# TECHNO-PEDAGOGY: ITS IMPACT ON STUDENTS' ACHIEVEMENT SCORES IN MATHEMATICS

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***ABSTRACT:*** *The study employed pretest-posttest quasi-experimental design maximizing the 18 sections of grade 10 mathematics. The 9 sections control group with 342 students were taught without technology integration, while the 9 sections experimental group with 388 students taught with technology integration such as Edmodo, Google Classroom, Desmos, GeoGebra and Flipped classroom. Pretest and Posttest achievement scores of the students were used in the analysis of the data using mean, standard deviation and ANCOVA. The analysis revealed that there was a statistically significant difference of the achievement scores of the students in favor of the students who were taught with technology integration. Researchers recommended that every school must have available technologies and make them available to students for hands-on manipulation. Also teachers of mathematics must integrate technology in their mathematics class.*

**Key words:** techno-pedagogy, mathematics achievements

## 1. INTRODUCTION

The 21st - century generations live in an era of accelerating change and advanced technology [1]. Technology integration is a must for classroom instruction to facilitate learning. Education 4.0 is essentially used technology-based tools and resources to drive education in non-traditional ways. Also the East Asian countries like China, South Korea, and Japan used technology-based tools and resources to drive education in non-traditional ways [2; 3, 4]. These countries showed a high average score in mathematics with the Program for International Student Assessment (PISA) 2018 [5], asserted that adaptation of innovative technologies and methodologies in education ensures interactive, effective, and efficient learning. Integration of technology in teaching is recognized as a factor in bringing change to classrooms and fostering students' learning [6. 7] reiterates that the most critical aspect of teachers' knowledge was pedagogic knowledge development. Pedagogical content knowledge is considered a special teachers' knowledge beyond teaching knowledge [8; 9]. Through the years, with the fast evolution of new digital technology tools, teachers have been challenged to apply new strategies and competencies to be updated from the appearances of new and more powerful technologies of today [10]. Research found that excellent use of technology does not always lead to the successful integration of technology into teaching and learning of the content [11]. Others also found that integrating technology teaching and learning was a complicated process [1; 3].

Elsewhere, [14], suggested that technological and pedagogical content knowledge concerning mathematics must be considered in detailed.

According to the literature, for technology integration is helpful for students learning, teachers need to experience some change in any or all of the following: Content knowledge, teaching practices, beliefs, and attitudes in the direction of their pedagogical ideologies [15].

## 2. METHODOLOGY

This study employed pretest-posttest quasi-experimental design. The control group of students were taught without the technology integration, while the experimental group taught with technology integration such as Edmodo, Google classroom, Desmos, GeoGebra and Flipped classroom. The scores of students in achievement test were collected before and after the discussions of the desired topics. There were 9 sections in the control groups which comprise of 342 students and 9 in the experimental groups which comprised of 388 students.

### 2.1 Data Gathering Instruments

The instrument used was a 14-item multiple-choice test with a reliability coefficient of 0.71. The data were analyzed using the average, standard deviation and ANCOVA.

## 3. RESULT AND DISCUSSION

**Table I. Mean and Standard Deviation of Students' Performance under Control and Experimental groups**

| | | Pretest | | Posttest | |
|---|---|---|---|---|---|
| Groups | N | Mean | SD | Mean | SD |
| Control | 342 | 3.80 | 0.28 | 6.58 | 0.89 |
| Experimental | 388 | 3.93 | 0.69 | 7.72 | 0.39 |

Perfect score: 14

During the pretest, data shows both groups are still at the beginning level of proficiency, and the pretest mean score difference is only 0.13. It indicates that the levels of students' abilities in Grade 10 mathematics from both groups are comparable and very close before doing this study. It means further that the students' have a little stock knowledge in the subject matter. In the posttest, scores of both groups have improved. However, experimental group obtained a higher mean score compared to the control

group. This means that those students exposed to educational technologies improved their mathematical abilities in solving mathematics problems. The result is parallel to the study of [16] and
[17], where they found out that students made a significant improvement in their math skills when technology was integrated into a constructivist approach. Also, [18] figured out that using GeoGebra enhanced students' performance in mathematics studies since it would help them to explore the concept more in detail and help them build and develop their mathematical knowledge. To determine whether the difference of the mean is significant further analysis is used using ANCOVA utilizing the means of 18 groups.

**Table 2. One-Way ANCOVA Summary of 9 control group and 9 experimental group**

| Source of Variation | Adj Sum of Squares | df | Mean Square | F-Value | P-Value |
|---|---|---|---|---|---|
| Treatment between groups | 5.298 | 2 | 5.298 | 11.101 | 0.005 |
| Error Within | 7.159 | 15 | .477 | | |
| Total | 13.434 | 17 | | | |

*Significant at p<0.05 alpha level

The data yielded a P value of 0.005 less than 0.05 level of significance. This implied that there is a statistically significant difference in the students' achievement scores in mathematics as they expose to technology. The result lead the researchers not to accept the null hypothesis which states that there is no significant difference between the students' achievement scores as they taught with technology integration. From the result we may infer that the activities in mathematics with the aid of technological tools and applications had enabled the students to broaden and deepen their understanding in mathematical concepts.

## 4. CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis of the data researchers concluded that the students' level of achievement in mathematics as they taught with technology integration was significantly higher than the achievement scores of the students taught without technology integration. It is therefore recommended that every school must have available technology of which the students can access anytime especially during mathematics time.

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