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RESEARCH ARTICLE

EFFECTIVENESS OF E – CONTENT IN MATHEMATICS ON MATHEMATICAL THINKING AMONG SECONDARY SCHOOL STUDENTS

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ABSTRACT

Through the study, the investigator tried to analyze the effectiveness of e – Content in Mathematics on Mathematical Thinking among Secondary School Students. the research works showed that it was possible to promote Mathematical Thinking in children by means of suitable techniques in teaching Mathematics by providing suitable teaching experiences. Hence, through the study, the investigator tried to find the effectiveness of e – Content in Mathematics on Mathematical Thinking among Secondary School Students. the investigators adopted Experimental Method in the present study on a sample of 112 Secondary School Students taken at random. The study revealed that the e – Content in Mathematics is effective over Activity Oriented Method on developing Mathematical Thinking of Students at Secondary level.

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INTRODUCTION

The process of teaching – learning is one in which the individual learner is expected to take up challenges through an inevitable intellectual revolution. The learner creates new understanding for him / herself. An important aspect of learning process is that students reflect on their activities and also set their own goals and means of measurements. They control their own learning process, and thus reflect it on their experiences. Thus, students must be capable of applying these concepts outside the classroom, beyond the context of summative assessment.

The teachers can make use of classroom activities and assessments to build student's confidence in them as learners, provide students with constructive guidance and frequent feedback, adjust instruction to meet students' needs and engage them in self assessments and self managements. Thus the teachers have to rise to the challenges of meeting the needs of these diverse learners, while keeping the integrity of quality and targeted standards, knowing the when, why and how of the method of teaching. According to Wadhwa (2004), teachers have to instill in their student's mind, the spirit of scientific temper and rational thinking.

Mathematical thinking is an ultimate goal of teaching that students will be able to conduct Mathematical investigations by themselves, and that they will be able to identify where the Mathematics they have learned is applicable in real world situations (Stacey, 2007). It is clear that mathematical thinking is important in large measure because it equips students with the ability to use mathematics, and as such is an important outcome of schooling.

Need and Significance of the study

There are research studies that revealed the importance of Mathematical Thinking in the regular classroom settings (Thomas, 2010; John, 2008). Stephen (2005) suggested that it is part of our responsibility as teachers to attempt to induce Mathematical Thinking in our students. it is a reality that pupils who are not sharing the mathematical thinking style with thwir teachers may have the problems of understanding. But if teacher is conscious of his own style and arranges mathematical facts in different ways, problems of understanding could be prevented (Zhang and Sternberg, 2001). Franke and Kazemi (2001) highlighted that focusing on students' Mathematical thinking remains a powerful mechanism for bringing pedagogy, Mathematics and student understanding together. From these studies it is clear that developing Mathematical Thinking among students will enable them to solve the problems they are facing in the daily life

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situations and to use the Mathematical applications of it in the day to day processes. e – Content makes and stimulates each student's individual or self – paced learning process. It gives the enjoyable learning process in their subjects. They will exchange their knowledge with each other so that at the end of the learning process the students will get the complete information about lessons. Students are active participant in the learning process. It encourages cooperation and active learning and promotes student's own– pace of learning (Muruganantham, 2015). It is a very powerful tool of education. It is valuable to the learners and also helpful to teachers of all individual instruction system. With e – Content, teachers are able to create their own material and thus have more control over the material used in the classroom than they have had in the past (Albina and Benjamin, 2013). These studies revealed that e – Content can serve as a tool for ensuring the quality of the content. It will help the teachers to design their teaching content appropriately and interestingly to the students so that they can grasp the content in a different but passionate way. Studies on Mathematics and Mathematics Education are enormous, but very little studies are conducted on teaching mathematical thinking through e – Content in Mathematics. Hence the investigator intended to find the effectiveness of an e – Content in Mathematics on Mathematical Thinking among Secondary School Students.

METHODOLOGY IN BRIEF

The investigators adopted experimental method for the study and non-equivalent pre test post test design was used. The sample was divided into two groups- experimental and control groups. Both the groups were administered the test of Mathematical Thinking as pre-test. The experimental group was taught using the e – Content in Mathematics and the control group was treated with Activity Oriented Method. After experimentation, the same Test of Mathematical Thinking was administered as post test to both the groups to obtain their mathematical thinking. The sample constituted 112 students of class IX from schools at Ernakulam and Alappuzha Districts in which 68 were included in experimental group and 44 were included in control group.

The tools used in the study were

- E – Content in Mathematics (Jaleel, S 2015)
- Lesson transcript based on Activity Oriented Method
- Test of Mathematical Thinking (Jaleel, S 2015)

The statistical techniques used for analyzing the collected data were the test of significance of difference between two means and Analysis of Covariance (ANCOVA)

ANALYSIS AND DISCUSSION

The analyzed data are given under the following headings.

Effectiveness of Gaming Strategy on Mathematical Creativity of students at secondary level

The investigator measured Mathematical Thinking of Secondary School Students in experimental and control groups before and after the experiment. Analysis was carried out to find the effectiveness of e – Content in Mathematics on Mathematical Thinking of Secondary School Students for the total sample. The detailed description of the analysis is presented below under the following heads.

Descriptive statistics for pre – test scores of Mathematical Thinking of experimental and control groups

Before starting the experiment, Mathematical Thinking Test was administered to both groups as pre – test and the obtained scores were tabulated and the measures of central tendency such as Arithmetic Mean, Median, Mode, measure of dispersion such as Standard Deviation, measures of normality such as Skewness and Kurtosis were calculated in order to get a general picture of the groups. The details of the analysis are given in Table 1

Table 1 Descriptive statistics for pre – test scores of Mathematical Thinking of experimental and control groups

Group	N	Mean	Median	Mode	SD	Skewness	Kurtosis
Experimental	68	9.37	9	9	3.55	-0.22	0.72
Control	44	8.20	8	8	2.39	0.08	1.20

When measures of central tendency were calculated, the obtained mean score of pre – test scores of Mathematical Thinking of experimental group is 9.37, median is 9 and mode is 9. The standard deviation obtained is 3.55, which says that the scores are not much deviated from the mean value. The distribution is negatively skewed and the value is -0.22. Since the obtained kurtosis value is greater than the normal value, the distribution is platykurtic. The obtained mean value of the pre – test scores of Mathematical Thinking of control group is 8.20, median is 8 and the mode is 8. The scores are not much deviated from the mean value as the value of Standard Deviation is 2.39. The distribution is positively skewed and the value is much closer to zero. The distribution is platykurtic also for the control group of Secondary School Students.

Comparison of pre – test scores of Mathematical Thinking of experimental and control groups

The mean and Standard Deviation of the pre – test scores of Mathematical Thinking were calculated for the experimental and control groups. The investigator compared the means of pre – test scores of Mathematical Thinking of Secondary School Students in experimental and control groups using the test of significance of difference between two means of independent samples. Table 2 presented the summary of results. From Table 2, it is clear that the obtained t – value ($t = 1.91$, $p > .05$) is not significant at .05 level of significance. This revealed that there is no significant difference between the means of pre – test scores of Mathematical Thinking of Secondary School Students in experimental and control groups before the experiment.

Table 2 Test of Significance of difference between the means of pre – test scores Mathematical Thinking of experimental and control groups

Groups	N	Mean	SD	T
Experimental	68	9.37	3.55	1.91
Control	44	8.20	2.39	

The mean scores of Mathematical Thinking of experimental group (M = 9.37) is comparatively higher than that of control group before the experimentation.

Descriptive statistics for the post – test scores of Mathematical Thinking of experimental and control groups

After the experiment, Test of Mathematical Thinking was administered to both groups as post – test and the obtained scores were tabulated and the measures of central tendency such as Arithmetic Mean, Median, Mode, measure of dispersion such as Standard Deviation, measures of normality such as Skewness and Kurtosis were calculated in order to get a general picture of the groups. The details of the analysis are given in Table 3

Table 3 Descriptive statistics for post – test scores of Mathematical Thinking of experimental and control groups

Group	N	Mean	Median	Mode	SD	Skewness	Kurtosis
Experimental	68	10.49	9	10	3.37	-0.75	0.11
Control	44	5.11	5	5	3.32	1.02	0.88

When measures of central tendency were calculated, the obtained mean score of post – test scores of Mathematical Thinking of experimental group is 10.49, median is 9 and mode is 10. The standard deviation obtained is 3.37, which says that the scores are not much deviated from the mean value. The distribution is negatively skewed and the value is -0.75. Since the obtained kurtosis value is less than the normal value, the distribution is leptokurtic. The obtained mean value of the post – test scores of Mathematical Thinking of control group is 5.11, median is 5 and the mode is 5. The scores are not much deviated from the mean value as the value of Standard Deviation is 3.32. The distribution is positively skewed and the value of skewness is 1.02. The distribution is platykurtic for the control group of Secondary School Students.

Comparison of post – tests scores of Mathematical Thinking of experimental and control groups

The investigator compared the means of post – test scores of Mathematical Thinking of Secondary School Students in experimental and control groups using the test of significance of difference between two means of independent samples. Table 4 presented the summary of results. From Table 4, it is clear that the obtained t – value (t = 8.28, p < .01) is significant at .01 level of significance. This revealed that there is significant difference between the means of post – test scores of Mathematical Thinking of Secondary School Students in experimental and control groups after the experiment. The mean scores of Mathematical Thinking of experimental group (M = 10.49) is comparatively higher than that of control group after experimentation. Hence it can be concluded that the e – Content in Mathematics is effective than Activity Oriented Method on enhancing the Mathematical Thinking of students at secondary level.

Table 4 Test of Significance of difference between the means of post – test scores of Mathematical Thinking of experimental and control groups

Groups	N	Mean	SD	T
Experimental	68	10.49	3.37	8.28**
Control	44	5.11	3.32	

Comparison of gain scores of Mathematical Thinking of experimental and control groups

The gain scores of Mathematical Thinking of Secondary School Students in the experimental and control groups were compared using the test of significance of difference between means. The summary of result of the test of significance of difference between two means is presented in Table 5.

Table 5 Summary of result of test of significance of difference between the means of gain scores of Mathematical Thinking of experimental and control groups

Groups	N	Mean	SD	T
Experimental	68	1.12	4.11	5.09**
Control	44	-3.09	4.51	

** p < .01

From Table 5, it is clear that the obtained t – value (t = 5.09, p < .01) is significant at .01 level of significance. This revealed that there is significant difference between the means of gain scores of Mathematical Thinking of Secondary School Students in experimental and control groups. Also the Table revealed that the mean scores of Mathematical Thinking of experimental group (M = 1.12) is comparatively higher than that of control group. It implies that the experimental group gains more score than control group in Mathematical Thinking. Hence it can be concluded that the e – Content in Mathematics is effective than Activity Oriented Method on enhancing the Mathematical Thinking of students at secondary level. The comparison of Mathematical Thinking of Secondary School Students in experimental and control groups in pre – test and post – test are depicted as shown in Figure 1

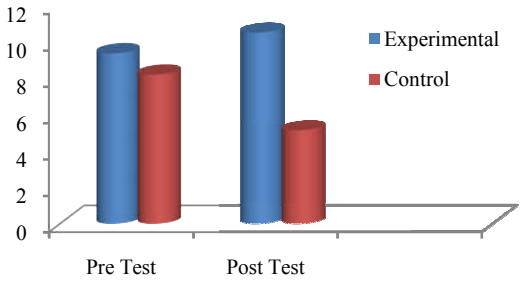

Figure 1 Graphical representation of pre – test and post – test scores on Mathematical Thinking of Secondary School Students

From Figure 1, it is clear that the post – test scores Mathematical Thinking of experimental group is higher than that of control group. The mean score of Mathematical Thinking of control group is lesser than that of experimental group. Also, the pre – test scores of Mathematical Thinking is higher than that of the post – test scores of the control group. It may be due to the effect of treatment that is given to them. For the control group, there is no conscious effort to enhance the Mathematical Thinking of Secondary School Students.

Comparison of pre – test and post – test scores on Mathematical Thinking of experimental and control groups for the total sample using ANCOVA

The analysis of the post – test and gain scores of the Secondary School Students in experimental and control groups showed

that there is significant difference in the Mathematical Thinking of the two groups. Since the investigator selected non-equivalent and intact class groups as it is very inconvenient to sort out students into different equated groups, so it is necessary to analyze the data by using statistical technique, Analysis of Co-variance (ANCOVA) in which the difference in the initial status is removed statistically. The pre-test and post-test scores of the experimental and control groups were subjected to Analysis of Covariance to determine the effectiveness of e – Content in Mathematics on Mathematical Thinking among Secondary School Students . Before proceeding to ANCOVA, ANOVA was done and the F-ratio for the pre-test and post-test scores was computed. The summary of Analysis of Variance of pre-test and post-test scores is given in Table 6

Table 6 Summary of ANOVA of pre-test and post-test scores of Mathematical Thinking in experimental and control groups taken separately

Source of variation	df	SSx	SSy	MSx	MSy	Fx	Fy
Among means	1	36.14	770.83	36.14	770.83		
Within groups	110	1090.97	1235.42	9.92	11.23	3.64	68.63**
Total	111	1127.11	2006.25				

** p < .0 x : Pre - test y : Post - test

The obtained F ratios were tested for significance. The obtained Fx is not significant at .05 level. The result revealed that there is no significant difference in the pre – test scores on Mathematical Thinking of Secondary School Students in experimental and control groups. The obtained Fy is significant (Fy = 68.63, p < .01) as it exceeds the Table values of F with degrees of freedom (1,110). So it can be tentatively concluded that there is significant difference among the post - test scores of Mathematical Thinking between experimental and control group among Secondary School Students. This further means that the post - test scores of Mathematical Thinking among Secondary School Students between experimental and control groups differ significantly within and among groups.

The adjusted sum of squares for post - test was computed and the F-ratio was calculated. The summary of ANCOVA of pre-test and post - test scores of students in experimental and control groups is given in Table 7

Table 7 Summary of ANCOVA of pre-test and post - test scores of students in Experimental and control groups

Source of variation	df	SSx	SSy	SSy.x	MSy.x	SDy.x	Fy.x
Among Means	1	36.14	770.83	699.81	699.81		
Within Groups	109	1090.97	1235.42	1212.29	11.12	3.33	62.92**
Total	112	1127.11	2006.25	9862.00			

** p < .01

The obtained Fyx – ratio was tested for significance. The obtained Fyx – ratio is significant (Fyx = 62.92, P < .01) at .01 level of significance. It is clear from the result that the final means differ significantly after they have been adjusted for initial differences on pre-test. The adjusted means of post – test scores (Y means) of Secondary School Students in experimental and control groups were computed. The difference between the adjusted Y – means was tested for significance. The data for adjusted means of post – test scores of the Secondary School Students in the experimental and control groups are given in Table 8

Table 8 Data for adjusted means of post – test scores of Mathematical Thinking of experimental and control groups of Secondary School Students

Groups	N	M_x	M_y	$M_{y.x(Adjusted)}$	SE_M	T
Experimental	68	9.37	10.49	10.42	0.64	8.07**
Control	44	8.20	5.11	5.22		

** p < .01

From Table 8, it is clear that the calculated value of t (t = 8.07, p < .01) is significant at .01 level of significance. It indicated that the Secondary School Students of experimental and control groups differ significantly in their post – test scores of Mathematical Thinking as they were adjusted to pre – test scores. From Table, it is also clear that the mean scores of Mathematical Thinking of experimental group (M = 10.42) is significantly higher than that of the control group (M = 5.22). It leads to the major inference that e – Content in Mathematics is effective than Activity Oriented Method on enhancing the Mathematical Thinking of Secondary School Students.

FINDING AND CONCLUSION

The investigator analyzed the effectiveness of e – Content in Mathematics on Mathematical Thinking among Secondary School Students over Activity Oriented Method. The study revealed that e – Content in Mathematics is more effective than Activity Oriented Method for developing Mathematical Thinking among Secondary School Students. Hence the following implications are made based on this result. Learners should try to learn the complex mathematical concepts through e – Content in Mathematics. This method will make the learning of mathematics more flexible, easy and according to their level of Mathematical thinking. This method serves as a better instructional strategy for developing mathematical thinking skills. So teachers should plan the teaching – learning activities according to the needs o the students. The curriculum planners and educational administrators should include innovative methods like e – Content in the curriculum design for the effective implementation of the content.

References

1. Albina, A. P., & Benjamin, A. E. W. (2013). *Effectiveness of e – Content in teaching Mathematics for standard IX students.* retrieved from http://www. Theglobal journals.com/ijar /file.php?val= September_ 2013_1378217273_3a30e_58.pdf
2. John, G. (2008). *Book Mathematics – Part I.* retrieved from www.eric.ed.gov (EJ790565).
3. Muruganantham, G. (2015). *Developing of E – Content package by using ADDIE model.* Retrieved from www. allresearchjournal.com/vol1issue3/PartB/pdf/67.1.pdf
4. Stacey, K. (2007). *What is mathematical thinking and why it is important?*. Retrieved from http://www.criced. tsukuba.ac.jp/math/apec/apec2007/paper_pdf/Kaye%20S tacey.pdf
5. Stephen. A. (2005). *Investigating Functions: Exploring Calculus Concepts.* Retrieved from www.eric.ed.gov (EJ717787).
6. Thomas, R. T. (2010). *Systematic and Sustained: Powerful Approaches for Enhancing Deep Mathematical Thinking.* Retrieved from www.eric.ed.gov (EJ874020).

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