskevas, (2015); Kapp, (2014); Simões, et al., (2013) and Zichermann & Cunningham, (2011) explained gamification as the use of game elements and game design techniques.

Consequently, educationists, as well as teachers, are adopting the game mechanics and techniques to motivate students for the purpose of improving their level of engagement. Hartley & Davies, (1978) study explained that student gave more attention in the first ten minute of lecture, a situation that subsequently diminishes as the class goes due to distraction and lose concentration. In gamification, the game elements are the small parts that form a game and the commonly used game elements are points, badges and leaderboards otherwise called "PBL Trio" (Werbach & Hunter, 2012).

Flipped classroom is one of the evolving technology support-based active learning pedagogy. Flipped classroom, also known as inverted classroom can be traced back to the gos, at a time when Earie Mazar, a Professor of Physics at Harvard University first use the method in his research. Thereafter, Bergman & Sams, (2012) applied the model in K-12 education practice, with the aim of helping students to carry-out their home work as well as assist those that find test difficult by accessing instructional materials through videos and listening to explanation at their home through the aid of technology online or offline before the conventional class, thus inverting the classroom. Flipped classroom however exerts some of the advantages of blended learning, promoting utilization of instructional resources, and establishes new style of relation between teachers and students.

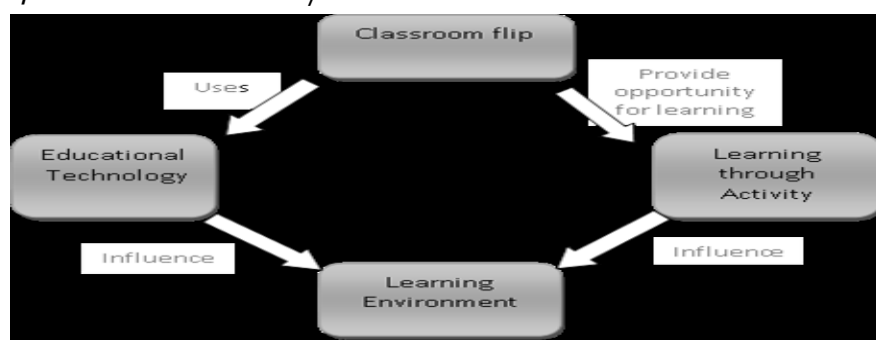


Figure 1: Key Elements of a Flipped Classroom (Strayer, 2012).

The flipped classroom is a typical case of blended learning model (O'Flaherty & Phillips, 2015). As a result, Lamerias, (2015) explained that flipped learning model is adopted in teaching by providing learning materials in form of info-graphics, virtual experiments, quizzes, videos etc for students to research on before going to the classroom. Numerous researchers and instructional designers have sought to investigate the benefits in flipped learning environments aftermath.

It is not a fallacy to say that students of the present age do not find listening to instructors and taking lecture notes in the traditional way fascinating anymore. Therefore, to encourage them and offer passion to take a particular course seriously, new strategies have to be inculcated in teaching curriculum. A great deal of new strategies for education have been innovated because of societal change, such include game based learning, technology and game elements though not limited to them. New innovations permit instructors to utilize new ways to deal of teaching. Li et al., (2012) and Denny, (2013), found gamification effective in learning. Also, Zhamanov & Sakhiyeva, (2016) described how the combination of gamification and flipped classroom was applied in learning a Computer Network subject using Cisco Networking Academy tools set. Cisco Certified Network Associate (CCNA) course was integrated into the subjects offered by the 3rd & 4th year Bachelor Degree students, through the development of an online portal that consist of some self-study tools and learning materials such as online exams, online quizzes etc.

In like manner, Tretinjak, et al., (2014) demonstrated the usefulness of gamification in flipped classroom and other modern teaching techniques on Electrical Engineering students in Zagreb. In the research, points were awarded at the completion of task, project and test and students' grades depend on the amount of points they have gathered at the end of each course. The study analysis of a second-year undergraduate business course and how they introduce a gamified approach within a flipped classroom experience and focus on the use of gamification in a flipped business school program to know whether if a flipped classroom is gamified it will improve student engagement and results. The feedbacks from students have been tremendously positive, and the pass rate has improved for this unit. Students seemed to find the workshop activities (and pre-workshop materials) fundamentally satisfying and engaging; therefore, their intrinsic motivation seemed to increase (Abeysekera & Dawson, 2015).

Table 1: Traditional Classroom

Time	Teachers	Students
Before Class	Prepare lecture notes	No clear activity
During Class	Pass information in the prepared note to student	Listen to lecturer and take note as well as follows guide instruction
After Class	Assess past work	Revise note and do home work

Table 2: Flipped Classroom

Time	Teachers	Students
Before Class	Prepare instructional materials in digital forms	Complete assigned task and prepared for in-class activities
During Class	Engage the students in discussion and question session	Verify their understanding and extend learning skills
After Class	Post additional resources and explanation as necessary	Continue applying their knowledge and skills, extend learning to more complex task

Methodology

A well-structured questionnaire was designed and used to elicit the necessary data for analysis. Hundred and Fifty (150) copies of the questionnaire were distributed to some selected HND students from five different departments of the Federal Polytechnic mubi to get their responses on how gamified flipped learning has improved their performance through reward, competition, collaboration, satisfaction and confidence. A Likert Scale of 5-points was used to measure the level of agreement or disagreement by the respondents. The response format is as follows:

SA - Strongly Agree, A – Agree, N - Not Sure, D – Disagree, SD - Strongly Disagree

Frequency distribution was used to analyze the data collected and examined the pattern of response to each variable under investigation.

Data Analysis

85 males representing 56.67% and 65 females representing 43.33% from the five randomly selected departments for the study. Analyses are as shown in the tables below:

Table 2.1: Departments

Department	Frequency	Percentage (%)
Business Admin. & Mgt.	52	34.67
Computer Science	33	22.00
Library and Information Sc.	10	6.67
Mechanical Engineering	12	8.00
Public Admin.	43	28.67
Total	150	100

Table 2.2: Competition

S/N	QUESTION	SD	D	N	A	SA
1.	Everybody is more active in the class than before.	10	17	28	51	44
2.	Students who hardly participate in class activities before now engage in discussion	8	14	25	48	55
3.	Gamification can increase students' engagement.	12	16	29	42	51

Table 2.3: Collaboration

S/N	QUESTION	SD	D	N	A	SA
1.	Students understand clearly the objective of each learning activities	12	22	18	52	46
2.	Learning contents are found important to every learner	14	17	21	47	51
3.	Students find relationship between the theory and practical in every lesson	15	23	21	49	43

Table 2.4: Confidence

S/N	QUESTION	SD	D	N	A	SA
1.	The students do not feel intimidated or embarrass by asking the teachers about the studied subject.	11	19	21	62	34
2.	Students develop self-confidence and a positive attitude for what they have learnt.	7	15	27	49	52

Table 2.5: Satisfaction

S/N	QUESTION	SD	D	N	A	SA
1.	Students performed their activities not only for the obligation, but for considering them fun to do.	10	19	21	62	34
2.	Students feel a sense of satisfaction by being awarded with positive reinforcement.	14	12	30	53	41

Results and Discussion

From table 2.2, we have 95, 103, and 93 responses representing agree and strongly agree cumulatively for the three different questions. This is an indication that students' attention and participation increase with gamified flipped learning.

In table 2.3, with a cumulative total of 98, 98 and 93 for agree and strongly agree. This agrees with the fact that gamified flipped learning avail the students a better understanding of each learning activity.

With the frequencies of 96, 101 in table 2.4 agreeing and strongly agreeing to these facts is an indication that students develop self-confidence and a positive attitude for what they have learnt and the students do not feel intimidated or embarrassed by asking the teachers about the studied subject.

In table 2.5, we have $A = 115$ and $SA = 75$, these responses from the respondents are in confirmation of the assertion that students feel a sense of satisfaction by being awarded with positive reinforcement.

Recommendations

Considering the present day technology, emphasis has to be on student-focused and active learning where students have access to personalized learning out of the regular classroom through Technology-Aided Instruction (TAI) using computers and internet connectivity as against the traditional learning which is teacher-focused. The authors recommend thus:

- i. That Technology-Aided Instruction (TAI) be adopted at all levels of learning with the support of the government and donor agencies.
- ii. That there is need for orientation and re-orientation for all categories of educators to help keep them abreast with innovations.
- iii. That student of Federal Polytechnic Mubi should be provided with the necessary materials/equipment needed to enable their usage of the new system.

Conclusion

In education, keeping students engaged has being a challenge in learning. This research proposes a gamified flipped learning to improve student's performance in the Federal Polytechnic Mubi. The findings showed, that students' attention and participation increases with gamified flipped learning, agrees with the fact that gamified flipped learning avail the students a better understanding of each learning activity, that students develop self-confidence and a positive attitude for what they have learnt and the students do not feel intimidated or embarrassed by asking the teachers about the studied subject, and also that students feel a sense of satisfaction by being awarded with positive reinforcement.

References

- L. Abeysekera and P. Dawson, "Motivation and cognitive load in the flipped classroom: definition, rationale and a call for research". *Higher Education Research & Development*, Vol.34 No.1, pp. 1-14, 2015.
- B. Anger and T. Roulet, "What is the flipped classroom model and why is it amazing". *Forbes Business*, Vol. 13, No. 7, pp. 123, (2012).
- S. A. Ambrose, M. W. Bridges, M. DiPietro et al., "How learning works: Seven research-based principles for smart teaching" John Wiley & Sons, 2010.

- K. A. Bakar, A. F. Ayub, W. S. Luan, et al., "Exploring secondary school students' motivation using technologies in teaching and learning mathematics" *Procedia-Social and Behavioral Sciences*, Vol. 2, No. 2, pp. 4650-4654, 2010.
- A. Bandura, "Toward a psychology of human agency". *Perspectives on psychological science*, Vol. 1, No. 2, pp. 164-180, 2006.
- D. A. Adams, R. R. Nelson, P. A. Todd, et al. "Perceived Usefulness, Ease of Use and Usage of Information Technology" A Replication, Vol. 16 No. 2, pp. 227-247, 2010.
- J. Bormann, "Affordances of flipped learning and its effects on student engagement and achievement" Unpublished Master of Arts Dissertation, Iowa. University of Northern Iowa
- S. L. Christenson, A. L. Reschly and C. Wylie, *Handbook of research on student engagement*. Springer Science and Business Media, pp. 26, 2012.
- R. S. Davies., D. L. Dean, and N. Ball, "Flipping the classroom and instructional technology integration in a college-level information systems spreadsheet course", *Educational Technology Research and Development*, Vol. 61 NO. 4, pp. 563-580, 2013.
- P. Denny, "The effect of virtual achievements on student engagement" *In Proceedings of the SIGCHI conference on human factors in computing systems* pp. 763-772, (2013)
- B. C. Debnath, M. M. Rahman and M. J. Hossain, "Blended Learning Approach for Engineering Education – An Improvement Phase of Traditional Learning" *International Journal of Computer Science and Network Security (IJCSNS)*, Vol. 14 No. 11, pp. 85-90, 2014.
- D. Dixon, R. Khaled, and L. Nacke, "From game design elements to Gamefulness". *Proceedings of the 15th International Academic MindTrek Conference on Envisioning Future Media Environments – MindTrek*, pp. 9-11, 2011.
- N. Yuan, Y. Xie, J. Feng, "A study on the application of flipped classroom teaching in higher vocational education" *10th International Conference on Computer Science & Education (ICCSE)*, pp. 819-823, 2015.
- W. M. Hamzah, N. H. Ali, M. Saman, et al., "Influence of Gamification on Students' Motivation in using E-Learning Applications Based on the Motivational Design Model". *International Journal of Emerging Technologies in Learning*, Vol. 2, No. 3, 2015.
- J. Hartley and I. K. Davies, "Note-taking: A critical review" *Programmed learning and educational technology*, Vol. 15 No. 3, pp. 207-224, 1978.
- L. G. Kabari and U. P. Ukpong "Creating an Effective E-Learning Environment for Nigerian Polytechnic Educational System", *International Journal of Emerging Technologies in Learning*, Vol. 3, No. 1, 137-142, 2015.
- P. Kanchanamala and S. Muppidi, "An Integrated Learning Model of Self Learning, Inquiry Based, Problem Solving, Activity Based, and Instructional Learning for Engineering Education". *6th International Conference on Advanced Computing (IACC)*, pp. 820-824, 2016.
- D. Lamprinou and F. Paraskeva, "Gamification design framework based on student motivation". In *Interactive Mobile Communication Technologies and Learning (IMCL)*, *2015 International Conference*, pp. 406-410, 2015.
- P. W. Lei and Q. Wu, "Introduction to structural equation modeling: Issues and practical considerations". *Educational Measurement: issues and practice*, Vol. 26 No. 3, pp. 33-43, 2007.
- H. Jang, E. J. Kim and J. Reeve, "Longitudinal test of self-determination theory's motivation mediation model in a naturally occurring classroom context". *Journal of Educational Psychology*, Vol. 104 No. 4, pp. 61-75, 2012.
- K. Kapp, "Gamification: Separating Fact From Fiction" *Chief Learning Officer*, Vol. 13 No. 3, pp. 42-46, 2014. Retrieved from <http://www.cedma-europe.org/newsletter/articles/Clomedia/Gamification>.

- S. Malik, "Effectiveness of ARCS Model of Motivational Design to Overcome Non Completion Rate of Students in Distance Education" *Turkish Online Journal of Distance Education*, Vol. 15 No. 2, pp. 194-200, 2014.
- J. O'Flaherty and C. Phillips, "The use of flipped classrooms in higher education: A scoping review", *Internet and Higher Education*, Vol. 2 No. 5, pp. 85-95, 2015.
- J. B. Smart and J. C. Marshall, "Interactions between classroom discourse, teacher questioning, and student cognitive engagement in middle school science" *Journal of Science Teacher Education*, Vol. 24 No. 2, pp. 249-267, 2013.
- E. A. Skinner, T. A. Kindermann, and C. J. Furrer, "A motivational perspective on engagement and disaffection: Conceptualization and assessment of children's behavioral and emotional participation in academic activities in the classroom" *Educational and Psychological Measurement*, Vol. 69, No. 3, pp. 493-525, 2009.
- J. F. Strayer, "How learning in an inverted classroom influences cooperation, innovation and task orientation". *Learning Environments Research*, Vol. 15 No. 2, pp. 171-193, 2012.
- C. Silpasuwanchai, X. Ma, H. Shigemasu, et al., "Developing a Comprehensive Engagement Framework of Gamification for Reflective Learning". *Proceedings of the 2016 ACM Conference on Designing Interactive Systems*, pp. 459-472, 2016.
- M. F. Tretinjak, A. Bednjanec and M. Tretinjak, "Application of modern teaching techniques in the educational process" In *Information and Communication Technology, Electronics and Microelectronics (MIPRO)*, 2014.