J. Appl. Environ. Biol. Sci., 6(3S)108-113, 2016

ISSN: 2090-4274
Journal of Applied Environmental and Biological Sciences
www.textroad.com

Interactive Multimedia Courseware In Improving Students' Mathematics Achievement

Mohini Mohamed[1], Amiruddin Faizal Basar[2], Norma Alias[3]

[1]Sports Innovation and Technology Centre, Institute of Human Centered Engineering; Department of Science & Mathematics Education and Creative Multimedia, Faculty of Education, Universiti Teknologi Malaysia
[2]Department of Science & Mathematics Education and Creative Multimedia, Faculty of Education, Universiti Teknologi Malaysia
[3]Ibnu Sina Institute, Universiti Teknologi Malaysia

Received: January7, 2016
Accepted: March 2, 2016

ABSTRACT

This research was conducted to investigate the effectiveness of interactive multimedia courseware among year 4 pupils for their performances in mathematics on the topic of fractions, decimals and money. Sixty ten years old participants from national schools in a rural area were involved consisting of 30 boys and 30 girls. They were divided into three groups which were high, moderate and low performance students. The instruments used in this research were pre-test and post-test of the selected topics. The multimedia courseware that was chosen was CD- ROM Mathematic Year 4 Teaching Courseware, Ministry of Education of Malaysia. This research has shown that there were significant differences in performance between pre-test and post-test and between the three groups of student after learning mathematics using interactive multimedia courseware. However, there were no significant differences in terms of genders. This research has indicated that the use of interactive multimedia courseware was effective in improving students' mathematics performance for all level of students' performance.

KEYWORDS: Mathematics Interactive Multimedia Courseware; Quasi-experiment; Rural Primary School Student.

1. INTRODUCTION

The world class educational system has continuously become the mission of the Ministry of Education in Malaysia. Other than expanding individual potential as a whole, this mission also hopes to fulfil Malaysian aspiration in producing the global educational standards. In line with that mission, education in Malaysia needs to move one step ahead to overcome any issue that can affect the quality of education.

There are various alternatives in producing effective teaching and learning process and one of them is by using teaching aids to support learning. The usage of teaching aids can help teachers in explaining the content and concept of learning more precise rather than verbal explanation [1, 15].

Amir Hasan [2] expressed that each and every individual has different ability in thinking. So, teachers need to be more sensitive in planning their lesson by following students' ability with the support of teaching aids. They also have to be creative in using teaching aids depending on the need of the lesson including using computer technology to produce effective learning. For instance, teacher can explore on the use of interactive multimedia courseware to teach Mathematics for different ability levels of students. This was in line with Ismail Zain [9] that stated the use of interactive multimedia courseware made teaching and learning process become more interesting and meaningful.

Teaching and learning processes that are supported by interactive multimedia courseware can improve students' performance in the particular topic [3, 13]. Teachers need to be up to date with the use of multimedia to support learning. In Malaysia as in other countries, teaching and learning processes are still focused on teachers centered approach with text book as a main reference. The method used in teaching mathematics need to be changed in order to attract students' attention in learning. There are many issues in the teaching and learning of mathematics in primary school level. For instance, many mathematics teachers are reluctant in

* **Corresponding Author:** Mohini Mohamed, Sports Innovation and Technology Centre, Institute of Human Centered Engineering; Department of Science & Mathematics Education and Creative Multimedia, Faculty of Education, Universiti Teknologi Malaysia p-mohini@utm.my or mohainimohd@yahoo.com

using computer in the classroom. In addition, teachers refused to use the interactive multimedia courseware that was freely supplied by the Ministry of Education of Malaysia. To improve students' performances in mathematics is certainly a big challenge. One of the factors that contribute to the low achievement in mathematics is low competency in ICT among teachers. Saritas and Akdemir [14] implied that three factors contributing to the lower achievement in mathematics were learning method and strategy used by teachers, teachers' competency and teachers' motivation.

Teaching and learning process of Mathematics Year Four was conducted based on a standard curriculum called Standard Curriculum of Primary School (SCPS). Based on this new syllabus of Mathematics [16], teaching Mathematics would promote students to learn about the number concept, basics skill in calculation, understanding the Mathematics concept as well as solving daily problems using students prior knowledge.

The use of multimedia in teaching and learning process can bring positive result in enhancing students' understanding [4,13]. Multimedia had a significant role in supporting self-learning, help teachers' problems in teaching, helping in imagination and promote students' thinking skills [3, 13]. These researches have indicated that the use of multimedia courseware had benefitted students in understanding the content in the learning process.

Teachers need to be more creative in finding various alternatives method to attract students' interest in learning mathematics. The use of ICT tool and other multimedia courseware in teaching and learning process is one of the ways to stimulate students' interest in mathematics. Multimedia can be a good teaching aid that can deliver information faster and more precise. Hence, it can promote interest among students to get involve with the learning session [20]. With the use of graphic, animation, audio, text and video can act as catalyst to deliver information more effectively and make the learning process more interesting [6, 17, 18].

There are some researches that found *game-based activity* can make the multimedia courseware more effective. Klawe [12] specified that the use of games can enhance students' performance and promote their interest in mathematics. Subsequently, the characteristic of effective multimedia is that it is a *supportive* content. It should be able to help in building the understanding of the content. This idea is parallel to the concept of *Scaffolding* proposed by Vygotsky [19]. Furthermore, the effective multimedia should have *integration* between the contents in a topic. This is to ensure that the activities are related and consequently to help students understanding the topic better. Lastly, the effective multimedia should be *user friendly* which can be easily operated by users.

Alternatively, there were researches done to investigate the effectiveness of interactive multimedia courseware in improving students' performance in mathematics based on gender for higher education. However, the result can be contradictory to one another. Quest et *al.* [7]; Hyde et *al.* [8] and Campbell & Beaudry [5] established that male students attained better performance in mathematics compared to female students. However, the research conducted by Ferbar & Trkman [11] and Kimball [10] showed that female students acquired better grade in mathematics in higher education compared to male students. However, none of these researches that were based on gender were conducted at primary school level. This has become part of the reason for conducting this research.

From the literature review, it was found that there were no research done on the effectiveness of interactive multimedia courseware in improving students' achievement in mathematics in primary school level specifically on the topic of fraction, decimal and money. Thus, this research was conducted to investigate if there was a significant difference between the different performance groups of students in learning mathematics using interactive multimedia courseware on these basic topics. In addition we like to examine if there was a significant differences between genders towards students' performance in mathematics at a primary school level.

2. METHOD

The research was conducted using quantitative design through quasi-experiments. Sixty ten years old participants were selected via purposive sampling which were year four students in national schools in rural area of Yong Peng, Johor. They consisted of equal number of samples in terms of gender; 30 boys and 30 girls. The pre and post questions were the main tool in collecting the data; consisted of 40 multiple choice questions for each pre and post-test on the topics of fraction, decimal and money. Each participant was screened and were divided based on their mathematics performance; low, moderate and high performance level. This study was conducted by the teacher before and after teaching each topic in Mathematics using interactive multimedia courseware for over 10 weeks. The findings were analysed by the *Statistical Package*

for Social Science (SPSS 20.0). Pilot test was conducted to 30 students who were comparable but not chosen as samples for this study. The validity of the pre and post test questions were endorsed by three mathematics teachers who had more than ten years of experience in teaching Mathematics in primary school. The reliability value of Cronbach' Alpha between 0.7 and 0.89 of the pre and post-test shows that each set of test questions on the topic of fraction, decimal and money were appropriate for this study.

3. FINDINGS AND DISCUSSION

The research findings were focused on two aspects; 1) analysis of students' performance based on the topic of fraction, decimal and money for the three independent groups and 2) the analysis of students' performance based on gender. The first aspect was analyzed by using paired t-test to identify significance mean difference between pre and post-test for each topic. The one-way analysis of variance *(*ANOVA*)* was used to determine whether there are any significant differences between the means of the three groups of samples (low, moderate and high performance). The second aspect was analyzed by using t-test to identify the significant difference between genders in students' mathematics performance.

ANOVA						
		Sum of Squares	**df**	**Square Mean**	**F**	**Sig.**
Pre Fraction	Between Groups	272.049	2	136.025	13.905	.000
	Within Groups	557.601	57	9.782		
	Total	829.650	59			
Post Fraction	Between Groups	1449.834	2	724.917	53.586	.000
	Within Groups	771.099	57	13.528		
	Total	2220.933	59			
Pre Decimals	Between Groups	967.033	2	483.516	31.598	.000
	Within Groups	872.217	57	15.302		
	Total	1839.250	59			
Post Decimals	Between Groups	1173.592	2	586.796	38.572	.000
	Within Groups	867.141	57	15.213		
	Total	2040.733	59			
Pre Money	Between Groups	1093.459	2	546.730	21.354	.000
	Within Groups	1459.391	57	25.603		
	Total	2552.850	59			
Post Money	Between Groups	995.015	2	497.507	42.368	.000
	Within Groups	669.319	57	11.742		
	Total	1664.333	59			

Table 1: One-way ANOVA of Pre & Post Test

Table 1 show the result of ANOVA analysis for pre and post-test on the topics of fraction, decimals and money for three independent group of high, moderate and low students' performance. Significant mean differences were indicated between the three groups on all three topics after learning mathematics using interactive multimedia courseware. With reference to the result above, the significant value of P for all pre and post-test in every topics were equal to 0.00 (P=0.00). Subsequently, the Post Hoc Test was later used in determining which of these groups differ from each other.

Dependent Variable	**Group (I)**	**Group (J)**	**Mean Diff. (I-J)**	**Std. Error**	**Sig.**
Pre Fraction	High	Moderate	3.33182*	.96632	.001
		Low	5.26111*	1.01617	.000
	Moderate	High	-3.33182*	.96632	.001
		Low	1.92929	.99405	.057
	Low	High	-5.26111*	1.01617	.000
		Moderate	-1.92929	.99405	.057
Post Fraction	High	Moderate	8.74545*	1.13636	.000
		Low	11.75556*	1.19497	.000
	Moderate	High	-8.74545*	1.13636	.000
		Low	3.01010*	1.16896	.013

	Low	High	-11.75556*	1.19497	.000
		Moderate	-3.01010*	1.16896	.013
Pre Decimal	High	Moderate	6.18182*	1.20857	.000
		Low	9.94444*	1.27091	.000
	Moderate	High	-6.18182*	1.20857	.000
		Low	3.76263*	1.24325	.004
	Low	High	-9.94444*	1.27091	.000
		Moderate	-3.76263*	1.24325	.004
Post Decimal	High	Moderate	4.72727*	1.20505	.000
		Low	11.11111*	1.26721	.000
	Moderate	High	-4.72727*	1.20505	.000
		Low	6.38384*	1.23962	.000
	Low	High	-11.11111*	1.26721	.000
		Moderate	-6.38384*	1.23962	.000
Pre Money	High	Moderate	6.46364*	1.56332	.000
		Low	10.60000*	1.64395	.000
	Moderate	High	-6.46364*	1.56332	.000
		Low	4.13636*	1.60817	.013
	Low	High	-10.60000*	1.64395	.000
		Moderate	-4.13636*	1.60817	.013
Post Money	High	Moderate	5.91364*	1.05871	.000
		Low	10.16111*	1.11332	.000
	Moderate	High	-5.91364*	1.05871	.000
		Low	4.24747*	1.08908	.000
	Low	High	-10.16111*	1.11332	.000
		Moderate	-4.24747*	1.08908	.000

Table 2: Post Hoc Test Analysis for Pre & Post Test

Based on the Post Hoc Test result, the significant values of P were less than 0.05 ($P \leq 0.05$) for almost all pairs of group. This clearly showed that there was a significant difference between each group towards their performance in mathematics after being taught using the application of interactive multimedia courseware. However, the test had identified a pair that gave the significant value of P greater than 0.05 ($P \geq 0.05$). It was a pair of moderate and low group (P=0.057) that occur in pre-test of fraction. This pair showed that there were no significant mean differences between these particular groups on the topic of fraction.

TITLE		**GROUP**		
		HIGH	**MODERATE**	**LOW**
FRACTION	Mean Pre	18.4	14.7	13.7
	Mean Post	26.0	18.1	15.5
	Mean Post - Pre	7.60	3.40	1.80
DECIMAL	Mean Pre	24.8	18.1	14.6
	Mean Post	28.3	22.6	17.3
	Mean Post - Pre	3.50	4.50	2.70
MONEY	Mean Pre	27.5	21.3	16.9
	Mean Post	31.6	26.0	20.9
	Mean Post - Pre	4.10	4.70	4.00
AVERAGE MEAN		5.07	4.20	2.83

Table 3: Summary of Mean for Pre and Post Test between Groups on the Topic Fraction, Decimal and Money

Table 3 shows the summary of mean for pre and post-test between groups on the topics of fraction, decimal and money. It also shows the difference between the mean of pre and post-test for every group. For high performance group on fraction, the mean pre-test was 18.4 while the mean post-test was 26.0. The difference between the two tests was 7.6. In decimal, the mean pre-test was 24.8 while the mean post-test was 28.3. The difference between the two tests was 3.50. For the topic on money, the mean pre-test was 27.5 while the mean post-test was 31.6. The difference between the two tests was 4.1. Hence, the average mean for high performance group for the three topics was 5.07.

For moderate performance group on fraction, the mean pre-test was 14.7 while the mean post-test was 18.1. The difference between the two tests was 3.4. In decimal, the mean pre-test was 18.1 while the mean post-test was 22.6. The difference between the two tests was 4.50. For the topic on money, the mean pre-test

was 21.3 while the mean post-test was 26.0. The difference between the two tests was 4.7. Hence, the average mean for moderate group for the three topics was 4.20.

For low performance group in fraction, the mean pre-test was 13.7 while the mean post-test was 15.5. The difference between the two tests was 1.8. In decimal, the mean pre-test was 14.6 while the mean post-test was 17.3. The difference between the two tests was 2.70. On the topic of money, the mean pre-test was 16.9 while the mean post-test was 20.9. The difference between the two tests was 4.0. Hence, the average mean for low performance group for the three topics was 2.83.

The post-test mean were higher than the pre-test mean for every group and topics. This allowed this research to prove that all group of students' performance had increased after being taught using interactive multimedia courseware for over 10 weeks. Based on the result, the group that obtained highest average mean difference was high performance group. This research has indicated that the high performance group was the most affected groups on the use of interactive multimedia courseware in teaching mathematics.

	Gender	t	Mean Diff	Std. Error Diff	Sig. (2-tailed)
Pre-Fraction	1	-.928	-.900	.969	.357
	2	-.928	-.900	.969	.357
Post-Fraction	1	.292	.467	1.597	.771
	2	.292	.467	1.597	.771
Pre-Decimal	1	-.069	-.100	1.454	.945
	2	-.069	-.100	1.454	.945
Post-Decimal	1	-.524	-.800	1.528	.603
	2	-.524	-.800	1.528	.603
Pre-Money	1	-.058	-.100	1.713	.954
	2	-.058	-.100	1.713	.954
Post-Money	1	-.096	-.133	1.383	.924
	2	-.096	-.133	1.383	.924

Table 4: T-Test Analysis for Pre and Post Test for the Topic Fraction, Decimal and Money towards Gender

Table 4 shows the analysis of t-test to identify gender difference on students' performance after being taught using interactive multimedia courseware. Boys were represented by gender 1 while girls were represented by gender 2. The result had shown that there is no significance difference on students' performance on the three different topics based on gender.

In general, this research has indicated that the use of interactive multimedia courseware has increased students' performance in the rural school area in mathematics. However, students' performance in mathematics was not affected by gender.

4. Conclusion

This research has indicated that the use of interactive multimedia courseware was able to improve students' performance in mathematics. The positive result was obtained by all three different level of performance in the topics of fraction, decimal and money. The group that had a great jump in their mathematics performance was the students with high performance followed by moderate and low performance. In another words, the use of interactive multimedia courseware in learning mathematics benefits the most for high performance students. The research also found that both boys and girls show positive performance in mathematics. This result showed that there was no significant difference in gender on students' performance in mathematics after being taught using interactive multimedia courseware. Overall, this research showed an alternative dimension in teaching and learning approach in mathematics. The usage of interactive multimedia courseware was able to improve primary school students' mathematics performance in the rural area.

Acknowledgment

The authors acknowledge the Universiti Teknologi Malaysia and Ministry of Higher Education (MOHE) for the financial support under vote 07H86

REFERENCES

[1] Abdul Rahim Hamdan & Hayazi Mohd Yasin (2008*). The use of Teaching Aids among Technical Teachers in Technical Secondary School in Johor Bahru, Johor.* Universiti Teknologi Malaysia, Skudai.

[2] Amir Hasan Dawi (2002). The Theoretical Sociology and Education. Tanjung Malim: Quantum Books Sdn. Bhd.

[3] Aszoura Muhamed Salleh (2007). *The Effectiveness of Learning with Computer (The use of Interactive Power Point) towards The Competency in Science Concept*. Universiti Teknologi Malaysia, Skudai.

[4] Baharuddin Aris, Noraffandy Yahaya, Jamalludin Harun & Zaidatun Tasir (2000). *Series of Module Learning Education of Technology*. Skudai: Universiti Teknologi Malaysia.

[5] Campbell, J.R.; & Beaudry, J.S. (1998). "Gender gap linked to differential socialization for high-achieving senior Mathematics." *Journal of educational research* 91, 140-147.

[6] Chong Sui Li (2007*). The Effectiveness of Using Rounding Courseware in Teaching and Learning Mathematics Form 1*. Open University Malaysia.

[7] Else-Quest, Hyde & Linn (2010). Cross-National Patterns of Gender Differences in Mathematics: A Meta-Analysis. *Psychological Bulletin,* Vol. 136, No. 1, 103–127

[8] Hyde, J. S., Fennema, E. H., & Lamon, S. J. (1990). Gender Differences in Mathematics Performance: A Meta-Analysis. *Psychological Bulletin 107*, 139-55.

[9] Ismail Zain (2003). *Smart Students Stepped into The Cyber World*. Utusan Publication & Distributor Sdn. Bhd.

[10] Kimball, M. M. (1989). A New Perspective on Women's Math Achievement. *Psychological Bulletin 105*, 198-214.

[11] Liljana Ferbar & Peter Trkman (2003). Impact of Information Technology on Mathematics Education. *InSITE- "Where Parallels Intersect*", 343-353.

[12] Maria M. Klawe (1998). When Does The Use of Computer Games and Other Interactive Multimedia Software Help Students Learn Mathematics? The University of British Columbia, Vancouver, Canada.

[13] Saridah Hussein (2006). *The Effectiveness of Using Multimedia Courseware in Teaching and Learning Locus among Form Two Students*. Open University Malaysia.

[14] Saritas, T., & Akdemir, O. (2013). Identifying factors affecting the mathematics achievement of students for better instructional design. *International Journal of Instructional Technology and Distance Learning*, *10*(8), 57-62.

[15] Siti Nurashiken Md Sabudin (2013). The Development and Evaluation Video of Learning Reasoning Statistics for Education Post Graduate students. Universiti Teknologi Malaysia, Skudai.

[16] Standard Document of Curriculum Assessment (2013*). Mathematics Year 4*. Curriculum Development Division, Ministry of Education of Malaysia.

[17] Vaughn Tay. (2001). *Multimedia Working it Work*. (5th ed.) California: Osborne/McGraw-Hill.

[18] Vijaya Kumaran K.K Nair. (1996). *Multimedia in Teaching and Learning Science: A Challenge. National Science Curriculum Seminar,* Langkawi.

[19] Vygotsky, L. S. (1987). *Thinking and Speech*. In L. S. Vygotsky, Collected works (vol. 1, pp. 39–285).

[20] Zamri Mahamod & Mohamed Amin Embi. (2008). Information Technology and Communication in Teaching and Learning. Theory and Practice. Shah Alam: Karisma Publications Sdn. Bhd.