

Study of Effectiveness of Game-based Learning in Periodic Classification of Elements in Science

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DOI: doi.org/10.5281/zenodo.18204636

Accepted on: 27/12/2025 Published on: 10/01/2026

Abstract:

Research has shown that game-based learning improves student learning outcomes. In Chemistry, particularly in periodic table classification interactive games, puzzles, and activities facilitate exploration, experimentation, and discovery, making Chemistry accessible and enjoyable. By leveraging game-based learning, teachers can promote student-centred learning, encourage collaboration and foster a love for Chemistry, preparing the next generation of scientists and thinkers. By embracing game-based learning, teachers can create an inclusive, interactive, and immersive learning environment that caters to diverse learning styles. This innovative approach has the potential to transform Chemistry subject, making it more engaging, effective, and enjoyable for students. As a result, students develop a deeper understanding of periodic table classification, laying the foundation for future success in Chemistry and related fields. This research will improve students learning capacity in the Science subject. Using game with supportive song will make learning easy. It will increase the achievement of students in the topic. Students will understand the place of elements in the periodic table easily. Students will be able to understand the different concepts of periodic table. Students will grasp the topic easily. Students will be able to solve many problems related to periodic table classification of elements. Student will solve many problems related to periodic table quickly. Students will be able to create their own songs related to the periodic table of classification.

Keywords: Periodic table, Game Based Learning (GBL).

Introduction:

Education is the most important part of everyone's life. It is the way of manifestation of life. In the earlier days we used to take support of blackboard and chalk with traditional teaching methods. Nowadays vast technology is developed and it has captured whole teaching

learning process. While going through learning phases, students may face problems. It has been observed that many high school students struggle to learn Chemistry concepts including periodic table as a part of mandatory curriculum. The periodic table, a fundamental concept Chemistry, can often be daunting for students to learn. Traditional teaching methods, such as rote memorization, can lead to disengagement and lack of understanding. However, game-based learning offers revolutionary approach to master periodic table classification. By incorporating interactive and immersive games, students can develop a deeper understanding of element properties and relationships, fostering a lifelong love of learning Chemistry. Game-based learning provides an innovative solution to overcome learning barriers associated with periodic table classification. Complex information is broken down into manageable, bite-sized chunks, allowing students to visualize element relationships, reinforce learning, and build confidence in their understanding. This engaging approach promotes active learning, critical thinking, and problem-solving skills, creating a collaborative learning environment that motivates students to explore and understand the periodic table.

Theoretical Background of the research:

Sr. No.	Psychological Theory	Psychologist	Theory states
1.	Constructivism	Piaget, Vygotsky	Learners build knowledge through active problem solving. Games allow learners to actively construct understanding by experimenting, making mistakes, collaborating rather than passively receiving information.
2.	Self Determination Theory	Desi and Ryan	Games motivate human being by satisfying core psychological needs like competence, autonomy, relatedness.
3.	Experimental Learning	Kolb	Learning occurs through a cycle of concrete experience, reflective observation, abstract conceptualisation

			and active experimentation, all inherent in game play.
4.	Behaviorism	Pavlov, Skinner, Watson	Reinforcement through points, badges and levels encourages desired actions and sustained engagement.

Objectives of Research:

- To find out the status of achievement of students in learning periodic table classification of elements.
- To prepare some activities to enhance their achievement in learning periodic table classification of the elements.
- To find out effectiveness of the game-based learning activity in the topic periodic classification of element.

Hypothesis:

Null hypothesis - There is no any significant difference between mean of pre-test and post-test. Research hypothesis - Game based teaching is more effective than the traditional method of teaching in learning the periodic classification of elements.

Scope, delimitations and limitations of the research:

Scope – This research will be useful to all the state board based secondary level schools.

Delimitations - 1) This research is limited to one unit of science book of 10th standard.

2) This research is limited to only study of impact of games provided to learn periodic table classification.

Limitations - 1) 10th standard students of one English medium school of SSC board are included in this research.

2) There was no control over the mood and motivation of the responders at the time they responded.

Assumptions:

- 1) The game-based learning engages and motivates students and also develops a growth mindset. (Adipat S. 2021)

- 2) Game based learning system has helped the student to enhance their knowledge and learning performance (Soundar Rajan S. 2022)
- 3) In education, game-based learning has the potential to promote cognitive, social, and emotional development. (Manar S.A. 2014)

Research Method: Survey and Experimental methods will be used for this research.

Data Collection Tools: Interview, Achievement tests (Pre and Post) will be used for data collection.

Methodology:

- After teaching periodic table unit by using traditional method, pre-test was conducted by the researcher. With reference to the students' achievement, interview with science teachers to figure out the difficulties in understanding the periodic table classification of elements were also carried out. The most important reason found is that the elements are difficult to understand as they are more in numbers. In the periodic table classification of elements students found it difficult to remember all the elements as their name differs in the Latin as well as in normal way of using.
- The researcher used different activities by using the cardboard and cards and different coloured papers for elements of periodic table. Activity was conducted to understand the concept easily.
- Play with cards activity was implemented by using the board of periodic table different elements and their atomic numbers.
- To remember initials of each group elements, students were taught how to make a relevant song.
- Instruction way of playing the game was provided with the guidance book of playing the game.
- Researcher after conducting the activities, researcher has conducted a post-test to analyse the effectiveness of the activities as a remedy taken to improve the student's ability to learn and to identify the periodic table classification of elements.

Analysis of Data: Through this research, relevant data was collected through the pre and post-tests. Then the data was classified and tabulated. With the help of statistical measures like mean, standard deviation and t-test, data is analysed.

Table for statistical analysis:

Test	Sample	Mean	SD	t-test
Pre-test	N= 44	9.10	4.59	10.84
Post-test	N= 44	16.96	5.01	

Testing of hypothesis:

There is a significant difference between the mean of the pre-test and post-test. Table t-value is 2.016 on 0.05 significance level while calculated t-value is 10.84. Therefore, the null hypothesis is rejected and research hypothesis is accepted. Thus, conducting different activities prepared to understand the periodic table classification of elements is more effective than traditional way of teaching and learning method.

Conclusion:

- There was an improvement in the student's achievement after using the game based learning method to learn the topic periodic classification of elements.
- Students remembered the periodic table classification of elements more easily after using the game and song to learn the topic.
- Students were able to recognize the symbols of elements, atomic numbers and solve the problems easily.

Recommendations:

The researcher suggests schools to provide the game book or the cardboard playing methods, making of chart activity for the students, to conduct quiz on the given topic to understand its importance in their study. A school can make a study corner to understand this game easily so that whenever they have time, they can use it to fill the game like as given in the cardboard. Students can use their valuable time to learn periodic table games. Teacher can ask everyday five elements name in the class. Students can be given opportunity to make their own song to remember shortcuts of all the elements of periodic table so that they can remember it easily. A small pocketbook can be made to check every time whenever they have free time to understand the place of elements in the periodic table so that their learning could become easier.

Contribution of said research:

This research will be helpful for all the researchers to get the knowledge of the different activities to be conducted in the classroom to make students learning easier. The method to be followed to evaluate students on the basis of the effect of activity or game-based learning in the students. In the same manner different activities can be conducted for making students' concept clear and precise, to make their learning easier and to learn the difficult concept of Chemistry with the fun filled way. This makes students not only to learn the concept easily, but also it gives them long term memory to understand the concept. Without going for road learning they can recognize and identify the elements in the periodic table easily, so that they could use it for further processes of solving problem of Chemistry. Thus, by using game way-based method, the learning can be made easier for students.

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