

## A Comparative Study on E-learning for Mathematics Subjects in Two Malaysian Smart Schools

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**Abstract:** Electronic learning (e-learning) is capable of transforming a marginalized school into a top performing school, it can provide leverage for Malaysian students to have life long learning. The purpose of this experimental research is to find the difference between e-learning and conventional learning in two Malaysian secondary smart schools. E-learning involves electronic media, self-paced and student centered compared with conventional learning method where the students are taught by the teachers and they depend more on teachers for their learning. Mean, T-test, was used as a measurement to find the difference between individuals, groups for both the e-learning and conventional groups and also to find the difference of mean between Form One and Form Two student. The e-learning students have achieved the standard mean level above 0.80 which was set as an excellent score by Malaysian Education Ministry.

**Key word:** E-learning; Conventional learning; Smart School; T-test.

### 1. Introduction

The smart school concept is part of the Malaysian Information Technology (IT) agenda that exposes students and teachers to IT in every aspect of education at the classroom levels. This concept also aims to systematically change the education system from conventional learning and examination oriented culture to an electronic learning system. Thus, the learning will be self-directed, individually spaced, continuous and reflective which utilizes teaching and learning materials such as electronic books, multimedia software, courseware catalogues and databases. The e-learning environment is focused on communicative feature and access to plethora of information and resources. The e-learning students explore the wealth of information and resources and practice themselves to learn independently using electronic learning materials. Whereas, the conventional learning students depend much on the teachers and use limited electronic materials.

Computers are becoming an essential tool for our students in this 21<sup>st</sup> century. The students must be exposed to e-learning environment, so that they become self

dependant in accessing information and their learning becomes more meaningful and effective.

The conventional learning method provides very little opportunities to learners for meaningful and effective because it is teacher-dependant and using very limited electronic material. Educational reform movements have shifted the emphasis from teaching to learning, enabling the learners to be identified as individuals with varying needs, personalities, cognitive and learning styles and ability to take active part in their own learning.

Students must be provided a conducive learning environment, so that the learning would take place effectively and continuously. Smart schools are heading towards achieving this goal. This was also stressed by an educationist who noted that the ultimate goal of education is to produce learners with an increasing capability to initiate the learning process for themselves ([1]). ([2]) has noted that the learning process which uses computers typically will have great effect on the students and capable of motivating the learners to be more positive and constructive of what they learn.

The constructive outcomes are by definition contextual which is the important element to the students who are exposed to e-learning environment ([2]).

These clearly show that the need for the new learning environment, so called electronic learning which requires the learners to learn independently with electronic media. This has resulted in setting up smart school in Malaysia. In relation to this, a comparative study is conducted on learning for mathematics subject through e-learning and conventional learning in two Malaysian secondary smart schools in Form One and Form Two. The study will reveal the achievement level of Form One and Form Two students who were exposed to e-learning and conventional learning in mathematics in Seri Bintang Utara and Seri Bintang Selatan smart schools. The mathematics topics selected for this purpose for Form One students are Area and Perimeter and for Form Two students are Ratio of Two Quantities, Ratio of three Quantities, rates, Proportions and Linear Equation.

The main objective of this paper is to find the difference in mean achievement level of Form One and Form Two students who were exposed to e-learning and conventional learning in mathematics in the above mentioned topics in both the schools.

## 2. Methodology

This section describes the method of collection information from Seri Bintang Utara Secondary Smart School (SBUSSS) students who are studying in Form One and Seri Bintang Selatan Secondary Smart School (SBSSSS) students who are studying in Form Two.

### 2.1. Research Strategy

([3]) stated that the experimental method can test the cause and effect relationship and it allows manipulation of variables, controlling some variables and observe the effect of the variables. The experimental design is used widely in educational research which involves independent group and control group. ([4]) noted that the experimental

method is suitable to conduct a research on educational matters and the method is effective to test any hypothesis. As applied to education, this method which involves experimentation will help to measure the results.

Two sets of twenty mathematics objective questions were prepared from the topic of Area and Perimeter from Form One mathematics as shown in the Appendix I (pre-test) and Appendix II (post test) of ([5]). Another two sets of twenty mathematics objective questions were prepared from the topics of Ratio of Two Quantities, Ratio of Three Quantities, Rates, Proportions and Linear Equations for Form Two mathematics shown in the Appendix XII (pre-test) and Appendix XIV (post-test) of ([5]). The students were given 40 minutes to answer all the items for each set. Every item has its own objectives as shown in Appendix III for Form One and Appendix XV for Form Two of ([5]).

### 2.2. Research Setting and Population

The study was conducted on SBUSSS students who are studying in Form One and SBSSSS students who are studying in Form Two. Both the schools are situated in Kuala Lumpur. These are two of the ninety smart schools in the country which provide e-learning facilities for the students. The students using e-learning method to learn four subjects, namely, Malay language, English language, Mathematics, and Science as the Malaysian government decided to conduct the e-learning for these subjects first and after seeing the success of e-learning, the other subjects will be included in the e-learning.

The SBUSSS has 105 female students studying in Form One. They are studying in 3 different classes. Where as, the SBSSSS has 103 students and also studying in 3 different classes. Most of the students are staying nearby to the school and they are from medium and well to do families.

### 2.3. Method of Sampling

The data about the population was collected from the students class registers which have

information about the students. Based on this information, the sample size was decided and samples were selected. The statistics about the students shows, out of 105 Form One student, only 84 students are having similar family back ground and education. Where as, out of 103 Form Two students, only 88 students are having similar family back ground that is the socio-economy of the family, parents education level and facilities provided in the house for children to study in a conducive environment.

### **2.3.1. Sample Size and Demography**

Since the population is type of nominal variables that is they are multiracial, namely, Malays, Chinese and Indians, the sample is selected randomly from three races according to the required sample size. According to ([6]), sample means the people or object that gives the actual observation in any studies. The sample size for each group is 21 students which consist of 7 students from each race totaling to 42 students. The sample for Form One was selected randomly which is 84 students and constitutes to 40 percent from the population. Where as, 88 students for Form Two and constitutes of 40.8 percent from the population.

The sample group consists of 42 students for Form One and 42 for Form Two. Each group was divided into two groups that e-learning group and conventional group, Form One has 21 students for e-learning and 21 for conventional learning. Where as, Form Two has also 21 students for e-learning and 21 students for conventional learning. The e-learning group is called independent group, where the conventional group is called control group.

### **2.3.2. Education Achievement level**

The selected sample from both school have the same achievement level in education that is they have passed their Primary School Evaluation Test (PSET) with 5 A's. This the public examination conducted by The Ministry of Education. These students are from primary smart schools where they were exposed to e-learning. After the have

finished their primary school studies, they moved in to Form One in secondary school.

### **2.3.3. Family Education and Socio-Economic**

The socio-economic and family education plays an important role in the student's education. The parents of the selected samples are educated where they have finished their Malaysian Certificate of Education (MCE) and some of them are degree holders. Also, this sample are from well to do families where they have their family income above one thousand and five hundred Ringgit Malaysia per month and the family has at least one computer in the house and a facility to access the internet.

### **2.4. Pre-Test and Post Test**

Pre-test and post test were conducted for all the e-learning and conventional learning groups from Form One and Two. Twenty objective questions which were prepared groups from Form One from the topics on Area and Perimeter were used for pre-test and post test for Form one student. The reason for using the same questions in pre-test and post tests is to get the difference in the mean between e-learning and conventional learning groups.

The other twenty objective questions which were prepared from Form Two mathematics syllabus from the topic of Ratio of Two Quantities, Ratio of Three Quantities, Rates, Proportions and Linear Equations were used for pre-test and post test for Form Two students.

Both Form seat in different classrooms and different mathematics teachers taught these groups because the planned for this research to have the teaching and learning process to take place simultaneously. The time was conducted for three consecutive days after which they sat for the post tests. Each test was conducted for 40 minutes.

### **2.5. Data Analysis**

A comparative study is conducted to see the achievements level of mean in both e-learning and conventional learning groups in both the pre-test and post tests for

individual, group and 5 main objectives by using SPSS for both Form students. Besides, the difference in mean between Form One and Form Two students was also analyzed to see if there exists any considerable difference after they undergone e-learning and conventional learning on different topics and in different Forms. T-Test is used in this study because it can produce the mean difference for both groups at 0.05 significance level.

### 2.5.1. Variables

Dependent variables would be the student's achievement level in mathematics on topics Area and Perimeter for Form One and Ratio of Two Quantities, Ratio of Three Quantities, Rates, Proportions and Linear Equations form Two students which would be obtained from the pre-test and post test results. However, independent variable would be both the e-learning and conventional learning methods. The mean difference, mean frequency, and t-test were used to find the students achievement levels in mathematics.

## 3. Results and Discussion

### 3.1. The individual mean difference between Form One and Form Two students for both the e-learning and conventional learning groups in the pre-test and post test.

Table 1 shows the individual mean difference between Form One and Form Two students for both the e-learning and conventional learning groups in the pre-test and post test. The individual mean difference for the *e-learning group* for Form One students in the pre-test is between 0.11 and 0.16 and for Form Two students is between 0.15 and 0.20. This shows the Form One and Form Two students' general knowledge in their respective mathematics topics from Form One and Form Two is almost similar because the difference of mean is not considerable.

The individual mean difference for the *conventional learning group* for Form One students in the pre-test is between 0.11 to

0.17 and for Form Two students is between 0.15 and 0.20. Which is indicate that the knowledge level of Form Two students in the respective topics from mathematics is almost similar with the knowledge level of Form One.

**Table 1:** The individual mean difference between Form One and Form Two Students for both the e-learning and conventional learning groups.

Test	Group	Form One	Form Two
Pre-Test	E-learning Group	0.11 to 0.16	0.15 to 0.20
	Conventional Group	0.11 to 0.17	0.15 to 0.20
Pos Test	E-learning Group	0.71 to 0.98	0.80 to 0.95
	Conventional Group	0.43 to 0.82	0.45 to 0.80

### 3.2. The group mean difference between Form One and Form Two students for both the e-learning and conventional learning groups in the pre-test and post test.

Table 2 shows the group mean difference between Form One and Form Two students for both the e-learning and conventional learning groups in the pre-test and post test. The group mean difference of e-learning group for Form One students in the pre-test is 0.1357 and for the conventional group is 0.1353. This shows that both the groups have similar achievement level. Whereas, for Form Two students, the mean level for e-learning group in the pre-test shows 0.1571 and the mean level for conventional learning group is 0.1595. The result shows that there is not considerable difference of mean in the pre-test between Form One and Form Two. Therefore, Form One and Form Two students' knowledge level in the respective mathematics topics are almost at similar level.

The group mean difference for the e-learning group for Form One students in the post test is 0.8797 for e-learning group and for the conventional learning group is

0.6780. This shows that both the groups have difference in mean achievement level. Whereas, for Form Two students, the mean level for e-learning group in the post test is 0.8762 and the mean level for conventional learning group is 0.6929. The result also shows that there exists considerable difference in the achievement level of mean between e-learning groups in Form One and Form Two and conventional learning groups in Form One and Form Two. But, the mean achievement levels of e-learning groups in both the Form One and Form Two are almost similar. Like wise, the mean achievement levels for conventional groups are also almost similar. But, the difference of mean achievement levels for both the e-learning and conventional learning groups between Form One and Form Two is considerable. This shows that the e-learning is proven to be better than conventional learning.

**Table 2:** The group means difference between Form One and Form Two Students for both the e-learning and conventional learning groups.

Test	Group	Form One	Form Two
Pre-Test	E-learning Group	0.1357	0.1571
	Conventional Group	0.1353	0.1595
Pos Test	E-learning Group	0.8797	0.8762
	Conventional Group	0.6480	0.6929

### 3.3. The mean difference in 5 main objectives between Form One and Form Two students for both the e-learning groups in the pre-test and post test.

Table 3 shows the mean difference in 5 objectives for Form One and Form Two students for both the e-learning and conventional learning groups in the pre-test. The Form One students' mean level is between 0.1290 and 0.1429 for both the e-learning and conventional learning groups which is almost similar. Also, Form Two

students' mean level is between 0.1548 and 0.1667 for both the groups which is almost similar. Since their achievement level of mean is between 0.1290 and 0.1667 for both Forms, then the difference is not considerable and they have almost similar level understanding about the topics before they undergo the e-learning and conventional learning.

Table 4 shows the mean difference in 5 objectives for both Forms of students for both the e-learning and conventional learning groups in the post test. The Form One *e-learning group's mean* achievement level in the post test is between 0.8500 and 0.9143. Whereas, the Form Two *e-learning group's mean achievement* level in the post test is between 0.8571 and 0.8929. This shows that both the Form's e-learning groups' achievement level of mean is above the standard mean set by Malaysian Education Ministry that is 0.80 which is considered an excellent result.

The Form One *conventional learning group's mean* achievement level in the post test is between 0.5976 and 0.7000. Whereas, the Form Two *conventional group's mean* achievement level is between 0.6190 and 0.7380. This indicate that both Form's of the conventional learning groups mean achievement level is below the standard mean set by Malaysian Education Ministry that is 0.80. So, it is proven that the mean difference in the 5 main objectives between e-learning and conventional learning for both the Form One and Form Two in the post test is considerable. Therefore, the mean achievement level of e-learning is proven to be better than conventional learning.

### 4. Conclusions

In this paper, we consider Form One & Form Two e-learning students and conventional learning students in the post test. Form one e-learning student who studies mathematics topics on Area and Perimeter and the Form Two e-learning students who studied mathematics topics on Ratio of Two Quantities, Ratio of Three Quantities, Rates, Proportions and Linear

Equations have shown that their achievement level of mean was the standard mean set by Malaysian Education Ministry that is 0.80 which is considered to be an excellent score. The Form One student's individual and group mean achievement level for e-learning group in the post test shows that their achievement level of mean is above 0.80 compared with conventional group's mean achievement level which mostly below the standard mean of 0.80. This shows that e-learners have done much better than the conventional group.

The Form Two students mean achievement level for individual and group for e-learning groups in the post test shows that their achievement level on mean is also above 0.80 compared with conventional group's mean which is mostly below 0.80. Finally, the achievement level of mean in the 5 objectives in the post test between e-learning group and conventional learning groups in Form One and Form Two also shows that the e-learning groups means are above 0.80. The e-learning group's achievement level of means are better than the conventional learner's which are all below 0.80.

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**Table 3:** The mean difference in 5 objectives for Form One and Form Two students for both the e-learning and conventional learning groups in the pre-test

Test	Group	Objective 1	Objective 2	Objective 3	Objective 4	Objective 5
Pre-Test	E-learning Group	0.1352	0.1290	0.1395	0.1333	0.1414
	Conventional Group	0.1295	0.1290	0.1333	0.1429	0.1419
Pos Test	E-learning Group	0.1667	0.1548	0.1667	0.1548	0.1667
	Conventional Group	0.1667	0.1667	0.1667	0.1548	0.1548

**Table 4:** The mean difference in 5 objectives for Form One and Form Two students for both the e-learning and conventional learning groups in the post test

Test	Group	Objective 1	Objective 2	Objective 3	Objective 4	Objective 5
Pre-Test	E-learning Group	0.8843	0.8500	0.8886	0.9143	0.8581
	Conventional Group	0.5976	0.6862	0.6443	0.7619	0.7000
Pos Test	E-learning Group	0.8929	0.8690	0.8571	0.8690	0.8890
	Conventional Group	0.6190	0.6429	0.7381	0.7262	0.6786