Project SIGE-21 (Sustainable Integration of Gamified Environment for 21st Century Learners): An aid for enhancing student engagement in the new normal education

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Abstract

Gamifying can flip the classroom. It may be any game where students and teachers take on various roles and utilize game elements to create a problem-solving situation. The researcher decided to create a new program, "Project SIGE-21," where the games could be integrated into the lessons without any violent content, an enjoyable, fun, educational, and learner-friendly gamified learning environment. The researcher tested the results through experimentation to test the effectiveness of Project SIGE-21 as an E-Learning virtual intervention for enhancing students' engagement. The study's respondents are thirty (30) Grade 11 online learning students of Noveleta Senior High School. The researcher included all students who participated in the class. The results show that students' engagement is fair before implementing the intervention. However, upon the administration of the new approach, it elevated to an excellent rating. The researcher identified a significant difference between the scores, indicating that students' engagement increased because of Project SIGE-21. The participants of the study found some challenges as well. Through qualitative analysis, the researcher identified four (4) thematic accounts with nine (9) different coded themes from the responses of the learners who had undergone Project SIGE-21. The study will benefit teachers as they craft their gamified instructional materials and integrate this strategy into their teaching style in the new normal. It will also positively affect the learners as the study proved that the mentioned strategy could increase students' engagement.

Keywords: gamification, students' engagement

Project SIGE-21 (Sustainable Integration of Gamified Environment for 21st Century Learners): An aid for enhancing student engagement in the new normal education

1. Introduction

In January 2020, the World Health Organization declared a COVID-19 outbreak. It became a pandemic later in March 2020. In the Philippines, classes at all levels were suspended, the government canceled unessential matters and placed the whole country under community quarantine. A lockdown was implemented, not only in the Philippines but in other countries as well. The pandemic has affected different sectors of the Philippines, including the education sector. The country later faced the so-called "new normal" in its system. All schools now offer hybrid, modular, or entirely online courses in the new normal (Tumapon, 2020 – Manila Times). Moreover, Secretary Leonor Briones (2020) said in an interview that DepEd continues to underline the unique synergy of their departments closely working together in the delivery of education as they analyze the successes and problems of the department in the present pandemic, particularly in schools located within community quarantine areas.

Due to the pandemic, many schools nationwide are adopting the hybrid learning approach, combining education with synchronous and asynchronous learning (Martin et al., 2020). Questions concerning the instructional quality of academic courses incorporating online material or gamification aspects arise when course designers and teachers study new technology and teaching methodologies (Machajewski, 2020). Also, students are not the digital natives many hoped them to be. Although eighty-three percent (83%) of millennials sleep with their cell phones, fifty-eight percent (58%) have insufficient abilities to use technology to solve difficulties (Machajewski, 2020). However, gamification may increase their engagement level in academic matters. When applying gamification to academic courses, focusing on student engagement and intrinsic motivation is natural.

According to Jan (2020), gamifying can flip the classroom. It may be any game where students and teachers take on various roles and utilize game elements to create a problem-solving situation. Not only are games used in schools, but they are entertaining. They can help our children learn more deeply and broadly if they are well-designed. Games may be created to give students the circumstances to participate in knowledge, values, and moral education. The notion that learning must be nurtured via directed involvement in problem-solving, inquiry, and collaboration is supported by gamification in the classroom. However, the researcher also found that video games as K-12 educational tools have been a center of intense discussion over the past fifteen years. Digital gamification has already been used, but for some reason, Generation Z students have different kinds of games they are interested in. Racing and puzzle games were the most popular gaming genres, with nearly three-quarters of the youths in the sample playing them. These genres stand out because they contain little or no violence. On the other hand, two-thirds of adolescents said they played "action" or "adventure" games, some of which are rather violent. Generation z like Action/Fighter, Casual Action, Adventure RPG, and Building/Simulation games, according to Harviainen (2017).

The researcher decided to create a new program, "Project SIGE-21," where the said genres could be integrated without any violent content, an enjoyable, fun, educational, and learner-friendly gamified learning environment. The researcher tested the results through experimentation to test their effectiveness on students' academic engagement. They determined the effectiveness of Project SIGE-21 as an E-Learning virtual intervention for enhancing students' engagement and developing a gamified learning framework from the study's results.

1.1 Research Questions

From the investigation results, this study determined the effectiveness of Project SIGE-21 as an E-Learning virtual intervention for enhancing students' engagement and developing a gamified learning program.

Specifically, it identified the student's engagement level before and after the implementation of Project SIGE-21, the processes involved in the implementation, the significant difference between the student's level of engagement, and the challenges encountered by students and teachers during utilization.

1.2 Proposed Innovation, Intervention, and Strategy

Project Sustainable Integration of Gamified Environment for 21st Century Learners (Project SIGE-21) is a proposed intervention to engage students in the new normal academic setting through the gamified learning environment. The teacher designed gamified learning exemplars/ lesson plans and contextualized gamified learning materials, and applied them during the learning process.

2. Methods

Participants and/or Other Sources of Data and Information - Having this study conducted in Noveleta Senior High School, the researcher widened his boundaries in getting accurate results, but not to the extent of involving other institutions to participate in the experiment. The study's respondents are thirty (30) Grade 11 online learning students of Noveleta Senior High School. The researcher included all students who participated in the class. This study determined the effectiveness of Project SIGE-21 as an E-Learning virtual intervention for enhancing students' engagement and developing a gamified learning framework from the investigation results.

Pre-test and post-test will be used to gather information from the samples to determine the project's effectiveness in teaching areas under the normal curve and hypothesis testing using population proportion and population means. The researcher employed a standardized test formulated by Hart et al. (2011).

Demographic Profile of the Respondents

Age	Male	Female	Total
15-18	11	10	*21*
19-22	2	3	*5*
23-26	0	3	*3*
27-30	0	1	*1*
Total	*13*	*17*	30

Data Gathering Method - This study utilized qualitative and quantitative research methods to obtain reliable and sufficient data supporting its objectives. Quantitatively, the research will use the *one-group pretest-posttest quasi-experimental design*.

Fig. 1. One- Group Pretest-Posttest Quasi-Experimental Design

Experimental Group	p_1	x	p_2

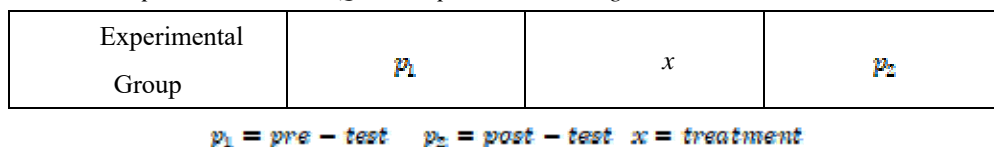$$p_1 = pre - test \quad p_2 = post - test \quad x = treatment$$

Fig. 1 shows the one-group pretest-posttest quasi-experimental design. The students were given a pre-test to identify their level of engagement before the intervention was employed. During the implementation, the teacher ensured the quality of teaching while gamifying the classroom through procedures integrated into the lesson exemplar anchored on the IDEA (Introduction, Development, Engagement, and Assimilation) format of the Department of Education. After it, the researcher employed a post-test among the students. Furthermore, the researchers used the qualitative thematic analysis to find out the challenges met by both students and teachers through their perspectives and experiences in implementing Project SIGE-21.

Data Analysis Plan - For the researcher to identify if the data gathered was normally distributed properly, Shapiro-Wilk Normality Test was used. Mann-Whitney U was utilized to identify the significant differences among the variables with nonparametric properties. It was used in all the analyses done in this research to find the

accurate amount of ratio of answers and the total number of respondents. Using the XCEL STAT and SPSS, absolute data were retrieved. The percentage was employed to analyze responses to the statements and questions in the pre-test and post-test. It was used in all the analyses done in this research to find the accurate amount of ratio of answers and the total number of respondents. The mean, percentage, rank, and Likert Scale were used to determine the level of students' engagement before and after the treatment was employed. Scores from 1.00-1.80 were considered Very Poor, 1.81-2.60 were Poor, 2.61-3.40 was Fair, 3.41-4.20 Good, and 4.21-5.00 was Very Good. However, the qualitative data underwent a thorough thematic analysis.

Ethical Considerations - This study was conducted with an eye toward ethics. No participants were compelled to participate in the study. The researchers provided a pre-activity orientation and post-activity debriefing to protect the respondents. All participants, including their parents, were asked to present consent letters. To protect the participants' privacy, all information was held in strict confidence. It was made clear to the participants that the results will only be used to further the study's objectives. To avoid injury, coercion, and dishonesty in the study, respondents were given a second informed consent assuring them that data from one-on-one interviews will be maintained in strict confidence and anonymity. Participants were advised that their sincere responses will give educators valuable information.

3. Results and Discussion

Table 1

Students' Level of Engagement Before the Implementation of Project SIGE-21

Engagement	Mean	Interpretation
Affective Engagement (Liking for School)	3.27	Fair
Affective Engagement (Liking for Learning)	3.07	Fair
Cognitive Engagement	3.05	Fair
Behavioral Engagement (Effort & Persistence)	2.90	Fair
Behavioral Engagement (Extracurricular Activities)	2.07	Poor
Overall Engagement	2.87	Fair

Table 1 shows the engagement level of students before the implementation of Project SIGE-21. The overall engagement level of students before the intervention was employed was Fair, with a weighted mean of 2.87. The highest among the five sub-factors is Liking for School under the affective domain with a mean of 3.27 and interpreted as a Good level of engagement. It means that students like being in Noveleta Senior High School. They are proud of being a student in the academe and motivated to go to school every day. However, the sub-factor with the lowest mean was extracurricular engagement, rated as a poor level. It accumulated a weighted average of 2.07.

Table 2

Students' Level of Engagement After the Implementation of Project SIGE-21

Engagement	Mean	Interpretation
Affective Engagement (Liking for School)	4.58	Very Good
Affective Engagement (Liking for Learning)	4.43	Very Good
Behavioral Engagement (Effort & Persistence)	4.30	Very Good
Cognitive Engagement	4.21	Very Good
Behavioral Engagement (Extracurricular Activities)	3.79	Good
Overall Engagement	4.26	Very Good

Table 2 shows the student's level of engagement after implementing Project SIGE-21. As attested in the results, the overall engagement of students is higher than their level before the execution of the intervention. It has a general weighted mean of 4.26, which signifies a very good level of engagement. This fact shows how a gamified environment can flip the entire class and enhance the engagement among the learners. According to Malahito & Quimbo (2020), games, especially those that promote healthy competitions, arouse students' excitement, leading to a higher level of engagement. Due to this instance, learners feel motivated to go to school.

They effectively like the school. The analyzed data supports this claim. As per the results, liking for the school under the affective domain is the highest among the sub-factors of engagement. It is interpreted as a very good engagement level, far from the fair level before the implementation of Project SIGE-21. The lowest subfactor was learners' engagement in extracurricular activities under the behavioral domain. It garnered a good level which shows an improvement from the previous level before the implementation of the intervention. Overall, by analyzing the weighted means of the post-evaluation of students' engagement, the level increased by a wide margin for all the subfactors and the overall engagement result.

Table 3

Significant Differences between Pre-test and Post-test of Engagement Assessment

Variable	Z-value	p-value	Decision
Affective Engagement (Liking for Learning)	-4.016	0.000	Reject Ho
Behavioral Engagement (Effort & Persistence)	-4.409	0.000	Reject Ho
Behavioral Engagement (Extracurricular Activities)	-4.424	0.000	Reject Ho
Affective Engagement (Liking for School)	-3.810	0.015	Reject Ho
Cognitive Engagement	-3.797	0.000	Reject Ho
Overall Engagement	-4.350	0.000	Reject Ho

Table 3 shows the significant differences between the students' pre-and post-evaluation engagement levels before and after the implementation of Project SIGE-21. As gleaned from the results, the two outcomes of students' level of engagement have significant differences. The negative z-test results signify that the post-test results are significantly higher than the pre-test outcomes. Looking closer at the data, students' behavioral engagement in extracurricular activities has the vastest differences as it has the lowest z-test value. It means that students' attention in this subfactor has significantly increased and was affected by Project SIGE-21. The least among the five is cognitive engagement, but it also implied significant differences and improvement. The last two indicators, effort and persistence and liking for learning, indicated significant negative z-test results, which means improvement in the two sets of evaluations.

4. Challenges Met in the Implementation of Project SIGE-21

Through qualitative analysis, the researcher identified four (4) thematic accounts with nine (9) different coded themes from the responses of the learners who had undergone Project SIGE-21.

Theme I: Affective Challenges

Feeling of Anxiousness

According to the students, they have felt nervous during the gamified classes. They felt anxious about working with each other because it was so long since they had been engaged in a face-to-face class. Despite the feeling of anxiousness, they tried to overcome it and participate in the activities. Here are some of their verbatim responses:

> *"I get anxious because I am so afraid to answer cause what if I get it wrong? If I do, I then get embarrassed."*

> *"Honestly, when sir bry gives a game in his class, I am afraid that I would be challenged to recite individually."*

> *"At first nervous because I knew it was hard, but I was still trying myself until I learned; at the same time, I enjoyed studying this subject because I learned a lot.*

> *nervousness and the time limit."*

> *"I'm still not that close to some of my classmates in my strand, so I often feel anxious whenever there's a group activity."*

"I'm quite an introvert towards new people and new to our school."

According to Chen et al. (2018), learning adjustment is inversely correlated to anxiousness; specifically, shyness to participate in academic activities. The author also emphasized in the study that proper motivation could uplift students participating in the activities.

Lack of Self-Esteem

Since a gamified classroom includes competition as one of the strategies for engagement, students found it hard to go against their opponents as they had doubts. They might lose. It leads to low self-esteem. They get easily intimidated by their classmates' skills, underestimating their potential to win. However, the students still managed to exert their utmost effort to attain the goal of the games instead of just aiming to win. That is, to learn new skills. Here are some of their responses regarding the matter:

"for me, it's a bit difficult because the opponent is a bit good, and he's still difficult, but I can do it if I continue and fight and don't give up."

"I am afraid I may lose to the competition with others."

According to Arshad et al. (2015), self-esteem and academic achievement have a direct relationship. This finding shows that high self-esteem results in high academic achievement. It is imperative that teachers, as they use gamified learning environments, should consider the students' self-esteem through observation and analysis.

Theme II: Cognitive Challenges

Level of Items' Complexity

The students found some items in the gamified class complex and challenging. They found things hard, especially when they failed to recall the concepts presented in the questions. Due to this, they perceived the complexity of items as one of the challenges they met in a gamified class. Here are some of their responses:

"Sometimes it is exciting, but there are times when it is difficult."

"There's a lot of challenges, and I can't answer them, especially those that I easily forget."

"The twist of the tasks given. The items get harder and harder."

"The challenges I have met is the hard task or activities."

In a study by Hovious (2020), students who receive highly complex questions tend to have lower academic engagement. From this result, the researcher recommends that teachers who intend to gamify their classes should design tasks that afford fair opportunity for all the learners.

Loss of Focus

Another challenge students met was the loss of focus. They get distracted easily and sometimes panics and gets mental block. In a gamified classroom, attentiveness is vital for successfully finishing a task. Therefore, this challenge should be overcome for academic engagement to increase. Here are some of the students' responses:

"Sometimes, I can't focus."

"The challenge I met is I get distracted quickly."

"I am easily distracted."

"I often have difficulty because I don't know much about math and can't focus."

Poor foundation on basic concepts

One of the significant challenges students faced during the gamified class was their poor background in the basic conceptual knowledge needed for accomplishing the tasks. In this case, a review class is required before every lesson. Also, they had difficulties with basic arithmetic, sometimes causing delays or errors in their computations. These are some of the responses of the students:

"Sometimes, there are lessons that I didn't know, but later, when my teacher starts teaching, the questions in my mind are finally answered, and the lesson that I didn't know, I already learned about it."

"Some lessons are unfamiliar to me, or I just didn't study them."

"There's a lot of challenges, and I frequently don't understand, but it is still exciting."

"It's hard for me to cope up."

In an article by Akbari et al. (2020), he emphasized that building a solid foundation of learning among the students could bring success to them. In a gamified learning environment, the teacher needs to assess the skills of their students. Before implementing a gamified class, they must identify the learner's quadrant and all their weaknesses to address possible issues. This preventive method may help educators avoid poor academic backgrounds hindering learning among their students.

Problems with Remembering Concepts

Students also perceived their problem of quickly forgetting the conceptual and analytical ideas of the lesson. They have emphasized how they become reliant on notes sometimes, which eventually causes panic and mental blocks.

"I think mine is when I forgot my notes. I can't answer any of the questions."

"Thinking of answers from the past lessons."

"Forgetting how to answer the question I get."

"While playing or engaging in gamification during Statistics and Probability, sometimes I panic and experience a mental block."

"The challenges I always encounter is nervousness, and I always experience mental blocks."

"I'm confused about the terms in stats because I mostly forgot them.

trying to remember the lesson."

Chen et al. (2018) stated that restudying students' forgotten concepts could enhance learning acquisition. As an implication, it is imperative to assure that students have a proper wrap-up of lessons, drills, and practices before indulging in the assessment of learning for the designated topic. Training and exercises eliminate students' problems remembering concepts in a gamified classroom setup.

Critical Analysis

Many students in this experiment found it hard to analyze the concepts presented in the gamified class critically. Critical thinking is one of the fundamental skills needed for problem-solving and one of the 21st-century skills that a person should develop over time. However, the students perceived this skill as one of the challenges they met during the implementation. Here are some of the responses under this thematic account when students were asked what challenges they met during the performance of the approach:

"I think the challenge I faced while playing was using critical thinking."

"The challenge I met is to think carefully about the answers and be able to answer in no more than the time provided."

"Sometimes, I don't know the answer to the questions."

"Sometimes, I'm struggling with what to do at first."

"Sometimes, I have difficulties at solving."

"The challenges that I met while playing/engaging in the gamification during Statistics and Probability Subject is so hard to do being well to know the lesson in Statistic and Probability because my knowledge in gamification and my knowledge in Statistic and Probability is fighting in my mind what are I believed in both and I'm so baffled what I want to know in both of these, and yet I want to work very well to know the Statistic and Probability and not focus my mind in playing games to enhanced my mind to know it."

"think faster, learn more."

"Think about what the question will be answered."

"Sometimes confusing"

According to Lazaro et al. (2022), critical thinking is a fundamental skill for problem-solving. Through critical thinking, students develop heuristics in solving the tasks at hand. In a gamified classroom, especially in Statistics and Probability, these skills are imperative and must be enhanced from time to time.

Theme III: Behavioral Challenges

Difficulty in Collaboration

One of the fundamental skills a 21st-century learner must possess is collaboration. However, in this experiment, students found cooperating and communicating with their teammates hard. Some of them believed that the new learning modalities made it hard to communicate with each other. The pandemic has flipped even their way of making conversations with their classmates. Here are some of their responses:

"Cooperation with other members."

"My only challenge is that we are an online class because the difficulty of groupings with task performance is that we can't do it right away, especially when it comes to connecting with others, it's hard on the internet, but we can do it."

"Experience how to communicate."

According to Mustakim et al. (2020), the student's presence in different places hinders collaborative learning. It is also affected by slow internet connection and the unavailability of gadgets. However, the teacher who implements gamified classrooms could apply differentiated instructions (Muthmainnah et al. (2021). In the study of Deliquiña & de Guzman (2021) in the context of Social Science subject, many differentiated instruction strategies may be utilized to enhance student's academic engagement and performance like Buzz Groups, Group-Investigation, Think-Pair-Share, and Issue Analysis.

Theme IV: Technical Challenges

Interrupted Internet signals

Internet connection is a frequent issue in an online distance learning setup. The respondents of this study considered it a reason they couldn't fully participate in the activities in a gamified learning environment. Though they found the games interesting, they couldn't follow the rest of their classmates as they often met interrupted

signals or lost internet connection. Here are some of their responses:

"The challenge I met while playing gamification during Statistics and Probability is when my signal got interrupted."

"Internet connection issue"

"Since I join online, poor internet connection is one of my challenges and struggles."

"Having a poor internet connection is a huge challenge I encounter whenever there is a game in an online class."

"Slow internet"

"One of the difficulties I've encountered while playing/interacting is an internet outage, which occasionally occurs while I'm in an online class."

"Loss of internet during meet"

"Bad connection of internet and struggling about the game"

"Speed of the site to load."

"Sometimes my internet connection is lost, and sometimes I don't understand because of the noise around me."

One of the solutions for the internet instability in the online distance classroom setup is through the help of stakeholders (Sufyan, 2020). The same study found that limited access to the internet is also caused by financial hardship. Data packages cost too much for a virtual meeting to attend. Also, internet traffic is rampant due to a considerable number of students and non-students using the same internet platforms. In a gamified classroom, the teacher may opt to include internet data-saving applications to avoid too much consumption of students' data packages.

5. Plan for Dissemination/ Advocacy

CIRCA 21: GAMIFIED

Gamified Contextualization of Instructional and Revolutionized Aids for 21st Century Learners

CIRCA 21 (Contextualization of Instructional and Revolutionized Aids for 21st Century Learners) is a project under PPA – I-LIKHA that includes seminars, pieces of training, and LAC sessions on contextualizing learning materials and strategies for 21st-century learners. It has been implemented in Noveleta Senior High School since 2020. Through the findings of the study "Utilization of Project Sustainable Integration of Gamified Environment for 21st Century Learners (SIGE-21) as an Aid for Enhancing NSHS Students' Engagement in Statistics and Probability", the gamified environment will be integrated.

Action	Success Indicator	Involved Individuals	Time Frame	Target
Preparation of Seminar Topics and Dates	Program of Seminar	School Head, Teachers	November-December	Identify speakers and topics for the list of seminar dates
Topic Preparation	Topic Outline	School Head, Speakers	January-February	PowerPoint Presentation for the topic/s.
CIRCA 21 – 1st Wave	Teacher's Output/ Mode of Verification	School Head, Teachers	March	Equip teachers with more knowledge on the technology-infused differentiated instructional materials.
Topic Preparation	Topic Outline	School Head, Speakers	April-May	PowerPoint Presentation for the topic/s.
CIRCA 21 – 2nd Wave	Teacher's Output/ Mode of Verification	School Head, Teachers	June	Equip teachers with more knowledge on the

technology-infused
differentiated instructional
materials.

6. Conclusion and Recommendations

This study revealed that Project SIGE21, a gamified intervention for the hybrid education modality, is an effective strategy for enhancing students' engagement in the new normal setup. The students level of engagement prior to the implementation of the intervention is fair. However, after the Project SIGE 21 has been implemented, it increased to a very good level, accompanied by high levels of engagement in affective, behavioral, and cognitive domains of learning. Through Mann Whitney U, it was found that there is a significant differences between the results of the experimentation. Looking closer at the data, students' behavioral engagement in extracurricular activities has the vastest differences as it has the lowest z-test value. It means that students' attention in this subfactor has significantly increased and was affected by Project SIGE-21. The least among the five is cognitive engagement, but it also implied significant differences and improvement. The last two indicators, effort and persistence and liking for learning, indicated significant negative z-test results, which means improvement in the two sets of evaluations.

There are challenges that implementers may find upon implementation of this program, such as affective, cognitive, behavioral, and technical challenges. Using the findings of the study, the researcher proposed the "CIRCA 21: Gamified" program to be incorporated in the teaching and learning process, specifically, in the lesson planning. The researcher recommends using the crafted program founded on the results of this study. They also encourage other researchers to conduct future studies about gamified strategies in the new normal, especially on the hybrid and flexible education setup.

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