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# Effectiveness of Game Based Pedagogy in Teaching of Mathematics to Secondary School Students

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## INTRODUCTION

The educational system is not like the economic system, it has always been slow to change. On one hand, the fact that conceptual changes are slow is a good thing, since it helps in avoiding the pitfalls of acquiring education fads before they're fully tested. On the other hand, it leads to a system that is sluggish to answer and respond responsibly to the rapidly changing technology. The only way to increase the rate of response is to drastically and systematically change the existing approach to curriculum, which is not a small and easy task. Games have been usually used as a learning tool for centuries ago as well. Chess was used to teach various strategic thinking procedures as far back as in the Middle Ages. The core concept behind the game-based pedagogy is teaching through repetition, failure/success and the accomplishment of targets. Video games are generally built on this principle. The player starts off slow and gains in skill until they're able to successfully and skillfully navigate the most difficult levels of the game If Games are planned and designed in a proper way will offer adequate levels of difficulty to keep it challenging while still being easy enough for the student to enjoy winning and losing. Game-based learning takes the similar concept and applies it to the process of teaching a curriculum. Students work toward a goal, choose respective actions and experience the consequences of those actions. They actively participate, learn and practice the right way to do things. The result is active learning of concepts instead of passive learning. Students are given very specific goals and practice until they can accomplish them. The result is much more effective than passive sitting through lectures and theory. Game-based learning is required to be built in a way that is adaptive from the beginning. During the planning phase the game is tested and adjusted in a way that it becomes a more effective learning tool. As new information comes out in the field or educational approaches are being adjusted, the game can be changed accordingly to suit them. In Mathematics, your students can cut out different shapes. They can measure the angles. They can identify a pattern.

- Your students will be able to learn about symmetry as well as shapes and theorems on angles while learning through 'Folding Origami Sheets'
- You can organise a competition for your students to build a tower of sicks and measuring the angle of elevation and depression through it.
- You can use different blocks for the clarity of AP and GP series in Mathematics.
- You can use toy train and tracks and pillars for the speed time and crossing of train related questions.

Hence a secondary school Mathematics teacher is a bundle of experience to produce better learning outcomes through Game based Pedagogy.

## REVIEW OF RELATED LITERATURE

Teachers, in certain contexts, can choose goals, games, materials and ways of mediating learning. Choices that a teacher makes are an indication of wanting to intervene in the learning process; it is an important feature that impacts Teaching and Learning Process. 21 reports (75%) were clear about teacher choices. Research reports mentioned teachers choosing to act on student needs. Nguyen and Khuat (2003) and Uberman (1998) chose to use a game in response to students asking them how to learn vocabulary. Sykes (2009) chose to connect a game to students' linguistic needs. Research reports mentioned teachers choosing games based on instructional goals. Franciosi (2017) chose a game connected to the Fukushima disaster. Hitosugi et al. (2014) chose a game connected to a textbook unit on global environmental issues.

There are basically 2 type of games : By origin / purpose: ○ Traditional games: games usually played by children and families, often based on language or physical play, passing on and evolving from generation to generation. Examples: Telephone, I spy, 20 Questions ○ Educational games: games designed explicitly to teach something.

Examples: Minecraft Education, Math Blaster, Dragon Box, Pox, Gutsy ○ Commercial games: games designed as mainstream consumer entertainment products. Examples: Assassin's Creed, World of Warcraft.

By medium of interaction ○ Digital games: games played on an electronic device, for example, on a smartphone, video game console, or personal computer. Examples: The Legend of Zelda, Mini Metro, Tetris, The Sims ○ Tabletop games: games played using non-digital components, for example dice, maps, tokens, or cards. Examples: Catan, Dungeons & Dragons, Monopoly, Bridge, Chess, Bingo ○ Speaking games: games played through verbal interactions. Examples: Truth or dare?, Mafia, I went camping and I …, 2 truths and 1 lie .Vasileiadou and Makrina (2017) describe free online games that were chosen by the teachers "based on their relevance with the vocabulary presented in the preceding lesson" (p.139).

Research reports mentioned teachers choosing specific pedagogical materials and activities to use with a game. Neville, Shelton and McInnis (2009) stated the importance of including briefing and debriefing in their teaching. Rasmussen (2017) chose to situate learning in and around online texts and communities. Miller and Hegelheimer (2006) and Ranalli (2008) and Shintaku (2016) chose to include materials alongside the game. Reinhardt and Zander (2011) planned to guide learners towards language awareness with activities. Coleman (2002) chose to modify how the game was played.

**Significance of Game Based Learning**

Game-based pedagogy is about more than giving students educational opportunities through direct participation. It's about changing the approach of students towards the process and the approach of learning. The goal is for students to enjoy the process of learning itself. As a student learns through game-based pedagogy, they gain much more ownership of the material, which improves retention. The combination of need based approaches and goal-based learning addresses almost all forms of learning styles at the same time. No matter what a student's primary, secondary, or tertiary learning style, a game can address all at a certain level. Games can even combine multiple subjects into a single game, hence creating a versatile learning tool. Game based pedagogy also provides students a safe and secure environment for failure. It can be hard for students, especially the adolescents, to fail in a public setting like a classroom. Games give them a chance to try out new things and digest failures. If they fail in any future setting of life, then they can simply try again and learn from their mistakes. Instead of acquiring education based on rote memorization, students will be able to learn through experimentation and trial and error. Thus game based pedagogy involve:

- formal or informal learning
- prior learning
- experience-based learning
- providing increased support for a wider range of students

The researcher thus kept in mind all these parameters while progressing through the process of research and data collection. All these learning styles need to be accessed in relation to certain parameters. This study will evaluate the effectiveness of a form of pedagogy in teaching of Mathematics and will provide a way forward for teachers to evaluate and re-evaluate their pedagogical skills and the future researcher of a new field of research to make classroom experiences better.

**Research Questions**

Through the study the researcher tried to answer the following research questions:

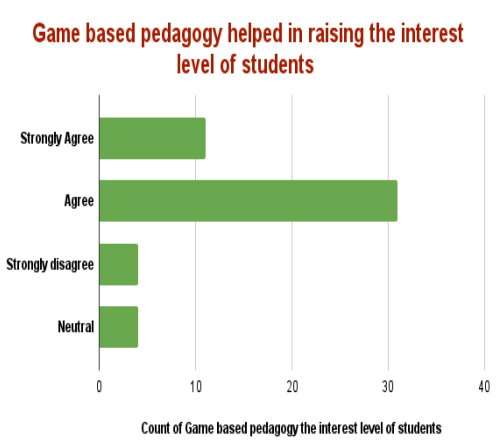
1. How do participants perceive game based pedagogy in relation to their classroom teaching?
2. How effective is game based pedagogy in teaching Mathematics?

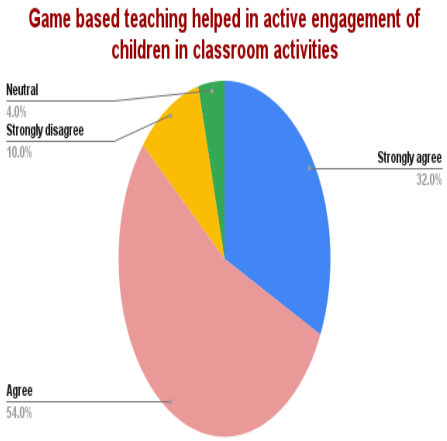
## METHODOLOGY

The process of primary data collection has been done through a Likert Scale. The scale was standardized, validated through experts. the reliability of scale done through test and retest method. For the purpose of data collection, 50 Secondary School Mathematic Teachers ( out of which 25 were male and 25 female). 25 teachers (male or female )

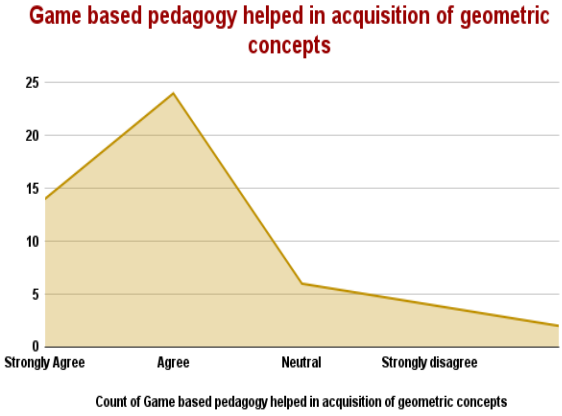
out of the 50 were from rural background and other 25 from urban background . The study was conducted on teachers of Haryana state only.

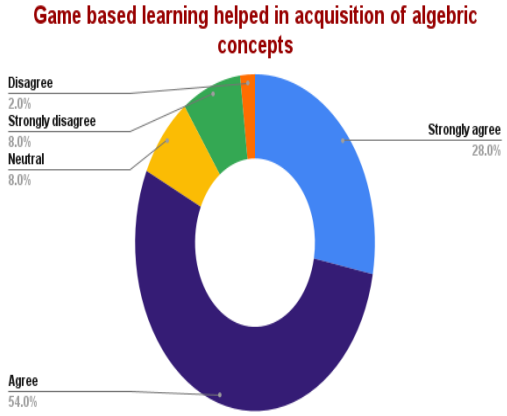
**Data Interpretation/ Finding**



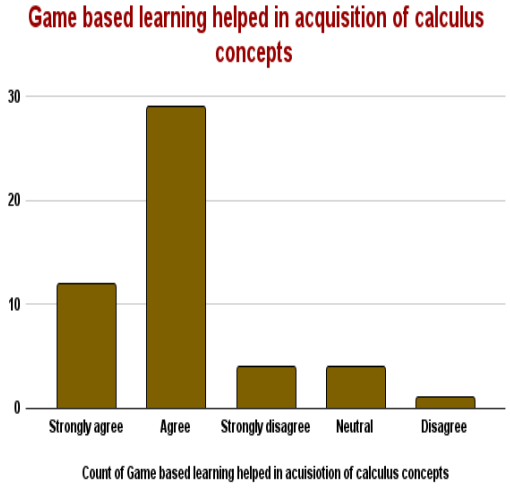



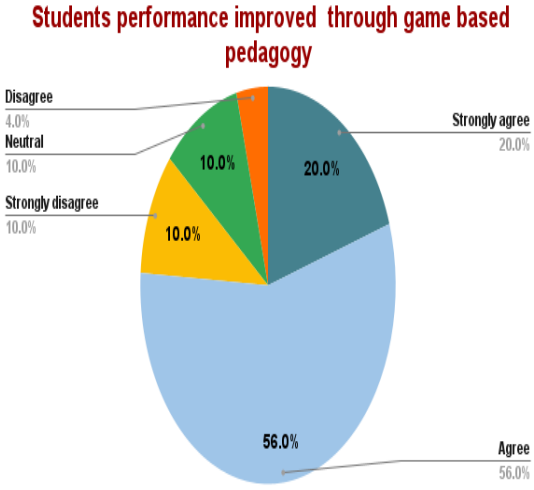

84% teachers were agree on the fact that game based pedagogy raise interest level of students, while 22% strongly agreed on raising the interest level of students through game based pedagogy. 38 teachers out of 50 find the concept acquisition become easier through Game based pedagogy.



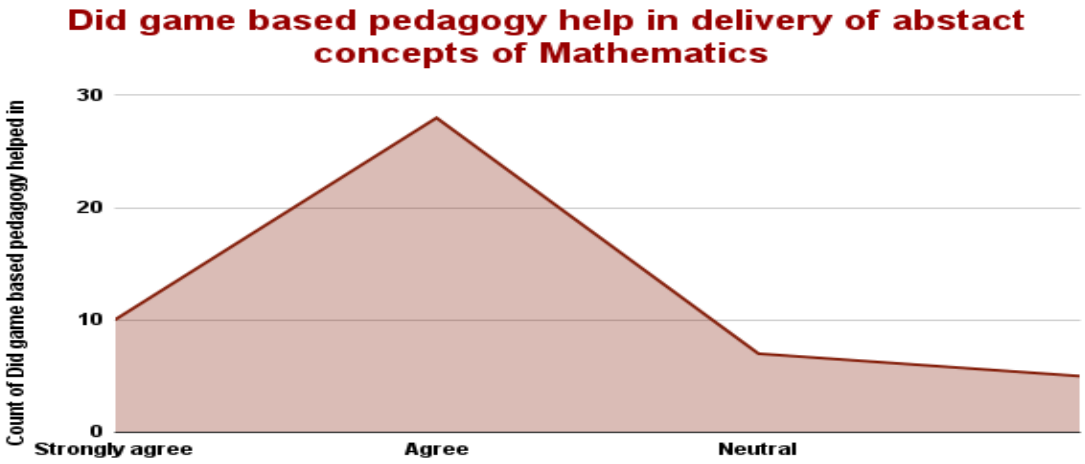




54% teachers were agreed on the fact that game based pedagogy helped in acquisition of geometrical concepts while 28% were strongly agree to the fact that geometrical concept should be taught through Game based pedagogy.



41 teachers out of 50 were agreed upon the fact that calculus can be better understand through active participation of students in games on calculus. 76% teachers saw improvement in performance of their students in Mathematics when taught through Games.




When asked about abstract concept teaching, it is evident from the graph that area covered under the agreement is far more than that of disagreement which clearly indicate that abstract concepts became easier with games.

## CONCLUSION

There are many opportunities to implement the concept of gaming in to education and there are many kinds of games that can be used in learning process which include problem solving, drill and practice, simulation, puzzle and tutorials based games. This paper has discussed the role of games in teaching History, by applying gaming theories to enable students to view the course in a different way so as to motivate and involve students to completion. Several learning theories such as social activism theory and cognitive information processing theory were applied to understand what literature says about the impact of games in education such that the game may be successfully integrated into the curriculum. The design of five educational games and the implementation process is also highlighted to make particular undertaking for accomplishing the educational games to ensure the objectives have been met as the effectiveness of the technology tool relies on how well it solves the desired instructional goals.

## REFERENCES

[1]. Alyaz, Y. &Genc, Z. (2016). Digital game-based language learning in foreign language teacher education. Turkish Online Journal of Distance Education, 17(4), 130-146.
[2]. Bernardi, R. A. (1994). Validating research results when Cronbach's Alpha is below .70: A methodological procedure. Educational and Psychological Measurement, 54(3), 766-775. doi:10.1177/ 0013164494 05400 3023
[3]. Blasco-Arcas, L., Buil, I., Hernández-Ortega, B., &Sese, F. (2013). Using clickers in class.The role of interactivity, active collaborative learning and engagement in learning performance. Computers & Education, 62, 102-110.
[4]. Cardoso, W. (2011). Learning a foreign language with a learner response system: the students' perspective. Computer Assisted Language Learning, 24(5), 393-417.
[5]. Faul, F., Erdfelder, E., Lang, A., G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behavior
[6]. Research Methods, 39, 175–191. doi: 10.3758/BF03193146
[7]. Golonka, E., Bowles, A., Frank, V., Richardson, D. & Suzanne Freynik (2014). Technologies for foreign language learning: a review of technology types and their effectiveness.Computer Assisted Language Learning, 27(1), 70-105.
[8]. Griffee, D. (2012). An introduction to second language research methods: Design and data. California: TESL-EJ Publications.
[9]. Hashemi, M., &Najafi, V. (2011). Using blogs in English language writing classes. International Journal of Academic Research, 3(4), 599-604.
[10]. Herrera, L., Cruz, M. & Sandoval, M. (2014). Using personal portable devices as learning tools in the English class. How, 21(2), 74-93.
[11]. Hinostroza,J. E., Labbé, C., Brun, M., & Matamala, C. (2011). Teaching and learning activities in Chilean classrooms: Is ICT making a difference? Computers & Education, 57(1),1358-1367.

[12]. Huck, S. W., & McLean, R. A. (1975). Using a repeated measures ANOVA to analyze the data from a pretest-posttest design: A potentially confusing task. Psychological Bulletin, 82(4), 511-518.
[13]. Hung, H. T. (2017). Clickers in the flipped classroom: bring your own device (BYOD) to promote student learning. Interactive Learning Environments, 25(8), 983-995.
[14]. Ismail, M., & Mohammad, J. (2017). Kahoot: A Promising Tool for Formative Assessment in Medical Education. Education in Medicine Journal, 9(2), 19–26
[15]. Iwamoto, D., Hargis, J., Taitano, E., &Vuong, K. (2017). Analyzing the efficacy of the testing effect using Kahoottm on students. The Turkish Online Journal of Distance Education,18(2), 80-93.
[16]. Jackson, G. T., Dempsey, K. B., & McNamara, D. S. (2012). Game-based practice in a reading strategy tutoring system: Showdown in iSTART-ME. In H. Reinders (Ed.), Digital Games in Language Learning and Teaching (pp. 115-138). London: Palgrave Macmillan.
[17]. Jaramillo, C. & Chavez. J. (2015). TIC y educaciónen Chile: Unarevisiónsistemática de la literatura. Nuevas Ideas enInformática Educativa, 11, 221- 231.
[18]. Kocaman, O., & Kizilkaya-Cumaoglu, G. (2014b). The Effect of Educational Software (DENIS) and Games on Vocabulary Learning Strategies and Achievement. Education and Science, 39(176), 305-316. CALL-EJ, 21(1), 64-7876
[19]. Licorish, S., Li George, J., Owen, H., & Daniel, B. (2017). "Go Kahoot!" Enriching Classroom Engagement, Motivation and Learning Experience with Games. Proceedings of the 25th International Conference on Computers in Education. New Zealand: Asia-Pacific Society for Computers in Education.
[20]. Turan, Z., & Meral, E. (2018). Game-Based versus to Non-Game-Based: The Impact of Student Response Systems on Students' Achievements, Engagements and Test Anxieties. Informatics in Education, 17(1), 105-116.
[21]. Wang, A. I., Zhu, M., &Sætre, R. (2016). The effect of digitizing and gamifying quizzing in classrooms. In Proceedings of the 10th European Conference on Games Based Learning. University of the West of Scotland, Paisley, Scotland.
[22]. Yoon, Seo Young. (2017). Using learner response systems for EFL classrooms: Students' perspectives and experience. Multimedia-Assisted Language Learning, 20(2), 36-58. CALL-EJ, 21(1), 64-7877
[23]. Zarzycka-Piskorz, E. (2016). Kahoot it or not? Can games be motivating in learning grammar? Teaching English with Technology, 16(3), 17-36.