

Teachers' Choices on Environmental Principles of Learning Effective Mathematics in Secondary Schools

Ashim Bora¹, Sahin Ahmed²

¹Department of Mathematics, Diphu Government College,
Diphu, Assam 782462, India.

²Department of Mathematics, Rajiv Gandhi University,
Rono Hills, Itangar, Arunachal Pradesh 791112, India

Abstract

The understanding of mathematics education objectives depends on the design of the appropriate learning environment. Teachers play an active role in the model of learning environments. Information of which includes a learning domain ought to have with the end goal to qualify as a perfect must be uncovered by taking teachers' opinions. In this context, the purpose of the study is to illustrate the views of mathematics teachers of secondary schools on the characteristics of the effective mathematics learning environment. The participants of the study consisted of 45 secondary school mathematics teachers serving in 35 different secondary schools. Data were collected through a research instrument constructed by the researcher. It was observed that teachers often expressed their views on effective mathematics learning environments based on the shortcomings they noticed in existing learning environments. It is pointed out that the most important factor in the formation of ideal mathematics learning environments is the class size. In addition, the emphasis was on the mathematics laboratory, equipments and technologically equipped classes. Based on the opinion of the majority of teachers, it is recommended that mathematics classes should be equipped with tools and technology in each secondary school.

Keywords: *Mathematics teaching, Mathematics learning, Effective learning environment, Secondary mathematics.*

1. Introduction

The Mathematics education leads students to acquire knowledge and skills to help them understand their environment and understand social interactions. It gives students a language and systematic that they can make various determinations

by considering their experiences, they can explain, even they can make predictions and solve problems. In addition, it contributes to the development of students' reasoning skills by creating learning environments in which various mathematical situations are examined. As a result of the planned learning-teaching activities for mathematics education, it is expected to acquire competences such as analyzing situations, critical thinking, and logical and systematic thinking to form a structure. Mathematics, it is broadly comprehended, assumes a key role in molding how people manage the different circles of private, social, and common life. As previously, today also numerous students battle with mathematics and end up offended as they ceaselessly stand up to snags to commitment. In fact, learning mathematics goes through learning to think mathematically (Schoenfeld, 1992; Stacey, 2005). The way to gain this mathematical thinking can be achieved through the creation of appropriate learning environments (Hudson, Henderson & Hudson, 2015). In mathematics lessons, the learning environment is influenced by teachers, program materials as well as learning environments. Inadequate learning environment is one of the main reasons for students' failure to acquire mathematical problem-solving skills.

2. Review of Literature

Learning environment is compressed into four walls of the class, mostly because of technology, educational technology and the use of materials and their effectiveness. (Kim, Grabovski, Shaharma, 2004). When the learning environment is mentioned, it should not be understood as the place where learning only takes place. As indicated by Lin, Hmelo, Kinzer, and Secules (1999), the explosive development and advancement of innovation require

new information and learning abilities. This blast is transforming the learning situations and instructive ideas. According to NCTM (1989) standards, learning environments should be able to fulfill many objectives such as using mathematical language as a communication tool, making mathematical reasoning, ensuring their self-confidence as being aware of their own abilities, being able to solve problems and making students feel the value of mathematics. Though the states of the class or the physical conditions are related to the learning environment, the learning environment is not so narrow. It contains all the factors affecting the learning process. Therefore, the environments formed by the interaction of space, time, infrastructure, hardware and psycho-social factors that are involved in the learning process and which influence this process can be defined as learning environment. Birgili (2015) stated that one of the accommodating instruments for the improvement of creative and basic reasoning aptitudes is issue-based learning environment in classrooms. Many researchers also found that the learning environment has an impact on mathematics achievement (Shamaki & Ado, 2015; Adnan, Abdullah, Puteh & Che, Maat, 2014; Hoang, 2008; Papanastasiou, 2002; Dorman, 2001). According to Wilson (1996) the learning environments, whose effectiveness is emphasized on learning, are generally referred to as places where individuals use existing resources for their purposes in defining events that develop in the environment and in developing a meaningful solution to problems. In the learning environment, besides the teacher, the definition of the characteristics of the subject and other factors, the determination of the level of realization of the learning, and the accurate analysis of many data about the achievements of the teaching materials and methods used are important in the organization of these environments. More effective learning environments can be created if the learning environments are rearranged by taking these elements into consideration. According to Yılmaz & Akkoyunlu (2006) if the learning environments are pre-configured, the student can easily reach the learning objective without any uncertainty. Therefore, effective learning environments can be created as a result of the arrangements made in this way, and it can be ensured that students can gain knowledge and skills for both their lives and their higher education. Effective learning environments can be achieved if individuals are provided with rich learning experiences which will interact more with their environment. Use of learning approaches such as cooperative learning and problem-based learning will make the learning environment more effective (Hmelo-Silver, 2004; Yasar, 1998). Tshewang

(2015) stated that mathematics learning environments that support the development of mathematical forces contribute to physical, social, design and academic factors.

3. Aim and Objective of the Study

In order to demonstrate the effectiveness of the approaches used in the process of effective learning environment, the teacher needs to create supportive and encouraging learning environments and to constantly renew it (OECD, 2009). Therefore, the teachers are to play an active role in the design of learning environments reveals the importance of their opinions about learning environments. The aim and objective of the study is to illustrate the views of secondary mathematics teachers on the characteristics of effective mathematics learning environments.

4. Research Methodology

It is a qualitative study conducted to determine the opinions of secondary mathematics teachers about effective learning environments related to mathematics teaching.

4.1 Selection of sample.

The sample survey method is chosen for the present study. The participants of the study consisted of 45 secondary school mathematics teachers serving in 35 different secondary schools.

4.2 Research Instruments.

A research instruments was developed for the study. The questionnaire was developed to access Teachers' Opinion on Effective Learning Environment (TOELE). There are two parts in TOELE scale. Part-A is for demographic information of the respondents and the part B-relates to their Opinion on Effective Learning Environment. Part-B of TOELE scale was scored on a 1-7 Likert-type scale. '1' for 'very strongly disagree (VSD) and '7' for very strongly agree (VSA). A panel of experts carefully reviewed both the instruments and made necessary adjustments.

4.3 Reliability and Validity Test.

The instruments were pilot tested on a sample of 10 teachers and for reliability test Cronbach's Alfa were evaluated. The reliability index for TOELE instrument was found as 0.847. For validity of research instrument, factor analysis test was carried out. Kaiser-Meyer-Olkin (KMO) value for TOELE instrument was found as 0.784.

4.4 Analysis of Data.

The collected data were analyzed with the Statistical Package for the Social Sciences (SPSS) version 22.

5. Results

The table 01 reflects the demographic pattern of the respondents of the present study.

TABLE: 01 Sample Demographic Data. N=45

Parameter	N	%
Gender		
Male	34	75.56
Female	11	24.44
Domicile		
Rural	23	51.11
Urban	22	48.89
School Authority		
Government	24	53.33
Private	21	46.67

5.1 Teachers' Views on Effective Mathematics Learning Environments in terms of Student and Teacher Characters.

Teachers' Opinion on Effective Learning Environment (TOELE) scale was divided into four factors. Teachers' Character Factor (TCF), Students' Character Factor (SCF), Teaching Tools Factor (TTF), Methods and Techniques Factor (MTF) are the subdivided factors.

TABLE: 02 Description of subdivided factors

Items	Description
TCF1	A guide to students
TCF2	Reaching all students
TCF3	Interaction with students
TCF4	Attract interest of the student
TCF5	Student recognition
SCF1	Active student
SCF2	Sufficient preliminary knowledge
SCF3	Homogeneity of student levels
SCF4	Less number of students
SCF5	Student's psychological condition
TTF1	Adequate toolkit
TTF2	Mathematics laboratory
TTF3	Technological equipment
TTF4	Having well equipped math class
TTF5	Protective class
MTF1	Associating with real life
MTF2	Creating a discussion environment
MTF3	Explain the importance of mathematics
MTF4	Cooperative learning
MTF5	An educational process without examination/ without homework

It has been particularly emphasized by teachers that the role of both the student and the teacher in the formation of effective mathematics learning environments is an undeniable element. Teachers mostly evaluated the student's role in terms of cognitive and affective aspects. 34 percent teachers pointed out the importance of having preliminary knowledge (SCF2) sufficient for the students to learn and comprehend the lessons. The ideal learning environments cannot be created no matter how much we want the students without their prior knowledge. 22 percent teachers admitted that SCF1 is an important factor for creating effective learning environment. 37 teachers strongly agreed that SCF4 is an important factor. Student's psychological condition is an important factor. 30 percent teachers agreed that students to be informed in terms of knowledge in the formation of an effective mathematics learning environment, as well as being psychologically prepared (SCF5) and motivated. Majority teachers, 60 percent teachers very strongly agreed that TCF3 is closely related to create the effectiveness of the learning environment and the condition of realization of the relationship between teacher and student. On the other hand, only 10 teachers agreed for TCF1, 7 agreed for TCF5. 15 teachers agreed and 1 strongly agreed for TCF2.

5.2 Teachers' Opinions about Effective Mathematics Learning Environments in terms of Teaching tools and Method and Technique.

Most of the teachers agree that the effectiveness of a learning environment in terms of equipment must be increased. 20 teachers draw particular attention to the need for mathematics-equipped toolkits (TTF1). 2 teachers strongly agreed and 30 teachers agreed that TTF2 is an important factor to create effective mathematics learning environment. 38 teachers agreed and emphasized the need for adequate equipment mathematics class room (TTF4) in an effective mathematics learning environment. Teachers' opinions on the method and technique are generally discussed in terms of planning the course process, changes in the training process and the benefits of effective learning environments. Only 11 teachers agreed for MTF1. MTF2 is agreed by 25 and strongly agreed by 6 teachers. MTF3 is agreed by 29 and strongly agreed by 2 teachers as important factor for creating effective learning environment. MTF4 and MTF5 are not marked as important factors. Only 5 teachers agreed for MTF4 and 3 agreed for MTF5.

6. Discussion

In spite of the fact that the learning instruments utilized in the arrangement of the learning condition, the apparatuses utilized, the innovative gear, the learning approaches utilized are viable, yet the fundamental draftsman of the plan of the learning condition is the teachers. Notwithstanding, with the end goal to have the capacity to qualify the learning environment as powerful, it was controlled by the assessments of the teachers that the components, for example, students and tools are important. Regulation of learning environment is effective as efficient and healthy work according to the effective objectives of the environment, the people of the region and other elements, not only the teacher but also other factors. The result of the study supports the fact that the learning environment covers beyond the physical conditions or the state of the class. Teachers state that the students' prior knowledge contributes to the learning environment. As long as their prior knowledge is at a certain level, they think that the lesson can be understood more easily and they can carry out the course without any problems. Teachers state that the number of students contributed to the idealization of learning environments as well as their cognitive and affective characteristics. They believe that the number of students in the classroom should be low in terms of communicating with each student in a learning environment and that this will improve the learning environment. Teachers are very sensitive about the size of the class. They state that the surplus of class sizes is an obstacle for them to create effective learning environments. Teachers say that addressing certain characteristics related to students is an important element in learning environment and the goal of student-centric education is one step closer to realization. The purpose of student-centric education is to educate those who think seriously, adapt to change and acquire skills to learn with key features such as flexible program implementation, high motivation, student responsibility, focus on individual differences. Although teachers do not look the shortcomings of equipment and technology as a major obstacle to the realization of a good learning, they believe that the existence of new discoveries and learning in a learning environment can lead to the realization of the subjects. In fact, they draw attention to the necessity of the presence of mathematics classes equipped with tools and technology in each school. Teachers point out that learning environment can be transformed into effective environments by providing guidance to students, communicating with students, and appropriate intervention if necessary.

7. Conclusion and Recommendations

In the eyes of the teachers, an effective mathematics learning environment is the environment where the teachers are guide, the students have sufficient knowledge and level, they are equipped with adequate equipments and technologies, methods and techniques that enable the student to participate in the process are used and the most important is the number of students. In the formation of effective learning environments, the teacher is determined by the teachers' opinions as well as by the teacher.

On the basis of the results of this study, it may be suggested that adequate mathematics laboratory and mathematics classes equipped with tools and technology should be included in each school. Moreover, further studies may be carried out to find the relations among different factors of effective learning environment and school authority, school environment and students' scholastic achievement in mathematics.

References

- [1] Adnan M.,Abdullah,M.L., Puteh,M., Ahmad,C. C., Maat, S. M. The Learning Environment And Mathematics Achievement Of Students Of High Performance Schools (HPS). *Jurnal Pendidikan Matematik*, 2 (1):1-15, (2014).
- [2] Birgili,B. Creative and Critical Thinking Skills in Problem-based Learning Environments. *Journal of Gifted Education and Creativity*, 2(2):71-80, (2015)
- [3] Dorman, J. P. Associations between classroom environment and academic efficacy. *Learning Environments Research*, 4(3):243-257, (2001).
- [4] Hmelo-Silver, C.Problem-Based Learning: What and How Do Students Learn? *Educational Psychology Review*, 16(3): 235-266, (2004).
- [5] Hoang, T. N. The effects of grade level, gender and ethnicity on attitude and learning environment in mathematics in high school. *International Electric Journal of Mathematics Education*, 3(1):20-38, (2008).
- [6] Hudson. B, Henderson. S,Hudson. A Developing mathematical thinking in the primary classroom: liberating students and teachers as learners of mathematics, *Journal of Curriculum Studies*, 47(3): 374-398, (2015).
- [7] Lin, X. , Hmelo, C. , Kinzer, C. K. , & Secules, T. J. Designing Technology to Support Reflection. *Educational Technology Research & Development.*, 47(3):43-62, (1999).
- [8] National Council for Teachers of Mathematics (NCTM).Curriculum and Evaluation Standards for School Mathematics. Reston, Virginia, (1989).
- [9] Organisation for Economic Co-Operation and Development (OECD). Creating Effective Teaching and Learning Environments-First

- results From Talis. Teaching And Learning International Survey, (2009).
- [10] Papanastasiou, C. Effects of Background and School Factors on the Mathematics Achievement. Educational Research and Evaluation. 8 (1):55-70, (2002).
- [11] Schoenfeld, A. H. Learning to Think Mathematically: Problem solving, Metacognition, and Sense-making in Mathematics. In D. Grouws (Ed.), Handbook for Research on Mathematics Teaching and Learning. New York: MacMillan, 334-370, (1992).
- [12] Shamaki & Ado, T. Influence of Learning Environment on Students' Academic Achievement in Mathematics: A Case Study of Some Selected Secondary Schools in Yobe State Nigeria. Journal of Education and Practice. 6(34): 40-44, . (2015).
- [13] Stacey, K. The place of problem solving in contemporary mathematics curriculum documents. Journal of Mathematical Behavior 24(3-4):341 – 350, (2005).
- [14] Tshewang, R. Bhutanese Eighth Grade Students' and Teachers' Perceptions of Their Classroom Learning Environment In Relation To The New Mathematics Curriculum. Faculty of Education. Queensland University of Technology, (2015).
- [15] Yasar, S. Structuralist Theory and Learning-Teaching Process. Anadolu University Faculty of Education Journal, 8(1-2): 68-75, (1998)
- [16] Yilmaz, M. and Akkoyunlu B, The Effect of Learning Styles on Achievement In Different Learning Environments. The Turkish Online Journal of Educational Technology, 8(4): 43-50, (2009).