A STUDY OF IMPACT OF ICT ON PROBLEM SOLVING ABILITY OF MALE AND FEMALE ELEMENTARY LEVEL MATHEMATICS STUDENTS

POOJA PANT, DR. ALKA MUDDGAL

Abstract: This research paper is based on the study made by investigator on the impact of ICT on problem solving ability of mathematics students. The study was experimental in nature. The data was collected from 120 students of class VIII of private schools in Delhi-NCR with ICT facilities. The objectives of the study were (a) To study the problem solving ability in mathematics of students of elementary level taught without using ICT (b) To study the problem solving ability in mathematics of students of elementary level taught using ICT (c) To compare the problem solving ability of girls and boys of elementary level taught using ICT. The results show that the there is no significant difference in problem solving ability in mathematics of girls and boys of elementary level. There is significant impact of ICT on problem solving ability of elementary level mathematics students.

Keywords: ICT, Problem Solving, Elementary Level Students.

Introduction:

Background of the Study: Mathematics has played a major role in shaping the present civilization. The word which best describes mathematics is ABSTRACT, in literal terms 'abstract' means distant from concrete. But it is quite paradoxical that we use mathematics in every nick and span of our lives and in almost all the professional or creative areas then also it is abstract. Mathematics has its own world of symbols, language, notations etc. which is abstract but found in abundance in the real world. Researches in the recent years show that gender gaps exist with certain variation because of cultural influence all over the world. The latest Global Gender Gap Report, published by the World Economic Forum, shows that no country in the world has yet reached equality between men and women (Hausmann, 2007). In the field of technology, there is also empirical evidence to suggest the continuance of male domination; men use computers and the Internet more than women, men have wider computer experience, spend more time online, report greater interests in and positive attitudes towards computer-related activities, and even appear to be more motivated to learn digital skills (Arnseth, 2007; Broos, 2006; Selwyn, 2007; Smihily, 2007).

ICT has the potential to uplift the downtrodden position faced by women. It also has the potential of providing tools in the hands of women to overcome their possible barriers like voice, social control and physical and social mobility. It is a common concept that like all other aspects of human interaction, ICT are gendered. Today the gap, the "digital divide", between women and men regarding access to ICT, and challenges when using the same is obvious. The access to, content and use of ICT are connected to gender norms and inequalities, as well as to efforts questioning and changing these.

In the present times young people's use of computers at home has a positive impact on their educational outcomes (Beltran, 2008; Espinosa, 2006). Also, as per PISA there is gender difference in the use of and time spent with computers; where the boys appear to dominate (OECD, 2007; Smihily, 2007). In order to avoid this gender based digital divide the teachers and school have this great responsibility of providing equal technological abilities to both boys and girls. Since, because of pre conceived gender biased attitude of society boys use computers and the Internet more than girlsand thus have a wider exposure to computers, they happen to spend more time online, report greater interest in and perceive more positive attitudes to computer-related activities, because of all these boys are also more motivated to learn digital skills (Arnseth, 2007; Broos, 2006; (OECD, 2003, 2007); OECD & PISA, 2005). On the contrary, girls appear to be dominating in the communicative field of ICT, like word processing, text messaging, as well as e-mail and blogging (Lenhart, 2007; OECD, 2007; Pedró, 2007). Moreover, in most western countries the proportion of women in computer science and in ICT related professions is static or declining instead of good efforts (Falkner and Lie, 2007).

Gender and Mathematics: Does gender differences exist in mathematics in the present times? The review of literature has not been able to identify any specific differences in the performance in mathematics between male and female students (Kadiri,2004).There have been contrasting studies like it was found that the girls achieved significantly higher scores in the mathematics achievement in the TIMSS(Third international Mathematics and science Study) conducted in 2003 for evaluation of educational achievement(Halimah Awang and Noor Azina Ishmael,2007)whereas the boys performance was found to be better in mathematics than girls in

the second International Assessment of Educational Progress in Mathematics and Sciences(Beller and Gafani, 1996). However, it is important to consider that research shows that reading gender gaps narrow during the elementary grades, whereas gender gaps in math grow during early elementary school.

Most research on gender and mathematics during the last few years has been conducted from a positivist perspective and has provided powerful and rich information. While, in general, gender differences in mathematics appear to be decreasing, differences between males and females are still found in the learning of complex mathematics in personal beliefs about mathematics and in the selection of university majors or careers that involve mathematics. These differences vary by achievement level, socioeconomic status, ethnicity, school and teacher. Since, in general, teachers tend to structure their classrooms to favor male learners, some interventions that help female learners have been identified. ICT can become the healer to abridge the not so wide gap between genders in mathematics education.

Problem Solving in Mathematics: In mathematics 'Problem solving' is the task which does not have a pre-known solution in advance. For determining the solution the learners must use their cognitive abilities and conceptual knowledge for developing understanding for new mathematical ideas. The problem solving is not the only goal of learning mathematics but rather it should be considered as a means to do so. The learners need to have opportunities for formulating as well as solving higher order problems and need to be encouraged to have reflective thinking.

Polya (1957) through his work has suggested certain strategies for solving problem few of these are:

- Looking for patterns
- Use of diagrams
- Trial and error method
- Solving backward
- Formulating an equivalent problem
- Making guesses and then checking

Through problem solving in the subject of mathematics, students acquire habit of thinking, curiosity and persistence. It also, provides them with the ability to face the problems in unfamiliar situations outside the mathematics classroom with confidence. This further leads them to become a good problem solver in real life situations.

Objectives of the Study: The objectives of the study are as follows:

- To study the problem solving ability in mathematics of students of elementary level taught without using ICT
- To study the problem solving ability in mathematics of students of elementary level taught using ICT
- To compare the problem solving ability of girls and boys of elementary level taught using ICT.

Research Hypothesis: The following hypothesis was tested in this study:

- There is no significant difference in the problem solving ability in mathematics of students of elementary level taught without using ICT and taught using ICT
- There is no significant difference of problem solving ability between the boys and girls taught without using ICT.
- There is no significant difference of problem solving ability between the boys and girls taught without using ICT.

Methodology:

Sample: The sample of the present study consisted of 120 children (60boys and 60girls) of class VIII from three schools in Delhi NCR. Purposive sampling technique was used for choosing the schools for the study based on the availability of ICT.

Tools Used: In the investigation following tools were used for data collection:

1. Monitoring performa, adopted by the investigator
2. Basic Technology competencies for educators inventory by Flowers C and Algozzine B
3. Self developed problem solving test

Statistical Technique: Mean Score and 't' test were used for analysis

Findings of the Study: The self-constructed Problem solving questionnaire was administered on the 60 students each of control and experimental groups. The tool consisted of 25 questions of mathematics which were assessed using three criterions i.e. understanding the problem, solving the problem and answering the problem.

To Examine the Effect of ICT on Problem Solving Ability of The Respondents of Control And Experimental Groups: We compare through pre and post test the problem solving ability of both control and experimental groups, which has been tabulated below.

Table1: Comparison of Pre-Problem Solving Scores between Control And Experimental Respondents

Groups	N	Mean	SD	t-value
Control Group	60	25.95	9.598	0.728(NS)
Experimental Group	60	27.033	9.966	

NS – *Not significant*

From **Table 1** it is evident that the comparisons of the mean pre-test scores of control and experimental groups on problem solving variable are 25.95 and 27.033 respectively SD is 9.598 and 9.966 respectively. The t ratio is 0.728, it signifies that the control and experimental groups are equal and matched with respect to the variable of problem solving

From **Table 2** it is evident that the comparisons of the mean pre-test scores of control and experimental groups on problem solving variable are55.85 and 106.65 respectively SD is 13.484 and 30.278 respectively. The t ratio is 11.732, it signifies that the there is significant difference between the control and the experimental groups after the experiment.

To Study the Effect of Gender on Problem Solving Ability in Mathematics of Both Control And Experimental Groups:

The table to study the effect of gender on problem solving ability in mathematics has been given below:

Table2: Comparison of Post-Problem Solving Scores between Control and Experimental Respondents

Groups	N	Mean	SD	t-value
Control Group	60	55.85	13.484	11.732**
Experimental Group	60	106.65	30.278	

***Significant at 0.01*

Table 3: Comparison of Pre-Problem Solving Scores between Male and Female Respondents of Both Control And Experimental Group

Group	Male(N=30)		Female(N=30)		t-value
	Mean	SD	Mean	SD	
Control	22.93	9.581	25.77	11.212	1.052(NS)
Experimental	32.67	12.922	36.30	17.221	0.924(NS)

NS- Not Significant

From **Table 3** it is evident that the comparisons of the mean pre-test scores of male and female respondents of control group on problem solving variable are 22.93 and 25.77 respectively SD is 9.581 and 11.212 respectively. Also, the mean post-test scores of male and female respondents of experimental group on problem solving variable are 32.67 and 36.30 respectively SD is 12.922 and 17.221 respectively .

The t-ratio between the male and female of control group comes out to be 1.052 and for the experimental group the t-ratio iso.24, in both the cases that is no significant difference between the male and female respondents of both experimental and control groups.

Table4: Comparison Of Post-Problem Solving Scores Between Male And Female Respondents Of Both Control And Experimental Group

Group	Male(N=30)		Female(N=30)		t-value
	Mean	SD	Mean	SD	
Control	55.87	13.214	52.70	10.822	1.016(NS)
Experimental	107.17	34.900	116.97	44.303	0.952(NS)

NS- Not Significant

From **Table 4** it is evident that the comparisons of the total mean post-test scores of male and female respondents of control group on problem solving variable are 55.87 and 52.70 respectively SD is 13.214 and 10.822 respectively. Also, the mean post-test scores of male and female respondents of experimental group on problem solving variable are 107.17 and 116.97 respectively SD is 34.900 and 44.303 respectively .

The t-ratio between the male and female of control group comes out to be 1.016 and for the experimental group the t-ratio iso.952, in both the cases that is no significant difference between the male and female respondents of both experimental and control groups.

Conclusion: Thus it can be concluded that there is a significant difference between the problem solving ability of students taught with ICT, although there is increase in the problem solving ability of both the groups but as evident from Table 2 that the problem solving ability has increased more by using ICT for teaching mathematics. There is no significant difference between the problem solving ability of male and female students whether taught using ICT

or not. Also, it can be concluded from the study that gender does not play a significant role in use of ICT or Problem solving ability in mathematics . ICT can be used as a great booster by the teacher and teacher educators to remove pre- conceived gender biasedness in the field of mathematics.

References:

1. Arnseth, H. C., Hatlevik, K., Kløvstad, V., Kristiansen, T., Ottestad, G., *Information Technology in Education*, The Digital state of the school, Oslo Norway, University of Laget, (2007).
2. Beller, M., & Gafni, N., The 1991 International Assessment of Educational Progress in Mathematics and Sciences: The gender differences perspective. *Journal of Educational Psychology*, (1996), 88, 365–377.
3. Beltran, D. B., Das, K., K. & R. W. Fairlie, *Are Computers Good for Children? The Effects of Home Computers on Educational Outcomes* The Australian National University, Centre for Economic Policy Research, (2008).
4. Broos, A. R., Keith, The digital divide in the playstation generation: Self efficiancy, locus of control and ICT adoption among adolescents. POETICS(34), (2006), 306-317
5. Espinosa, L., M., Laffey, J., M., Whittaker, T. & Sheng Y., Technology in the Home and the Achievement of Young Children: Findings from the Early Childhood Longitudinal Study. *Early education and development, 17*(3), (2006), 421-441.
6. Faulkner, W. M. L., Gender in the Information Society: Strategies of Inclusion. *Gender, Technology and Development, 11*(2), (2007), 157-177.
7. Hausmann, R., Tyson, L.D., & Saadia Zahidi, The Global Gender Gap Report 2007. Geneva, Switzerland: World Economic Forum, (2007).
8. Kadiri, S.A., The effectiveness of Personalised systemof Instructionin among Secondary School Studentsin Osum State, Unpublished PhD ThesisMathematicsObafemi Awolowo University, (2004).
9. Lenhart, A., Madden, M., Rankin Macgill,A. & A. Smith, *Teens and Social Media . The use of social media gains a greater foothold in teen life as they embrace the conversational nature of interactive online media.* Washington DC, USA: Pew Internet & American Life Project, (2007).
10. OECD. *The PISA 2003 assessment framework : mathematics, reading, science and problem solving knowledge and skills*. [Paris]: OECD, (2003).
11. OECD. (2006). *ICT and Learning. Supporting out-of-school youth and adults*. Paris: OECD. OECD. (2007). *PISA 2006: Science Competencies for Tomorrow's Word*. Paris: OECD.
12. OECD, & PISA. *Are students ready for a technology-rich world? : what PISA studies tell us*. Paris: OECD. (2005).
13. Pedró, F., The New Millennium Learners. Challenging our Views on Technology and Learning. *Nordic Journal of Digital Competence, 2*(4), (2007).
14. Selwyn, N., & K. Facer, Beyond the digital divide. Rethinking digital inclusion for the 21st century. Bristol: Futurelab, (2007).
15. Smihily, M., Internet usage in 2007. Households and individuals: Eurostat, (2007).

***

Pooja Pant, Assistant Professor, Amity Institute of Education, Amity University
Sector 125, Noida, Uttar Pradesh-201301
Dr. Alka Muddgal, Head, Amity Institute of Education, Amity University
Sector 125, Noida,Uttar Pradesh-201301