



Enhancing the Science Process Skills through Phet Simulation

Parthiban J¹, Dr. Leo Stanly S²

¹Research Scholar, Department of Education (CDOE), Centre for Distance and Online Education, Alagappa University, Karaikudi, Tamil Nadu, India.

²Professor, Department of Education (CDOE), Centre for Distance and Online Education, Alagappa University, Karaikudi, Tamil Nadu, India.

Email: jparthi78@gmail.com¹, leostanlys@alagappauniversity.ac.in²

Abstract

The aim of this study was to understand the science process skills among IX standard students with respect to Phet simulation. Science education is much important to understand day to day life concepts and develops problem solving skills of the students. The single group design was adopted during the experiment. The investigator adopted purposive sampling technique for this study. The sample consists of 30 Students. Generally, science process skills are essential to understand science concepts. The science process skills are classified basic and integrated process skills. The concept of chemical bonding in class IX is little complex to understand. To teach the concept, teacher needs an effective method. So, the investigator has adopted Phet simulation to understand the science process skills. Science process skills are the competencies and techniques of scientific methods which is necessary and sufficient condition to discover scientific knowledge. Phet simulations are interactive simulations that may scaffold the students to understand the concepts in terms of science process skills. This proposed study helped the science teacher to modify his or her instructional strategies with technical support and also for enhancing the performance of students in science subject.

Keywords: Science process skills, Phet Simulation, Chemical bonding.

1. Introduction

Science Process Skills, we teach a subject not to produce little living libraries on that subject, but rather to get a pupil to take part in the process of knowledge getting; knowledge is a process not a product (Bruner, 1960) [1]. Science process skills may help the learners to understand the concepts very clearly. Basic process skills like observing, Inferring, classifying, predicting and integrated process skills like hypothesizing, interpretation data, experimenting, generalizing, manipulating skills also assists to enhance science as a process and never be a product [2]. To understand some complex concepts, we need some specific methods. The current scenario of science education needs innovative methods for their teaching learning practices. Phet simulations provide an engaging

and intuitive way for students to explore various topics, including physics, chemistry, biology, and maths to understand complex problems and innovative way to solve them. Phet simulations aim to enhance teaching and learning by providing research-based interactive computer simulations assists the learners to understand the concept [3]. Phet simulations have been used to enhance skills, previous studies on simulations interventions provide limited findings and show moderate effects on student's learning [4]. In class IX certain selected concepts in Chemical bond was taken to prepare some simulations were used to understand different types of bonding like ionic and covalent bonding through certain selected process skills like Observe, Infer, Hypothesize and manipulate.

2. Need and significance of the study

In 21st century teachers have to adopt new strategies in their classroom practice [5]. The science subject

requires innovative instructional strategies for improving the academic performance of the students in science process skills [6, 12]. There are different science subjects are available in school education each has different characteristics which requires some innovative strategies to understand the learners. Especially in teaching of chemistry needs some innovative teaching strategies to understand the concepts like chemical bond in better way, it is not an easy to explain the concept to the students in traditional classroom settings [7]. Hence, the new innovative strategies like Phet simulations would be administered to enhance the knowledge in chemical bond among learners with respect to process skills [8, 13]. Phet aims to improve the way science is taught and learned by creating research-based interactive computer simulations. Phet simulation develops logical and critical thinking skills among students to learn and understand things [9]. Based on the evidences raised in previous literature and also need of the present context the proposed study would be need and significance one [10]. Science process skills are essential abilities that empower both scientists and students to explore the natural world systematically [11]. These skills form the bedrock of scientific inquiry and problem-solving. When science process skills integrated with Phet simulation would be more effective to the learner in clarity of the concepts [12].

3. Methodology

3.1 Sample of the study

The single group design was employed during the experiment. The investigator was used purposive sampling technique in this study. The 30 Students from IX standard in Govt High school, Nagamangalam, Ariyalur dt was used as the sample for the present investigation, as shown in Figure 1 and 2 [14].

3.2 Objectives of the study

- To Identify the needed process skills to improve the understanding of chemical bond
- To assess the level of science process skills among IX standard students

- To enhance the achievement of science process skills through Phet simulation among IX standard students

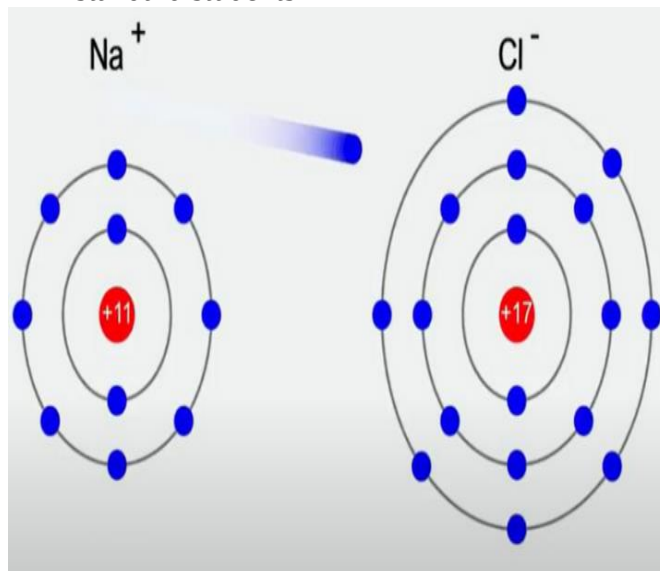


Figure 1 Phet Simulation for NaCl

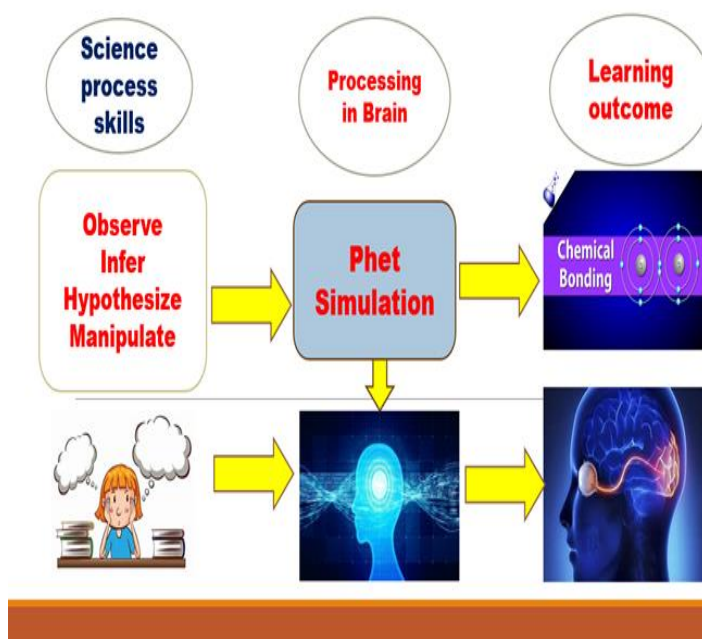


Figure 2 Phet Simulation Plot

3.3 Hypotheses of the study

1. The level of science process skills among IX standard students are low
2. There is no significance relationship between the achievement of science process skills Phet simulation among IX standard students

4. Result and discussion

4.1 Hypothesis 1

The level of science process skills among IX standard students are low. The Table 1 study indicates that there is an enhancement of science process skills 60% in moderate level and 10% in high level.

Table 1 Level of Science Process Skills

Low	Moderate	High
30%	60%	10%

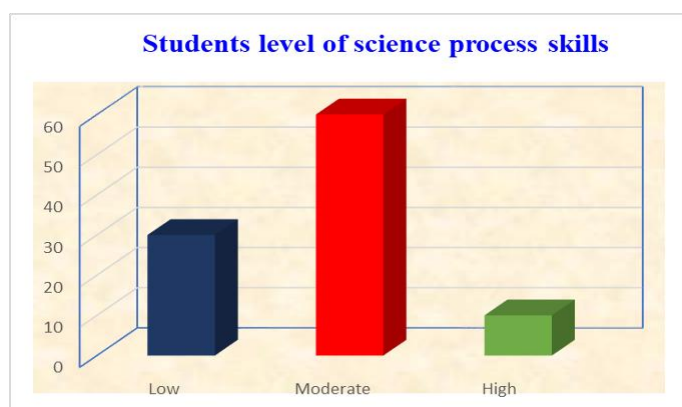


Figure 3 Level of Science Process Skills for Students

4.2 Hypothesis 2

There is no significance relationship between the achievement of science process skills through Phet simulation among IX standard students. The level the achievement of science process skills through Phet simulation in post-test is higher than that of Pre-test.

Table 2 Achievements of Science Process Skills

Test	N	M	SD	t	Level of significance
Pre test	30	5.8	0.59	16.42	S (2)
Post test	30	9.2	0.85		

Conclusion

The level the achievement of science process skills through Phet simulation in posttest is higher than that of Pre-test. So the present study has proved that level of science process skills among IX standard students through Phet simulation has enhanced. Therefore, it is concluded that Phet simulation is more effective because it offers a more attractive, instructive and interactive visual presentation to the learners which attracts the attention and helps for their improvement in science process skills among IX standard students and also study

helps for science teacher to improve their instructional capability for enhancing the academic performance of students. The science subject requires such kind of innovative strategies for learning the concept among teachers and students.

Reference

- [1]. Yumusak, G. K. (2016). Science Process Skills in Science Curricula Applied in Turkey. *Journal of education and practice*, 7(20), 94-98.
- [2]. Supriyatman, A., & Sukarno, S. (2014). Improving science process skills (SPS) science concepts mastery (SCM) prospective student teachers through inquiry learning instruction model by using interactive computer simulation. *International Journal of Science and Research*, 3(2), 6-9.
- [3]. Suman, S. (2020). Relationship Between Science Process Skills and Achievement in Science of Secondary School Students. *International Journal of Creative Research Thoughts (IJCRT)*, 8, 2320-2882.
- [4]. Hikmah, N., Yamtinah, S., & Indriyanti, N. Y. (2018, May). Chemistry teachers' understanding of science process skills in relation of science process skills assessment in chemistry learning. In *Journal of Physics: Conference Series* (Vol. 1022, No. 1, p. 012038). IOP Publishing.
- [5]. Aydın, A. (2013). Representation of science process skills in the chemistry curricula for grades 10, 11 and 12/Turkey. *International Journal of Education and Practice*, 1(5), 51-63.
- [6]. Yildirim, S. (2016). Infographics for Educational Purposes: Their Structure, Properties and Reader Approaches. *Turkish Online Journal of Educational Technology-TOJET*, 15(3), 98-110.
- [7]. Koray, O., Bahadır, H., & Gecgin, F (2006). The states of being represented of science process skills in the course books of chemistry and chemistry curriculums at the 9th, *ZKU Journal of Social Sciences*, 2(4), 147-156.
- [8]. R. Haryadi and H. Pujiastuti, Phet simulation software-based learning to improve understanding ability in light concept, in *Proceedings of the First International Conference on Technology and Educational Science (EAI, 2019)*, pp. 1-5, 10.4108/eai.21-11-2018.2282121
- [9]. E. C. Lin, High School Students' Perceptions

about the Helpfulness of PhET Simulations for Learning Physics (Queensland University of Technology, Queensland, Australia, 2020), 10.5204/thesis.eprints.201913.

- [10]. L. S. M. Piyatissa, M. G. Md Johar, and A. K. Tarofder, Evaluating the effectiveness of a phet simulation for teaching and learning of “turning effect of force” in physics at secondary school level, *Int. J. Adv. Res. Publ.* 2, 32 (2018), <http://paper.researchbib.com/view/paper/213380>.
- [11]. I C. Panis, the utilizing of PhET simulation as a computer-based learning media to improve the understanding of college student’s physics concepts, *Adv. Soc. Sci. Educ. Humanit. Res.* 66, 55 (2017).
- [12]. Ganasen, S., & Shamuganathan, S. (2017). The effectiveness of physics education technology (PhET) interactive simulations in enhancing matriculation students’ understanding of chemical equilibrium and remediating their misconceptions. In: Karpudewan M., Md Zain A., Chandrasegaran A. (eds). *Overco*. Springer. 10.1007/978-981-10-3437-4_9
- [13]. PhET Team Research page (2015). <http://phet.colorado.edu/research/index.php>
- [14]. Finkelstein, N., Adams, W., Keller, C., Perkins, K., Wieman, C. and the PhET Team, (2006). High-Tech Tools for Teaching Physics: The Physics Education Technology Project. *Journal of Online Learning and Teaching*, 2, 109-121.
- [15]. Perkins K. Transforming STEM learning at scale: PhET interactive simulations. *Childhood Education*. 2020;96(4):42–49. doi: 10.1080/00094056.2020.1796451. [CrossRef] [Google Scholar]
- [16]. PhET. (2021). PhET: Free online physics, chemistry, biology, earth science and math simulations. PhET. (2020). PhET. Retrieved December 5, 2020, from <https://phet.colorado.edu/en/simulations/browse>