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Experiential Learning and Geometry teaching: A call to action

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ABSTRACT

The success of nation depends upon the skills and creativity citizen possess. Expanding horizons of technology and its integration in various fields have promoted multidisciplinary approach. Education has to take up the responsibility to showcase multidisciplinary approach through pedagogical aspect. We are facing challenges – social, economic and environmental – which are the resultant effect of faster development rates. At the same time, these forces are providing us varied opportunities for human advancement. The children entering education in 2018 will be are future citizens of 2030. Schools have to prepare them for unseen jobs. To navigate future citizens they will need to develop curiosity, imagination, resilience and self regulation

among themselves. School education is the first phase to startup thinking and giving opportunity to students for generating ideas. Mathematics and mathematics teaching plays a significant role in the development of ideas and thinking. Mathematics is increasingly needed to understand the world today fully engage in democratic society (NCTM, 2018). Hence mathematics just taught as subject needs to be reinvented. Mathematics has its own language. Due to lack of understanding of literary skills abstractness of mathematics increases. Mathematics is abstract by nature and geometry as a branch of mathematics is closely associated with the thinking development and design. Geometry is a subject of visualization. Students find it difficult when taught in abstract manner. Cognitive science promotes learning through multisensory organs and experiential learning is the best option to be accepted for it. Students develop conceptual understanding and rote learning is minimized by changing pedagogy. This study throws light on how experiential learning can be integrated in classroom teaching and has given positive results in achievement scores.

Keywords: cognitive science, experiential learning

INTRODUCTION

We are facing challenges – social, economic and environmental – which are the resultant effect of faster development rates. At the same time, these forces are providing us varied opportunities for human advancement. The children entering education in 2019 will be future citizens of 2030. Schools have to prepare them for unseen jobs. To navigate future citizens they will need to develop curiosity, imagination, resilience and self regulation among themselves (Schleicher, 2019). School education is the first phase to startup thinking and giving opportunity to students for generating ideas. School subjects contribute immensely in providing opportunities where students can develop their imagination, design thinking. Mathematics is an abstract subject. Mathematics as a subject has the power of developing critical thinking and creativity among students.(Tate,2013) Mathematics can cover entirely abstract concepts and relations, and it can also be applied for practical purposes in fields like natural sciences, social sciences or engineering. Traditional teaching has tended to emphasis pure mathematics and more modern approaches have tended towards applied mathematics (Peterson,2018) School education system focuses on utilitarian value of mathematics and classroom are flooded with theory of mathematics. Mathematics pedagogies should maintain balance between abstraction and the application of knowledge. Certain aspects of mathematics indirectly impacts teaching-learning of the subject. As mathematics is abstract by nature, to understand concepts- imagination and linguistic skills needs to be sharpened. Mathematical ideas develop from "concrete to abstract" and "particular to general". So to involve concrete material in teaching learning process is essential. Scaffolding of knowledge is at peak in mathematics. There is a need to help both teachers and learners to develop understanding of mathematics concepts. Mathematics teaching has to be

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independent from simply memorizing formulas and computation. 21st century is the century of dynamic change. Skills that were essential yesterday are obsolete today. Critical thinking, creativity, analytical thinking, designing and problem solving are the major shift in the skills for 21st century. Hence future generation needs to be flourished with such skills through subjects. This directs in change of pedagogical aspects. Rote learning has no role in developing such skills and hence student's understanding has to be at pinnacle. But real classroom scenario has a very dissimilar story to narrate. Mathematics is taught as a simple subject focusing on formulas, calculations and rote learning. This leads to serious concerns in higher grades. The graph of quality of education system and teachers is highly correlated. Teachers are considered as designers of learning environment. Pedagogy is the central theme of education and hence teachers need to be motivated in experimenting innovations in the classroom. Innovation in education is a buzzword in contemporary era and feeding teachers with ICT skills is just not innovation. Teachers should incorporate pedagogical practices with a view to enhance knowledge, skills and attitudes that are central to success in 21st century. Innovative pedagogy demands student's participation at fullest. Mutual interrelationship between pedagogy and learners context is the primary condition for better outreach to learning outcomes. Any new pedagogy practiced in classroom needs to be assessed in terms of learning outcomes. In this research, researcher implemented experiential learning and research was carried out as need was felt to analyze learning in transformed pedagogical aspect.

WHAT IS EXPERIENTIAL LEARNING?

Experiential learning which focuses on the process of discovery learning is closely associated with learning by doing. This type of learning can be defined as "the process whereby knowledge is created through the transformation of experience (Kolb, 2016). Knowledge results from the combinations of grasping and transforming the experience. The experiential theory is holistic in approach and emphasizes how experiences influence the learning process. In the experiential learning model, concrete experiences leads to abstract conceptualization. The learning cycle basically involves four stages, namely: concrete learning, reflective observation, abstract conceptualization and active experimentation (Kolb,1985). Learner needs to be well oriented toward reflective observation and active experimentation.

OBJECTIVES

Following objectives were framed to conduct the research:

- Identify grey areas in geometry for Std IX students and find possible reasons for it.
- Design experiential learning based on error analysis.
- Construct and conduct post test and measure the efficacy of experiential learning.

HYPOTHESIS

Following hypothesis was framed for the present research.

- There will be no significant difference in the mean scores of pre test and post test.

METHODOLOGY

During teachers training, trainees visit various schools and sharpen their teaching skills. It was the time during practice teaching that students of Std.IX of A.G.High School were fumbling in the geometry period. They were not able to understand geometrical concepts easily. After interacting with them it was concluded that students were versed with single geometrical concept but they had difficulty in identifying geometrical facts represented in diagram form. Students of Std.IX were unclear regarding representing linguistic form into diagram form. They found difficulty in drawing geometrical shapes of particular measurement. It was difficult for them to measure the figure accurately. These hardspots were identified by reflective observation of researcher and pretest was designed keeping these inputs in mind. Error analysis depicted that students were comfortable when definitions were asked but they couldn't identify elements from figures neither they could draw geometrical figures nor interpret the figure. Students were facing difficulty in identifying various angles formed by parallel lines and its transversal, types of triangles, types of quadrilaterals measuring different angles and line segments. But, they were well-versed with the definitions of geometrical concepts.

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This reflected their rote learning strategies and weak foundation of geometrical concepts of std.VII and std.VIII. Investigator planned to imply experiential learning approach with the class.

Students were explained regarding the process and list of concepts to be covered was framed. As per the list, study materials for experiential learning for various concepts were designed. Cutouts of different geometrical shapes, model making, origami etc activities were taken into account along with activity based worksheets as study material. While explaining certain concepts students were taken to open space area and asked to feel geometrical concepts around them. E.g.(1) In recess list places in school premises where you can see different types of angles and classify them. (2) Cut three triangles of different types each having one side measuring 10cm. (3) Measure various shapes given to you and identify congruent shapes from them. (4) Measure the given sides and angles of the triangle and establish the relation between sides and angles as per their measures. Students were explained the concepts using experiential learning where they proved almost all results of geometry on their own. After the program was completed, post test was administered. T-test was conducted.

Pre-test post-test one group design was selected for research.

- Sample: The study was confined to 55 students studying in std. IX of A.G. High School.
- Tools: Teacher made pre-test and post-test consisted of objective type questions which carried 1 mark for each question and contained 50 marks.

DATA COLLECTION

Initially researcher listed the hard spots on the basis of reflective observation. Pre-test was administered to find out the hard spots in geometry. After doing error analysis of the result, remedial work was designed. Remedial work was framed for one week. Developed study material including activities were administered on students. Post-test was administered and efficacy of remedial work was measured by computing T-test based on the results of pre-test scores and post-test scores.

- **Data analysis:** The data was collected and analyzed keeping objective and design of the study. Data of 55 students studying in Std. IX was collected using teacher made pretest and post test. Table-1 shows the obtained data of the sample.

Table-1: Comparison of the difference between means of pre-test scores and post-test scores of geometry test

Test	N	Mean	SD	r	Mean diff.	"t" value
Pre-test	55	35.72	6	0.78	0.53	4.47
Post-test	55	38.09	5.8			

From table-1, it is evident that t-value is 4.47, that is significant at 0.01 level. It reflects that mean score of pretest and posttest do differ significantly. Mean scores of pretest is 35.72 and posttest is 38.09, which indicates that posttest result is higher than pretest. Hence remedial work in the form of experiential learning has benefitted the students and increased their learning.

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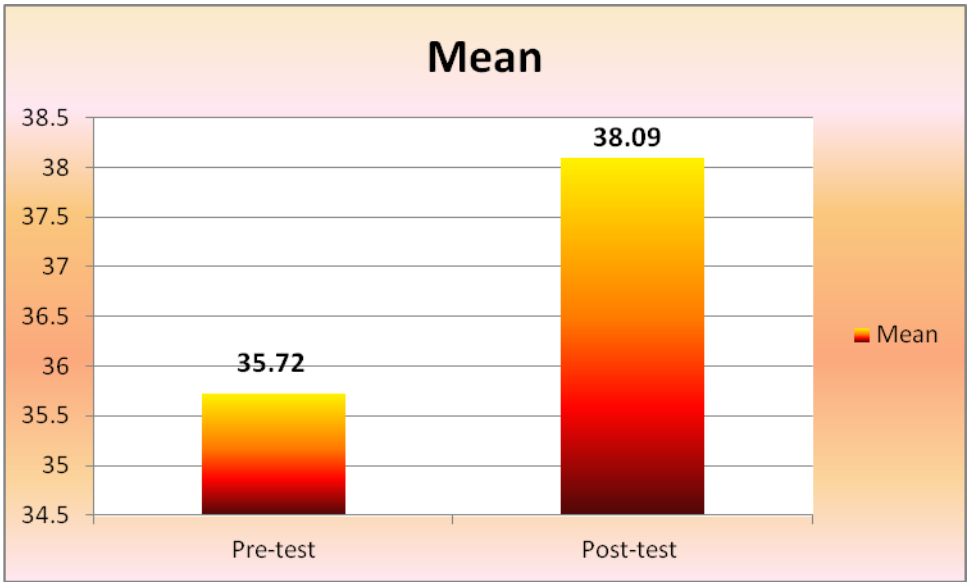

Graph-1: Comparision between pretest and posttest achievement in geometry test scores of students studying in Std.IX

FINDINGS AND CONCLUSION

There is a significant difference in the achievement of students of std. IX in Geometry after the remedial work. So, experiential learning enriched student's understanding of geometrical concepts. Students were interested in geometry model making and measuring them. They developed the insight of verifying geometrical results on their own. This made them more confident in the subject.

Mathematics and especially geometry has many abstract terms. These abstract concepts need to be delivered in a concrete manner. Cognitive science research reflects that students find difficulty in grasping abstract concepts till the age of 14 (Cynthia Luna Scott (2015)). Geometry is a subject of visualization and so if taught by only narration it becomes very difficult for students to grasp the concepts. Scaffolding of knowledge in mathematics is very much needed. Std.6 to 8 is the foundation for scaffolding of knowledge. So, if in this time period concepts are not cleared, students find difficulty in higher grades. Due to this difficulty, they get either isolated in the class or are pushed back from the subject interest.

The only solution to this problem is change in pedagogical aspect of a teacher. Designing learning environment progressive to independent thinkers is must. Pedagogical change is the need of an hour. Teachers have to incorporate STEM approach in subject teaching. STEM should be developed in such a way that supports the development of mathematical thinking and quantitative reasoning. Students have to change their mindset from being passive listeners to active learners. In order to promote 21st century skills, teachers need to modify their pedagogical skills and prepare students as independent thinkers. Experiential learning creates a very conducive learning environment which not only focuses on cognitive development but establishes a horizontal correlation between various skills, attitudes and environmental experiences.

PLAN OF ACTION

Classroom students are future citizens and hence it is the responsibility of teacher to develop the roadmap of learning from ability to employability. 21st century demands a very different set of skills which needs to be inculcated from classroom teaching. Experiential learning is a very useful technique through which students can get involved in the classroom. Cognitive science promotes involvement of multi-sensory organs in learning and "concrete to abstract" teaching style. Experiential learning satisfies both the criteria of cognitive science and so if practiced by teachers it can yield exponential success in achievement. This research finding highly recommends experiential learning strategy in the class room. Policymakers need to focus on developing effective materials, teachers training and assessment tools which can support experiential learning. Designing learning environment and promoting learning beyond the boundaries is the need of an

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hour. Pedagogy is at the heart of teaching and learning and preparing young people to become lifelong learners with a deep knowledge of subject matter and a broad set of social skills requires a better understanding of how pedagogy influences learning. Experiential learning accelerates the rate of learning among students as students find hands on learning experience interesting. So in terms of Blooms taxonomy, this pedagogy helps in fostering affective domain of child. It provides a safe learning environment and bridges the gap between theory and practice. It nurtures psychomotor domain of child. This experience promotes learning at own pace and hence students are directed towards lifelong learners.

REFERENCES

- Cynthia Luna Scott (2015) The future of Learning 3: What kind of pedagogies for the 21st century?: Working Papers Education Research and Foresight , UNESCO
- Green, H., Facer, K., Rudd, T., Dillon, P., & Humphreys, P. (2005). Personalisation and digital technologies. Bristol, England: Futurelab. Retrieved 29 July, 2018, from http://www.futurelab.org.uk/resources/documents/opening_education/Personalisation_report.
- Larson, M. (2017). Math education is STEM education! NCTM president's message. https://www.nctm.org/News-and-Calendar/Messages-from-the-President/Archive/Matt-Larson/MathEducation-Is-STEM-Education!/
- National Academy of Engineering & National Research Council (2014). STEM integration in K–12 education: Status, prospects, and an agenda for research, M. Honey, G. Pearson, & H. Schweingruber (Eds.). Washington, DC: National Academies Press.
- National Council of Teachers of Mathematics (2000). Principles and standards for school mathematics. Reston, VA: Author.
- OECD (2018), "Experiential learning", in Teachers as Designers of Learning Environments: The Importance of Innovative Pedagogies, OECD Publishing, Paris,https://doi.org/10.1787/9789264085374-10-en.
- OECD (2019), Education at a Glance 2019: OECD Indicators, OECD Publishing, Paris,https://doi.org/10.1787/f8d7880d-en.
- Peterson, A., et al. (2018), "Understanding innovative pedagogies: Key themes to analyse new approaches to teaching and learning", OECD Education Working Papers, No. 172, OECD Publishing, Paris, https://doi.org/10.1787/9f843a6e-en.
- Saavedra, A. and Opfer, V. (2012). Teaching and Learning 21st Century Skills: Lessons from the Learning Sciences. A Global Cities Education Network Report. New York, Asia Society. http://asiasociety.org/files/rand-0512report.pdf
- Schleicher, A. (2019), Helping our Youngest to Learn and Grow: Policies for Early Learning, International Summit on the Teaching Profession, OECD Publishing, Paris,https://doi.org/10.1787/9789264313873-en.
- Tate, W. F. (2013). Race, retrenchment, and the reform of school mathematics. In E. Gutstein & B. Peterson (Eds.), Rethinking mathematics: Teaching social justice by the numbers, second edition (pp. 42–51). Milwaukee, WI: Rethinking Schools.