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Effect of 'Gamification Through Multimedia' on Academic Achievement in Learning English Grammar by Secondary Standard Students

Dr. Madhurima Chakraborty

Assistant Professor, School of Education, Adamas University, West Bengal

Abstract

Existing studies on game-based learning has showcased improvement in academic performance of students, but needed supportive school infrastructure and network availability, which is still a challenge in rural India, though Indian educational scenario has embraced virtual teaching learning experience at present. This gap made the researcher frame a general 'Gamification through Multimedia' module applicable for all subjects, which requires minimal electronic gadgets, yet provides an engaging learning experience to the students, even without network availability in the classroom. 'Multimedia' to be used for instructional purpose were based on sections from the prescribed syllabus. The data analyzed revealed that the technique is significantly effective in improving academic achievement in English Grammar, irrespective of difference in Gender and Area of residence of the students and can also be applied to other subjects.

Keywords: Gamification, Multimedia, Academic Achievement

1. INTRODUCTION

Gamification is a design approach which utilizes the dynamics and mechanics of gaming in a non-game context. This term gained its popularity in the academia as children were found to respond to game-based learning quite satisfactorily. The difference between game-based learning and gamification has been outlined by Bradbury (2017), that game-based learning infers the use of games for learning, whereas gamification is gamifying the learning scenario in itself, by applying gaming framework or elements to existing learning activities (Centre for Teaching Excellence, University of Waterloo). Alexander Kapp, defines gamification as "using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems.". Thus, the focus is on the ways classroom learning experiences can be turned into gaming experience, so that the children can have a joyful learning experience. Specific goals are to increase attention and engagement, stimulating innovation, improving decisions, promoting learning, and changing behaviour (Mullins & Sabherwal, 2018).

Scot Osterweil, pointed out the "four freedoms of play": Freedom to fail (allow mistakes), Freedom to experiment (explore new strategies and knowledge), Freedom to assume different identities (have a different stance) and Freedom of effort (pause and reflect on their accomplished activities to find the solution to any problem), that makes gamification, appealing to the learners. Gamification is facilitated by affordances and the most common ones are points, challenge, badge and leader-board type which can be categorised as progress and achievement- oriented elements (Majuri et al., 2018). Hence, if these four

freedoms are incorporated in classroom learning situation too along with the affordances such as users, challenges, levels, time limit, badges competition, collaboration, and ranking or leader boards, learning can also become joyful and intriguing to the children as was demanded by the Yashpal Committee (Learning without burden, 1992). A review of several existing literatures on gamification has disclosed that gamification helps in enhancing motivation, participation, engagement, enjoyment, performance, productive learning experience and sense of accomplishment (Nah et al. 2014).

'Multimedia' is the other form which appeals even to the different kinds of learners i.e., VARK- Visual, Auditory, Reading Writing and Kinaesthetic (Nakano, 2016). It is interactive, conveying a message or information to an audience in a more understandable manner, and has huge impact on the educational system and the way we communicate information to the learners (Neo and Neo, 2000).

English is a global language and since independence has become a part and parcel of the Indian education system and therefore the curriculum followed in India remains incomplete without its' assimilation. The University Education Commission (1948) followed by the Kothari Commission (1964) endorsed English to be studied in high school and universities and special unit be set up in in all Universities where English will be taught as a skill subject and not so much as literature. National Policy of Education (1968) served as a successor emphasizing on the importance of study of English Grammar in Schools to keep on par with the world knowledge and contribute to it.

Therefore, the researcher here took English Grammar as the focus subject so that teachers in India can look forward towards ways to gamify English Grammar learning and make students enjoy this descriptive science.

2. Gamification through Multimedia Module: Concept and Development

India though has ventured in Digitalising Education, yet most of school students doesn't have access to free 24x7 internet facility in campus (Ocansey & Sharma, 2020) and digital classrooms to assist them in their learning (Sharma, 2021 & Bhattacharya, 2021).

The status of the supportive school infrastructure available at schools in India was perceived from the surveys (Unified District Information System for Education Plus, 2021-22) and research articles, and decision was made to convert the classroom itself into a gaming platform even without internet and sufficient number of computers. The 'Gamification through Multimedia' module is therefore a set of carefully and precisely divided lesson units from the entire syllabus of any academic year; each small unit of the lesson designed to be taught through games and activities.

Figure 1, shows through a framework, the channelization of the process of gamification within the classroom. The first step shows the breaking down of the syllabus into units, and then assigning gamifying tasks for those units. Every unit is to be completed within one week, therefore four units will be completed within four weeks. The third step shows the application of the mechanics, dynamics and elements of gaming to gamify the classroom activity. Every unit contains four Gamified Classroom Learning (GCL) Tasks. At the end of every week the overall outcome of the tasks was to be calculated. The final learning outcome is measured summing up all the overall outcomes (here 4) of each student at the end of a week. This is facilitated through multimedia instruction and the dynamics and mechanics of gamifying is applied within the classroom. The entire class gets divided into groups and they are to perform well both individually and as a member of the group, to maintain their position on the leader-board. They will be constantly rewarded with badges, stars or points which will be counted at the end of every week. At the end of a semester those collected rewards will get converted into grades or marks. The only technological

aid needed by the teacher is a laptop and speakers.

Figure 1: **Framework describing the developed Gamification Module for the classroom setting**

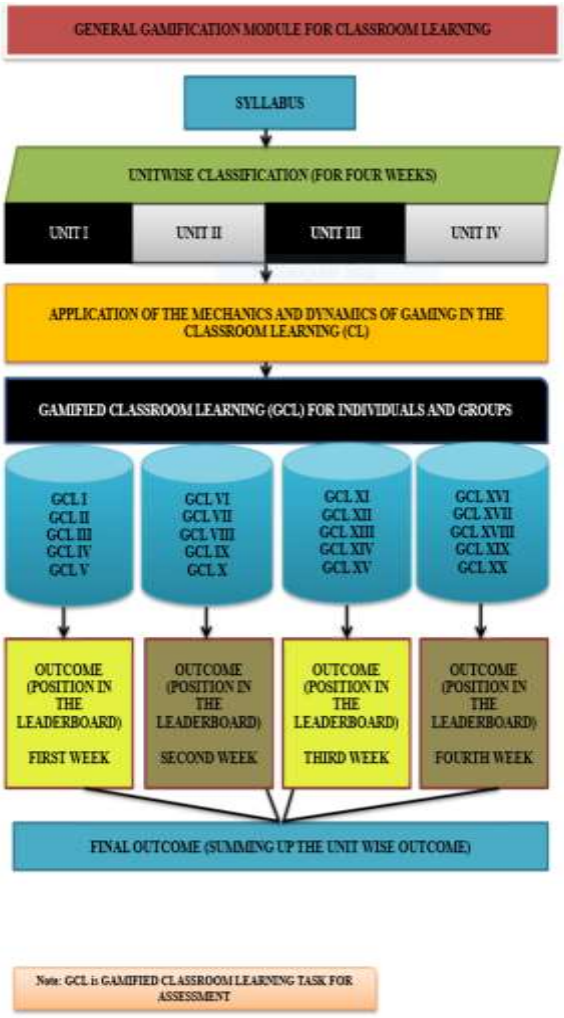


Table 1, discusses the mechanics, dynamics and elements of a gamifying task that is applied at the third step. The dynamics of gaming are divided into three parts- constraints, emotions and progressions. Constraints are the challenges the game poses, emotions are the emotional function occurring within the learners while performing, and progressions are position of the learners on the leaderboard, based on the performance of the learners at every task. The mechanics of gaming are the challenges (the students are posed with competitive tasks), rewards and resource acquisition (stars/badges/points), co-operation (made to work collaboratively in groups), and feedback (teacher giving feedback and also the leaderboard portraying the status of their performance and the progress made by them). The elements of gaming are those through which the mechanics and dynamics of gaming are applied within the classroom.

Table 1: Gamification Mechanics, Dynamics and Elements for Gamifying Tasks

Dynamics	Mechanics	Elements
Constraints	Challenge	● Learners need to perform well individually as well as in group in order to earn more points and save their group from getting eliminated

Emotions	**Reward**	● Badges or small tokens can be provided
	Competition	● Healthy competition is facilitated among the learners as they work in groups to achieve a united goal
	Co-operation	● Working with peers as a team increases co-operation as well as learners co-operate with teachers for instructional clarity
		● Points/Stars are to be collected instead of marks which can be converted to marks at the end of an academic session
	Resources Acquisition	● Leader board maintained shows the level of the learner and the teacher serves as the feedback machine as well as suggestions are provided for further improvement in the next level.
	Feedback	
Progression	**Reward**	● Badges and tokens defining achievements
	Resource Acquisition	● Points/ Stars collected
	Feedback	● Leader board, level followed by suggestions

A combination of video clips, audio clips, animations, and PPTs were used for instructional purpose, based on the syllabus and curriculum followed by the institution. The content and technique of the developed module was finalized and validated through consultation with the 'Principal' and teacher concerned for the subject at a particular school in Durgapur, West Bengal.

Grammar was taught to the experimental group students using various set of multimedia instructions and gamifying the classroom environment, for a duration of six weeks. In this treatment the following areas were highlighted: knowledge, understanding, applying, analysing and creating, which pertained to the language learning skills. The English Grammar Achievement test sections focused on prepositions, verbs, adjectives, adverbs, vocabulary, phrases construction, phonemic awareness and analytical ability of identifying the misfit which were prescribed in the syllabus.

3. Evaluated Grammatical Units along with the Process of Evaluation

The various grammatical units taught to the students with the help of 'Gamification through Multimedia' technique, and the process of Gamification occurring within the classroom setting is listed down in steps for better comprehension in Table 2.

Table 2: Grammatical Units taught and stepwise Gamification process occurring within Classroom

Name of the Unit and technique of presentation	Gamification process for Evaluation (Stepwise)
Adjectives and Adverbs (An explanation on meaning of adjectives and adverbs were provided)	**Step 1:** Students were divided into group of 5 members each (8 groups) **Step 2:** A leaderboard (Chart) was put up with the Names of all students tagged on separate board pins, and the groups they belong to were indicated with the help of blue, pink, yellow, green, red, brown, orange and purple-coloured tags. **Step 3:** An animated story of a mouse was played on the laptop and speakers were used for sound clarity

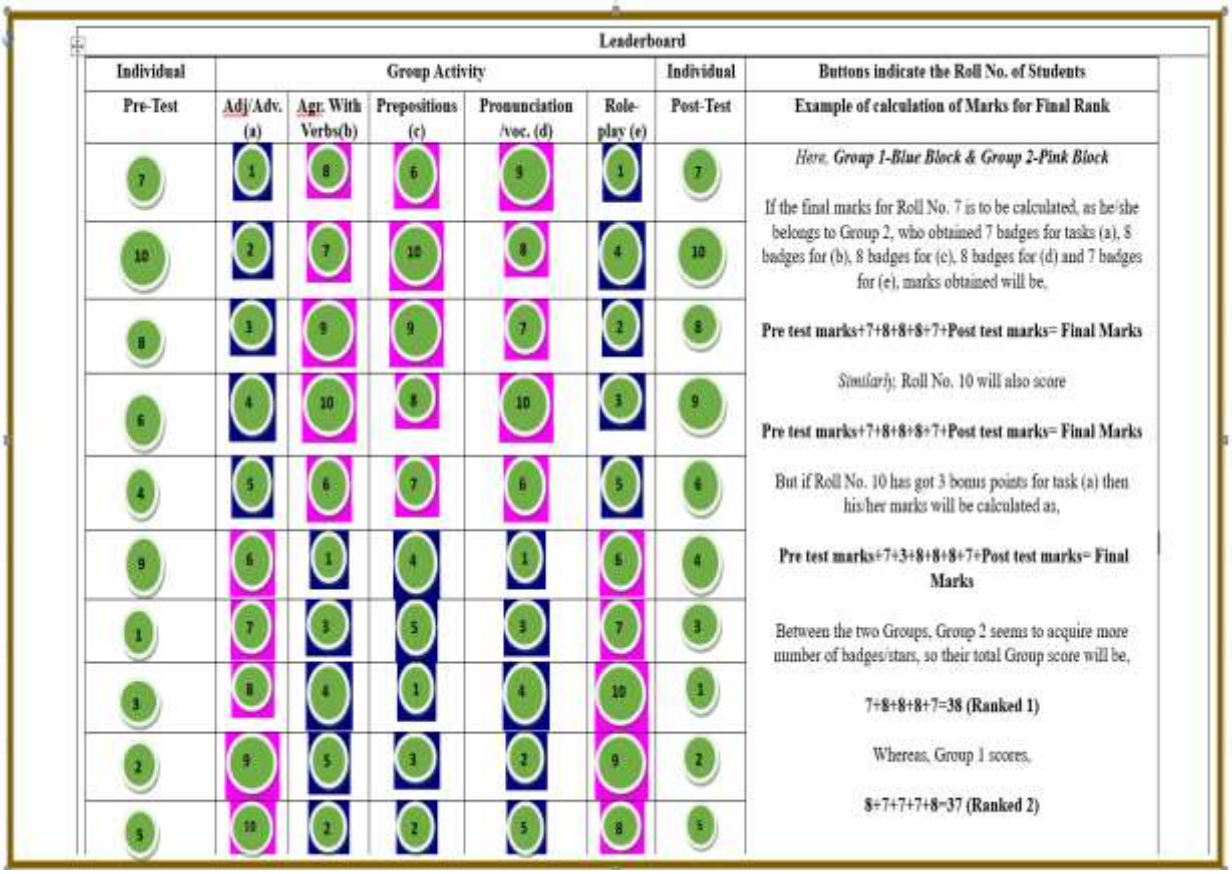
	Step 4: Students were instructed to grasp as many adjectives they can from the narration and video, and the group fetching highest number of adjectives gets the highest number of stars (i.e., 8) and the rest received stars according to their rank. **Step 5:** Students were also asked to pick adverbs from the video, which will fetch them bonus points (individual task and not a group effort). **Step 6:** The group with highest number of stars (8) and the individual with highest number of points were pushed up on the leader board.
Agreement with Verbs (Power Point Presentation was used to explain the subject-verb agreement, rules and exceptional cases.)	**Step 1:** Students kept retaining their groups. **Step 2:** Two videos were played with exercises to solve, but without solution. **Step 3:** They were given 20 minutes to discuss and solve those exercises. **Step 4:** At the end of 20 minutes, they were stopped and the video was played further. **Step 5:** The video displayed and articulated the solutions to those exercises. **Step 6:** The students were asked to match their answers. **Step 7:** The group with highest correct response were given 8 badges and the rest received badges according to the rank order. **Step 8:** The position of the groups changed on the leaderboard, according to their cumulative score.
Preposition (A video was played which was self-explanatory, explaining the meaning, rules and kinds of preposition)	**Step 1:** A short story about two kids having a discussion on how to reach their grandmother's house was played in intervals. **Step 2:** Questions on locating the prepositions were displayed on the screen during the intervals. **Step 3:** Students were instructed to write down the answers after discussing with their group. **Step 4:** The answers were then displayed and matched. **Step 5:** Groups with highest number of correct responses were given 8 badges and the rest were given according to their rank as a group. **Step 6:** The position of the groups on the leaderboard were changed based on their present badges and the earlier badges acquired.
Pronunciation and Vocabulary (Audio clip and videos of comprehension were used)	**Step 1:** An audio clip on the correct pronunciation and sounds of English alphabets was played twice and the students were made to repeat twice following it. **Step 2:** A series of comprehension were displayed through a video.

	Step 3: The students of each group were instructed to read out sections from the passages, while the members of other groups will note down every incorrect pronunciation of words that they made. **Step 4:** The group who achieves the least number of incorrect pronunciations, receives the highest number of stars and the rest receives stars accordingly. **Step 5:** Each student was asked to pen down a rhyming word to those that they have noted down before. **Step 6:** With every rhyming word written by them fetched them one bonus point. (Individual task, hence individual point allotted). **Step 7:** The pins with name tags on the leader board changed according to the position of the group, as well as the points/badges collected by individually by members of each group.
Role Play (Guidelines were provided to the students to enact a one act play of short duration, choosing any part of the Chapters of their Prescribed Literary Textbooks.)	**Step 1:** Students were instructed to choose any chapter from their prescribed textbook and select a particular scene/part from it. **Step 2:** They could modify the story based on the selected part to make it short and meaningful with a moral. **Step 3:** The groups were given two days for discussion and script writing. **Step 4:** Two days were allotted for enacting, with four groups performing on one day. **Step 5:** The plot of the roleplay was evaluated groupwise and the performance was evaluated individually. **Step 6:** Group with highest number of stars performed best and the rest were given stars accordingly. **Step 7:** The individuals who performed extraordinarily/ordinarily/poor were provided three/two/one badge respectively. **Step 8:** The position of the groups as well as the individuals changed on the leaderboard based on their performance.

The classroom gamification process involved the usage of chart paper serving as the leaderboard, and board pins. A depiction of the same (involving two groups only) is given below in Figure 2, for better understanding, where the green buttons represent the board pins, the blocks represent which group they belong to, the numbers inside the buttons indicate the roll number of the learner.

As the board pins could be pushed up and down based on the performance of the individual and the groups, the green buttons can also be dragged for the same purpose. The right-hand column in Figure 4, also discusses the conversion of stars/badges into marks, the counting of bonus points, adding up the pre-test and post-test scores, and the calculation of final marks obtained by an individual at the end of the treatment.

Figure 2: Portrayal of the Leaderboard Used and Calculation of marks



Objectives of the Study

The objectives of the present study are,

- To find out the difference between academic achievement on learning English Grammar of the control and the experimental group secondary school students, at the pre-treatment level
- To find out the difference between academic achievement on learning English Grammar of the control and the experimental group secondary school students, at the post-treatment level
- To find out the difference (controlling the covariates) between the academic achievement on learning English Grammar of the control and the experimental group of secondary school students

4. Hypotheses of the Study

The hypotheses framed for the study were,

- $H_0$1: There is no significant difference between academic achievement on learning English Grammar of secondary school students of the control group and the experimental group at the pre-treatment level
- $H_0$2: There is no significant difference between academic achievement on learning English Grammar of secondary school students of the control group and the experimental group at the post-treatment level
- $H_0$3: There is no significant difference (controlling the covariates) between the academic achievement on learning English Grammar of the control and the experimental group of secondary school students

5. Methodology

The study adopted the experimental method following the quasi-experimental research design. 80 students studying in Class 8, Jawahar Navodaya Vidyalaya, Durgapur, West Bengal, India, were taken as the sample and an English Grammar Achievement Test [EGAT] (constructed and validated), was administered to them before they were treated with 'Gamification through Multimedia' technique of teaching. Then the students were grouped into control and experimental group. The students in both the groups were matched approximately, on the basis of scores that maintained the average performance of both groups as similar, but their demographics (gender and residence) could not be matched. The students' profile collected, reflected so. Studies have shown that the academic achievement of students differs based on gender (Herrera et al., 2020 & Smirdele et al., 2020). Attitude towards gamification or gamifying learning also varies based on gender (Zahedi et al., 2021). Residence of students too, play a vital role in affecting their academic achievement (Kumar & Kaur, 2016). The researcher aimed at controlling the effect of Gender and area of residence of the students or learners, to carefully determine the effect of or test the 'Gamification through Multimedia' technique developed and adopted. Moreover, the difference in effect of Gamification through Multimedia in terms of gender and residence (locality) of students were also studied.

The experimental group was then taught through 'Gamification through Multimedia' technique, whereas the control group was left to be taught by the subject teacher concerned, at school, following the usual conventional method of teaching (lecture and note giving method). After six weeks of teaching, a post test of the similar pattern and focusing on the same grammatical sections of the syllabus assigned, as was in the pre-test, was administered to both the groups. The scores attained in pre-test and post-test, by the control group and the experimental group were compared with the help of Differential Analysis (ANCOVA and t-test), administered through the usage of IBM SPSS V21.

6. Analysis and Interpretation

The significant mean difference between the pre-test and post-test of the control and experimental group was found through ANCOVA.

ANCOVA was administered to see if the effect on the outcome can be accounted to 'Gamification through Multimedia' technique alone, or the pre-test, gender and residence also contributed to the outcome. The researcher at first checked the homogeneity of variance through one way ANOVA custom model to see the interaction effect of treatment (Gamification through multimedia and Traditional method) and pre-test score, where the pre-test was considered as the covariate and dependent variable was post test scores with the teaching methods as fixed factors. The result is as follows:

Table 3: **Interaction effect of treatment (Gamification through multimedia and Traditional method) and pre-test score**

Interaction	Mean square	Level of significance	'F' value
Treatment*Pre test	20.009	0.251	1.339

From Table 3, it is evident that the significance level is greater than 0.05 (0.251>0.05). So, it can be inferred that the assumptions of homogeneity of variance had not been violated and the groups are very similar.

Further analysis was to check whether the two groups differ significantly or not in terms of treatment effect on outcome variable, i.e., the post test score. The following table shows the significant difference as well as the effect size.

Table 4: Significant Difference between two Groups in terms of Treatment Effect on Outcome Variable

Effect variables	'F' value	Signi.	Partial Eta squared (Effect size)	Observed Power
Treatment	11.129	0.001	0.126	0.909
Pre test	8.865	0.004	0.103	0.836

Mean significant difference in post test scores (controlling the covariates)

Treatment methods used	Mean difference ('F' value)	Signi.*
(Gamification through multimedia)- (Traditional method)	2.925*	0.05

Table 4, shows that there lies a significant difference in post test scores between two groups subjected to different treatments as the significance level is 0.001<0.05. The effect size of treatment on post test scores is 12.6% (0.126x100) with a observed power of 0.909 which is adequate. But the pre-test too shows an effect size of 10.3% (0.103x100) on the post test scores. In order to nullify this effect and adjust the means a post hoc ANOVA, factorial model was applied. This shows which treatment method was more effective. Hence, it is evident from Table 4, that there lies a significant mean difference between the adjusted means of the post test scores of control group and experimental group.

Following those steps, categorical variables; gender and locality, were also controlled separately to see whether they have a significant effect on the post test score or not and also the adjusted mean difference in achievement scores between the groups was seen. Table 5, shows that there lies a significant difference (3.687) in post test scores between two groups subjected to different treatments. The effect size of treatment on post test scores is 15.3% (0.153x100) with an observed power of 0.945 which is adequate. The multiple covariates controlled shows no significant effect on the post test scores. So, it is seen that after controlling all the covariates the measured adjusted mean of the post test scores of the control and the experimental group significantly differ. Hence, the $H_0 3$ is rejected.

Table 5: The effect size of categorical variables on the outcome variable and Adjusted mean difference in achievement scores between the groups

Effect variables	'F' value	Signi.	Partial Eta squared (Effect size)	Observed Power
Treatment	13.039	0.001	0.153	0.945
Gender	0.019	0.891	0.000	0.052
Locality	0.286	0.594	0.004	0.082
Treatment methods used		**Adjusted Mean difference**		**Signi.***

	('F' value)	
(Gamification through multimedia)-(Traditional method)	3.687*	0.05

7. Findings of the present study

The findings of the study revealed that the covariates (pre test scores, gender and residence or locality) has no significant influence or effect on the variance in Academic Achievement in English Grammar of the Secondary School students. The 'Gamification through Multimedia' technique developed and adopted showed a significant contribution in bringing out variance in the outcome i.e., Academic Achievement in English Grammar.

8. Conclusion

The present study found that 'Gamification through Multimedia' technique of teaching positively affects the academic achievement score on learning English Grammar of Secondary School Students. Gamification as an effective method for instruction in teaching language, mathematics and social studies were also found by other researchers (Chircop, 2020; Öztürk,Ç., 2020; Sailer, M. & Homner, L., 2019; Sevillano, 2021 & Udjaja 2018). Chircop (2020) did a meta-study on Improved Students' Performance within Gamified Learning Environment revealed that gamification can improve students' learning by 50%. Multimedia being an effective medium to aid teaching has been showcased by several researchers (Shah & Khan, 2015; Sonu & Mahapatra, 2016; Subhashini, 2016 & Lan et al., 2010), who emphasized that multimedia is a compilation of audio-videos which is interactive and has a positive effect on achievement scores of students studying at any level. Shah and Khan (2015) conducted a study on Impact of Multimedia-aided Teaching on Students' Academic Achievement and Attitude at Elementary Level and witnessed a significant difference in the achievement scores (gains) of both group multimedia teaching on positively impacted students' academic achievement. Sonu and Mahapatra (2016) studied the Effectiveness of multimedia instructional package for teaching secondary school students in terms of their selected cognitive abilities and found that nearly Seventy-five percentage students achieved more than sixty percentages of marks. Subhashini (2016) conducted a study on the Effectiveness of Multimedia on Teaching Computer Science among XI Standard Students in Karur District. The findings clearly indicated that more than 90 per cent of the students felt comfortable about the computer-assisted instruction. About 70% of the subjects agreed or strongly agreed that the supplementary PPT or video recording materials put online were helpful to them in their grammar learning, can increase their interest in learning English grammar, and were willing to continue using them.

The present study was delimited to a small group of students, and the researcher intends to extend it to a wider audience to ensure its external validity. Moreover, further researches can be conducted with true experimental design instead of quasi-experimental, as that gives full experimental control through randomization procedures and would render more reliable and valid results.

References

1. Andrade Sevillano, P. Y. Design and evaluation of gamified questioning-based online educational applications for secondary school students, [Doctoral Dissertation, University of Leicester]. Thesis, 2021. https://doi.org/10.25392/leicester.data.16810228.v1

2. Araya, R.,Arias, O, Elena, B. Nicolas, C. & Julian. Does gamification work in education? Experimental evidence from Chile. Banco Interamericano de Desarrollo, IDB-WP-982, 2019, 48. http://www.iadb.org
3. Bhattacharya, D. (2021). With Poor Infrastructure, Lack of Facilities Govt Schools Perform Worst Across India: Report. News Click. Retrieved November 7, 2021, from With Poor Infrastructure, Lack of Facilities Govt Schools Perform Worst Across India: Report NewsClick
4. Bradbury, H. (2017). Gamification vs. Game-Based Learning: What' s the Difference? Knowledge Guru. Retrieved February 3, 2020, from www.theknowledgeguru.com/gamification-vs-game-based-learning/
5. Briffa, M., Jaftha, N., Loreto, G., Pinto, F. C. M. & Chircop, T. Improved Students' Performance within Gamified Learning Environment: A Meta-Analysis Study. International Journal of Education and Research, 2020, 8(1), 223-244. ISSN: 2411-5681. www.ijern.com
6. Chetan, V., Devadula, S., Sridhar, R. & Sadashiv, G. Gamification: The next Evolution of Education. Proceeding of the International Conference on Future of Education, 2018, 1, 38-49. ISSN: 2630-7413. https://doi.org/10.17501/26307413.2018.1106
7. Constitution of India. (1950). Official Language. Constitution of India
8. Dichev, C. & Dicheva, Darina. Gamifying education: what is known, what is believed and what remains uncertain: a critical review. International Journal of Educational Technology in Higher Education, 2017, 14(1), 1-70. ISSN: 2365-9440. https://doi.org/10.1186/s41239-017-0042-5
9. Education for All in India. Status of Digital Infrastructure in Indian Schools: A Detailed Analysis Using UDISEPlus. Education for All in India, 2024. https://educationforallinindia.com/status-of-digital-infrastructure-in-indian-schools-a-detailed-analysis-using-udiseplus-2021-22-data/
10. Giganti, F., Rosenkrantz, A.B., Panebianco, V., Stabile, A., Emberton, M., Moore, C. M., Villeirs, G. Gamification and the Future of Education. Oxford Analytica, 2016, 117(August), 150-156. https://www.worldgovernmentsummit.org/api/publications/document?id=2b0d6ac4-e97c-6578-b2f8-ff0000a7ddb6#:~:text=Gamification and the Future of Education is a forward-looking,context to improve educational outcomes.
11. Herrera, L., Al-Lal, M. & Mohamed, L. Academic Achievement, Self-Concept, Personality and Emotional Intelligence in Primary Education. Analysis by Gender and Cultural Group. Frontiers in Psychology, 2020, 10, 1-13. https://doi.org/10.3389/fpsyg.2019.03075
12. Kumar, R. & Kaur, G. Effect of Metacognition Integrated Multimedia Learning Package (MIMLP) on The Academic Achievement of Rural and Urban B.Ed. Trainee Teachers. International Journal of Humanities, Arts, Medicine and Sciences, 2016, 4(7), 87-92. ISSN: 2454-4728. www.bestjournals.in
13. Lan Wei-yu, B. Y., Hsiao, Y., Chiang, Y. & Kao, C. The Effectiveness of Computer-Assisted Instruction in Grammar Learning as Perceived by Technological College Freshman Students. [Bachelor's Dissertation, Yuanpei University]. Yuanpei University Institutional Repository, 2010. View/Open - Yuanpei University Institutional Repository:主頁 - MOAM.INFO
14. Ministry of Education. The Report of the University Education Commission. 1962,Microsoft Word - Report of the University Education Commission.doc (educationforallinindia.com)
15. Ministry of Education. Unified District Information System for Education Plus. 2021-22.

https://www.iassite.com/unified-district-information-system-for-education-plus-udise-2021-22-report/
16. Ministry of Human Resource Development. National Policy on Education. 1968NPE-1968.pdf (education.gov.in)
17. Mullins, J. K. & Sabherwal, R. Beyond enjoyment: A cognitive-emotional perspective of gamification [Paper presentation]. Proceedings of the 51st Hawaii International Conference on System Sciences, Hilton Waikoloa Village, Big Island, Hawai, January 2018. ISBN: 978-0-9981331-1-9.
18. Nah, F. F. H., Zeng, Q., Telaprolu, V.R., Ayyappa, A. P. & Eschenbrenner, B. Gamification of Education: A Review of Literature, 2014, In HCIB/HCII, LNCS 8527 (pp. 401–409). Springer International Publishing Switzerland.
19. Nakano, C. The Four Different Types of Learners and What They Mean to Your Presentations. April 2016, Retrieved July 17, 2022, from, The Four Different Types of Learners, And What They Mean to Your Presentations [INFOGRAPHIC] - Prezi Blog
20. Neo, M. & Neo, K. T. K. Innovative teaching: Using multimedia in a problem-based learning environment. Educational Technology and Society, 2001, 4(4), 19-31. ISSN: 1436-4522. https://doi.org/10.12944/cwe.6.1.28
21. Ocansey, T.S. & Sharma, A. Maharashtra Digital Schools Survey Findings Report. Earth Institute, Columbia University, 2020, Working Paper #24.
22. Öztürk, C. & Korkmaz, O. The Effect of Gamification Activities on Students ' Academic Achievements in Social Studies Course, Attitudes towards the Course and Cooperative Learning Skills. Participatory Educational Research, 2020, 7(1), 1-15. ISSN: 2148-6123. http://dx.doi.org/10.17275/per.20.1.7.1
23. Prakash, D. & Manchanda, P. Designing a comprehensive gamification model and pertinence in organisational context to achieve sustainability. Cogent Business and Management, 2021, 8(1), 1-25. ISSN: 2331-1975. https://doi.org/10.1080/23311975.2021.1962231
24. Sailer, M. & Homner, L. The Gamification of Learning: A Meta-analysis. Educational Psychology Review, 2020, 32, 77–112. https://doi.org/10.1007/s10648-019-09498-w
25. Shah, I. & Khan, M. Impact of Multimedia-aided Teaching on Students' Academic Achievement and Attitude at Elementary Level. US-China Education Review, 2015, 5(5), 349-360. https://doi.org/10.17265/2161-623X/2015.05.006
26. Sharma, K. Only 39% schools in India had computers, 22% had internet access in 2019- 2020, govt data shows. The Print. Retrieved November 11, 2021, from Only 39% schools in India had computers, 22% had internet access in 2019-20, govt data shows – ThePrint – Select
27. Smiderle, R., Rigo, S. J., Marques, L. B., Arthur, J., Miranda, P. D. & Jaques, P. A. The impact of gamification on students' learning, engagement and behaviour based on their personality traits. Smart Learning Environments, 2020, 7(3), 1-11. https://doi.org/10.1186/s40561-019-0098-x
28. Soni, S. K. & Mahapatra, B. C. Effectiveness of multimedia instructional package for teaching secondary school students in terms of their selected cognitive abilities. International Journal of Multidisciplinary Research and Development, 2016, 3(8), 150-154. ISSN: 2349-4182. www.allsubjectjournal.com
29. Subashini, V. K. A Study on the Effectiveness of Multimedia in Teaching Computer Science Among Xi Standard Students in Karur. International Journal of Research-Granthaalayah, 2016, 4(5), 35-39. ISSN- 2350-0530. http://www.granthaalayah.com

30. United Nations Educational, Scientific and Cultural Organization. Learning: The Treasure Within. 1996. ISBN: 9231032747. https://doi.org/10.1057/palgrave.hep.8390113
31. University of Waterloo. (n. d.). Gamification and Game-based Learning. Centre for Teaching Excellence. Retrieved July 17, 2022 from Gamification and Game-Based Learning | Centre for Teaching Excellence | University of Waterloo (uwaterloo.ca)
Yashpal Committee. (1993). Learning Without Burden Report.Microsoft Word - Yash Pal Committee Report Final.doc
32. Zahedi, L., Batten, J., Ross, M., Potvin, G., Damas, S., Clarke, P. & Davis, D. Gamification in education: a mixed-methods study of gender on computer science students' academic performance and identity development. Journal of Computing in Higher Education, 2021, 33(2), 441-474. ISSN: 1867-1233. https://doi.org/10.1007/s12528-021-09271-5