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# Preparing to teach Mathematics with Technology of Secondary School Students

M. Aparna Lakshmi, Research Scholar, Department of Education,
Sri Padmavathi Mahila Visvavidyalayam, Tirupati

Prof. Ch. Vijayalakshmi, Department of Education, (former dean, School of Education)) Sri Padmavathi Mahila Visvavidyalayam, Tirupati

**Abstract:** Several Organizations have highlighted the importance of preparing teachers to teach students mathematics using appropriate technology. This article provides examples from teaching learning process makes easily by using appropriate technology in the class room and decreasing student's anxiety, improves self-efficacy solving problems. The paper explains the issues teachers' understanding the content, technology and to prepare them to teach geometry topic by using specific technological tools. The purpose of this study was to investigate the effects of PTMT on the mathematic anxiety, and mathematical self-efficacy of 8th class students.

**Key words:** preparing, teach, mathematics, technology, primary school students.

## Introduction:

Teacher education materials helps educators develop a model of teaching and learning which specifies of a technology tool so that they are able to make informed decisions about the appropriate use of technology for teaching mathematics in general. Mathematics is a discovery of the human mind and learning mathematics is supposed to be 'rediscovery' at least to some extent. To achieve this goal, the classroom could be turned into laboratory workroom for the improvement of mathematics education.

Pupils work and learn by doing and develop self-learning, self-study, exploratory and investigatory techniques. Mathematics, as it is taught today in most of the secondary schools, appears to be a fragmental collection of facts, rules and formulas which bear little relation to each other. Mathematics is being taught in a desirable manner teaching topic after topic without following integrated approach for concept formulation and attainment.

Each topic further subdivided into distinct subtopics needing separate treatment, creates in the minds of students a false impression about the nature of mathematics. These topics are taught as if they have no connection with real life. Thus the student fails to understand the motivation of learning mathematics. The student looks at mathematics as a bag of tricks which have to be learnt for examination but which are otherwise meaningless.

Mathematics is presented as a matter of learning dead facts and techniques are not in terms of true nature, which involves processes that demand thought and creativity. Today's method of teaching is traditional where chalk and duster are used by teacher and pen and paper by student. The school system does not invite children to express

emotions in class about mathematics nor does it favour creativity. It does not allow dialogue among peers about mathematical concepts and problems, nor the construction of knowledge by the students themselves.

The use of technology when studying mathematic is not a new issue, since human kind always has been looking for solutions to avoid time consuming routine work. The use of technology has a long history in mathematics education. Starting from magic slate, book, magic lantern, black board, OHP, radio, slide rule video tape, television, calculator, computer, Interactive board, Apple I pad all come under technology. Geo-boards are useful for introducing geometrical concepts.

Clinometers are useful for teaching and learning Trigonometry. An abacus allows children to conceptualize math formulas by working with tangible objects

Although drawing on paper or on chalk board makes ideas felt, static drawings often fail to convey mathematics principles. For example many students think a triangle is an isosceles triangle if it looks like and do not understand how to establish properties formally. With ICT based geometry students can grab and drag a corner of a geometric construction of triangle and see how it behaves under transformations. Playing this corporeal image can prepare students to understand the formal proof which is much more abstract.

Virtual manipulative is best defined as an interactive; web based visual representation of dynamic object presents opportunities for construction of mathematical knowledge. While concrete manipulative are relevant for uses in classrooms, virtual manipulative add to the learning experience. Virtual manipulative gives student prompts feedback and answers to problems while working as problems leasing the students use more self-explanation. Having an internet connection at home is helpful to both student and parents with out of the class room while working on mathematics

Smart boards in class rooms are the new white board and give teachers a great present websites and virtual manipulates to the whole class, group and individuals. Smart boards support more effective learning. Smart boards have the potential to make manipulative, more accessible to large group students. Learning with the increase of technology students and teachers can take advantage of these on their tablets, computers and smart boards. Virtual and concrete manipulative reinforce mathematical concepts separately but combination of both is the best way to achieve the best result.

**Aims of the Study:** The purpose of this study was to investigate the effects of PTMT on the mathematic anxiety, and mathematical self-efficacy of 8th class students. This study sought to investigate the following questions:

1. Is there a significant difference between the means of post-test mathematics anxiety scores corrected with respect to the pre-test scores of the control group taught according to the TMI and the experimental group taught according to the PTMT?
2. Is there a significant difference between the means of post-test mathematical self-efficacy scores corrected with respect to the pre-test

scores of the control group taught according to the TMI and the experimental group taught according to the PTMT?

3. Is there a significant difference between the means of post-test mathematical problem solving scores corrected with respect to the pre-test scores of the control group taught according to the TMI and the experimental group taught according to the PTMT?

## Methodology:

An experimental research model with pre-test/post-test control group which was considered as appropriate to this study to examine the effect of PTMT on students' anxiety and mathematical self-efficacy and problem solving compared with the TMI.

### Study Group

This study took place in a middle school program in a public secondary schools located in Andhra Pradesh. There were 72 students from eighth class students participating in the study.

The experimental groups were chosen from among students who had access to computers and the internet at home. Overall, 36 students of study group had access to computers and the internet at home,and therefore there were 36 and 36 students in the experimental and control groups respectively.

### Instrument:

Mathematics Anxiety Scale:

The mathematics anxiety scale, which was assessed the mathematics anxiety of elementary students, was developed by Bindak (2005) and the scale consisted of 10 items which were rated on a 5-point (agree–disagree) scale. Cronbach alpha internal consistency for the scale was found to be .84.

Mathematical Self-Efficacy Scale:

The mathematical self-efficacy scale created by Umay (2002), who developed the instrument to assess the mathematics attitudes of pre-service mathematics teachers. The mathematical self-efficacy scale consisted of 14 items-eight positively worded and six negatively worded- using 5 point scale Likert-type scale. Cronbach alpha internal consistency for the scale was found to be .70.

### Research design and procedure:

This study was conducted during the fall term of 2014–2015 academic years for six weeks at secondary school in Andhra Pradesh. The pre-test-post-test two-equivalent group design was used to collect quantitative data to determine whether there was any significant difference between the anxiety, self-efficacy and problem solving of students taught by the PTMT and those taught by the TMI.

The experimental groups were chosen from among students who had access to computers and the internet at home. Overall, 36 students of study group had access to computers and the internet at home, and therefore there were 36 and 36 students in the experimental and control groups respectively. This study employed two different treatments.

The treatment for the students in the experimental group were taught by the PTMT whiles the students in the control group were received the 8th class

mathematics content through TMI (teacher-centered), which is a predominant approach as suggested in the curriculum. Educational activities for the experimental group had a designed by that displayed animations, basic explanations, examples, games, questions, interactive exercises for the 6th grade mathematics topics including: angles, absolute value, numbers, patterns and ornaments, polygons, similarity and congruency, and whole numbers.

**Analysis** :

The differences between the two groups were tested by correlation significance. The 'T' test was used to determine if there were any statistically significant differences in the mathematics anxiety, self-efficacy and problem solving of 8th class students in the experimental and control groups.

**Results:**

This implied that the PTMT was reduced students' mathematics anxiety, whereas the TMI was increased students' mathematics anxiety levels. Table 1. Results of the test significance on students' pre and post tests mathematics anxiety scores of experimental and control groups.

Test of significance difference between the mean scores of pre-test of experimental and control groups in Mathematical Anxiety.

| Groups | No.Of Students | Mean | S.D | t-Value | Level of Significance |
|---|---|---|---|---|---|
| Experiment | 36 | 13 | 3.439 | 1.43 | Not significant at 0.05 |
| Control | 36 | 11.42 | 3.589 | | |

The table value of 't' for df 70 at 0.05 level of significance is 2.00. The calculated value of t is 1.43 (<df 70). Therefore there is no significant difference between the pre-test and experimental and control groups of mathematical anxiety. This indicates that the pre-experimental status of the two groups is almost similar as measured by the pre-test. But the difference in the means shows that the two groups are not equivalent.

The posttest mean scores of students in the experimental and control groups were compared by test of significance of difference between means. The data and results are given in table 2.

**Table 2:** Test of significance of difference between the mean scores of post-test in the experimental and control groups in Mathematical Anxiety.

| Groups | No. Of Students | Mean | S.D | t-Value | Level of Significance |
|---|---|---|---|---|---|
| Experiment | 36 | 16.78 | 2.179 | 6.34 | Significant at 0.01 |
| Control | 36 | 12.72 | 3.141 | | |

From the table, the value of t at 0.01 level of significance for df 70 is 2.65. Therefore the calculated value of 't' is significant at 0.01 level of significant.

There is significant difference between the posttest means scores of students in the experimental and control groups. The higher value of mean mathematical anxiety scores of the experimental group indicates the decrease the anxiety of students in the experimental group. This is due to the effect of the treatment given to the experimental group. The control group was taught by Traditional method.

ii) Test of significance of difference between pre-test mean scores of students in experimental group and control group in creative thinking

The pre-test mean scores of students in experimental and control group of creative thinking were compared by test of significance difference between means. The data and results were presented in table 3.

Table 3:

Test of significance of difference between pre mean scores of students of experimental and control groups in self efficacy.

| Groups | No. Of Students | Mean | S.D | t-Value | Level of Significance |
|---|---|---|---|---|---|
| Experiment | 36 | 25.56 | 5.369 | 1.35 | Not significant at 0.05 |
| Control | 36 | 24.14 | 3.348 | | |

From the't' table for df 70 at 0.05 level of significance t=2.00. The calculated't' value s not significant at 0.05 level of significance. There is no significant difference between the pre-test mean scores of the experimental and control groups, i.e there is no significant difference between the pre-experimental statuses of the two groups. But the difference in the mean values indicates the two groups not equivalent.

The post-test mean scores of the experimental and control groups were also compared by test of significance of difference between means. The data and results are presented in table 4.

Table 4: Test of significance difference between experimental and control group of mathematical self efficacy

| Groups | No. Of Students | Mean | S.D | t-Value | Level of Significance |
|---|---|---|---|---|---|
| Experiment | 36 | 30.86 | 3.980 | 6.73 | Significant at 0.01 |
| Control | 36 | 24.94 | 3.472 | | |

The table value of t for df 70 at 0.01 level of significance is 2.65. The calculated 't' value is significant at 0.01 level. There is significant difference between the mean post scores of students in the experimental and control groups. The high mean scores of the experimental group shows the higher self efficacy ability in the concept of the experimental group. This may be due to the effect of the new model TBME used for teaching experimental group. The control was taught by the TME.

iii) Test of significance of difference between mean achievement scores of students.

The pre-test mean achievement scores of students in the experimental and control groups were compared by test of significance difference between means. The data and results were shown in table 5.

Table 5: Test of significance of difference between mean pre-test scores of experimental and control groups in problem solving.

| Groups | No .of Students | Mean | S.D | t-Value | Level of Significance |
|---|---|---|---|---|---|
| Experiment | 36 | 16.08 | 4.164 | 1.23 | Not significant at 0.05 |
| Control | 36 | 15.06 | 3.489 | | |

From the 't' table, for df 70 at 0.05 level of significance t=2.00. The calculated 't' value is less than tabled value. The 't' value is not significant at 0.05 level. Therefore there is no significant difference between the pre-test mean scores of the experimental and control group, i.e there is no significant difference between the pre-experimental statuses of the two groups. The post-test mean scores of the experimental and control groups were also compared by test of significance difference between means. The data and results are presented in table 6.

Table 6: Test of significance difference between experimental and control groups of problem solving.

| Groups | No. Of Students | Mean | S.D | t-Value | Level of Significance |
|---|---|---|---|---|---|
| Experiment | 36 | 20.72 | 3.187 | 6.4 | significant at 0.01 |
| Control | 36 | 15.92 | 3.175 | | |

The tabled value of 't' for df 70 at 0.01 level of significance is 2.65. The calculated value is significant at 0.01 level. There is significant difference between the mean post-test scores of students in the experimental group and control groups. The high mean scores of the experimental group shows the higher problem solving in the concept. This may be due to the effect of the new model TBME used for teaching the experimental group. The control group was taught by the TME.

Discussion:

The purpose of this study was to examine the effects of PTMT on the mathematics anxiety, mathematical self-efficacy and problem solving of 8th class students. Several interesting findings emerged in this study.

The result of this study was indicated that those students who received the PTMT performed significantly better than those in the TMI class. One

explanation for the higher achievement by the PTMT group versus traditional group was that all of the students in PTMT received immediate and adapted feedback on example and question items (Mavrikis & Maciocia, 2003; Nguyen & Kulm, 2005), and could receive and retake each examples and questions as many times as they wanted (Mavrikis & Maciocia, 2003; Nguyen & Kulm, 2005. The results were indicated that students in the PTMT probed to develop positive mathematics attitudes and mathematical self-efficacy than students in the TMI. Besides, it was found that students' mathematical self-efficacy were quite negative in the TMI class at the end of study. This situation could be explained that the PTMT lessons was improved students' confidence in mathematics problem solving, and increased positive attitudes toward learning and it not only given students with more practice, but also helped them made better self-motivation, self-confidence, and self-efficacy (Nguyen, Hsieh, & Allen, 2006). The result of this study was also shown that the PTMT was reduced students' mathematics anxiety, while the TMI was increased students' mathematics anxiety level. From this result, it could be explained that students in the WBMI made more reducement on mathematics anxiety. Also, it provided students, who had a high level of mathematics anxiety, to recognize their scores immediately; therefore, they might felt less math-anxious, and have more control over their learning mathematics (Nguyen, Hsieh, & Allen, 2006).

## Conclusion:

In summary, the results of this study were shown that students in the PTMT made more improvement on a positive mathematics attitude and mathematical self-efficacy, and reducement on mathematics anxiety. These results also useful for all mathematics teachers and teacher educators. Preparing technological lesson plans is useful to develop students understanding easily the concept and interest to learn mathematics effectively. Some organisations give orientation to teacher how to utilize the appropriate technology in teaching learning process. PTMT would success the implementation of technology in secondary school curriculum.

## References

Akinsola, M. K., & Animasahun, I. A. (2007). The effect of simulation-games environment on students' achievement in and attitudes to mathematics in secondary schools. The Turkish Online Educational Technology, 6(3), 113-119

Baki, A., & Güveli, E. (2007).Evaluation of a web based mathematics teaching material on the subject of fractions. Computers & Education, 51, 854-863. Baykul, Y. (1990). To what extent the students' attitudes towards mathematics and science subjects were changed in the Turkish schools in grades five through eleven, the factors which might have some significant relation with the student performance in student selection exam. ÖSYM Publishing, Ankara, Turkey.

Bindak, R. (2005). Mathematics anxiety scale for primary school

students. Science and Engineering Journal of Firat University, 17(2), 442−448. Corbett, B.A., & Willms, J.D. (2002). Canadian students' access to and use of information and communication technology. Paper presented at 2002 Pan-Canadian Education Research Agenda Symposium Information Technology and Learning, 30 April - 2 May, Montreal, Quebec. Retrieved May 11, 2011 from [www.cesc.ca/pceradocs/2002/papers/BCorbett_OEN.pdf]. .

Crippen, K.J., & Earl, B.L. (2007). The impact of web-based worked examples and selfexplanation on performance, problem solving, and self-efficacy. Computers & Education, 49, 809–821. Çavaş, B., Kışla, T., & Twining, P. (2005).

Eğitimde bilgi ve iletişim teknolojilerinin kullanımına yönelik bir araştırma: dICTatEd yaklaşımı [A study on the use of information and communication technologies in education: dICTatEd approach]. Retrieved May 11, 2011 from http://kn.open.ac.uk/public/getfile.cfm?documentfileid=4551.

Çepni, S., Taş, E., & Köse, S. (2006). The effects of computer-assisted material on students' cognitive levels, misconceptions and attitudes towards science. Computers & Education, 46, 192–205.

Gressard, C. P., & Loyd, B. H. (1985). Age and staff development experience with computers as factors affecting teacher's attitudes toward computers. School Science Mathematics, 85(3), 203–209.

Güzeller, C. O., & Akın, A. (2011). The inter-regional inequality of access to information and communication technology in Turkey based on PISA 2009 data. The Turkish Online of Journal Educational Technology (TOJET), 10(4), 349-354.

Hembree, R. (1990). The nature, effects, and relief of mathematics anxiety. Journal for Research in Mathematics Education, 21, 33–46.

Hill, J., & Hannafin, M. (2001). Teaching and learning in digital environments: The resurgence of resource based learning. Educational Technology Research and Development, 49(3), 37-52.

Isiksal, M., Curran, J. M., Koc, Y., & Askun, C. S. (2009). Mathematics anxiety and mathematical self-concept: Considerations in preparing elementary-school teachers. Social Behavior and Personality, 37(5), 631–644.

Jung, I., Choi, S., Lim, C., & Leem, J. (2002). Effects of different types of interaction on learning achievement, satisfaction and participation in Web-based instruction. Innovations in Education and Teaching International, 39(2), 153–162.

Kari, H. K. (2007). Availability and accessibility of ICT in the rural communities of Nigeria. Electronic Library, 25(3), 363–372.

Koszalka, T. A. (2001). Effect of computer-mediated communications on teachers' attitudes toward using web resources in the classroom – Statistical data included. Journal of Instructional Psychology, 28(2), 35-44.

Kılıç, R. (2007). Webquest destekli isbirlikçi ögrenme yönteminin matematik dersindeki tutum ve erisiye etkisi. Unpublished master's thesis, Osmangazi University, Eskisehir, Turkey. Kulm, G. (1994). Mathematics assessment: What works in the classroom. San Francisco: Jossey Bass.

Ma, L. (1999). Knowing and teaching elementary mathematics: Teachers' understanding of fundamental mathematics in China and the United States. Mahwah, NJ: Erlbaum.

Maag, M. (2004). The effectiveness of an interactive multimedia learning tool on nursing students' math knowledge and self-efficacy. Computers Informatics Nursing, 20(1), 26-33.

MacGregor K., & Lou Y. (2004) Web-based learning: how task scaffolding and web site design support knowledge acquisition. Journal of Research on Technology in Education, 37, 161– 175.

Mavrikis, M., & Maciocia, A. (2003). Incorporating assessment into an interactive learning environment for mathematics. Maths CAA Series: June 2003. Retrieved June 8, 2011, from http://ltsn.mathstore.ac.uk/articles/maths-caa-series/june2003/index.shtml Morgan, C. & O'Reilly, M. (2001). Innovations in online assessment, in: F. Lockwood & A. Gooley (Eds) Innovations in open and distance learning, Kogan Page, London. Nguyen, D. M., & Kulm, G. (2005). Using web-based practice to enhance mathematics learning and achievement. Journal of Interactive Online Learning (JIOL), 3(3),1-16.

Nguyen, D. M., Hsieh, Y. J., & Allen, G. D. (2006). The impact of web-based assessment and practice on students' mathematics learning attitudes. [Electronic Version]. The Journal of Computers in Mathematics and Science Teaching, 24(1), 5-25. Pilli, O. (2008). The effects of computer-assisted instruction on the achievement, attitudes and retention of fourth grade mathematics course. Unpublished doctoral dissertation.

Orta Doğu Teknik University, Ankara, Turkey. Qian, G. (1997). Assessing product-market diversification of U.S. firms. Management International

Review, 37, 127-149. Reeves, T.C., & Reeves, P. M. (1997). Effective dimensions of interactive learning on the World Wide Web. In Khan, B. H. (ed.) Web-based instruction, Educational Technology Publications, Englewood Cliffs, New Jersey. Sanchis, G. R. (2001). Using web forms for online assessment. Mathematics and Computer Education, 35(2), 105-114. Stuart, V. (2000). Mathematics curse or mathematics anxiety? Teaching Children Mathematics, 6, 330–335. Umay, A. (2002). İlköğretim matematik öğretmenliği programının öğrencilerin matematiğe karşı özyeterlik algısına etkisi. Paper presented at the V. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi. [Online] Available from: http://www.fedu.metu.edu.tr/ufb