

A Proposed Bring Your Own Device eLearning Framework for Private Secondary Schools in Dubai, UAE

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Abstract: -**Objectives**

This paper aims to study the impact of BYOD implementation on learning outcomes of ninth grade students in the subjects of Science and Mathematics. The target sample size of this study will involve 48 teachers and 1800 ninth grade students from six private schools in Dubai, UAE.

Methods/Statistical Analysis

The study is based on the principles of quantitative research. The casual comparative study will be based on independent and dependent variable. The examination scores in Science and Mathematics, student age and gender of the 1,800 ninth grade students will be collected as quantitative data for descriptive statistical and comparative analysis using the IBM SPSS software. The two examination scores of the students will be used to determine the level of academic achievement and will become the dependent variables of the study. The information on BYOD Implementation and the level of usage of technology by 48 teachers and 1800 students will be tested by administering a survey questionnaire research instrument to 10 teachers and 50 students who are representative of the larger population of the study. The information collected from the survey questionnaire instruments will become the independent variables for the study.

Findings

The two major findings of this study were that students' achievement has been significantly improved by the use of BYOD tools and applications with the traditional teaching methods and that students' achievement has been varying significantly in relation to gender as far as BYOD tools and applications are implemented and practiced. The benefits of BYOD on student learning include increased engagement, communication, collaboration, interaction and personalization. The factors that were crucial to effective BYOD implementation include adequate teachers training, a proper BYOD eLearning Framework, the availability of virtual learning environment (VLE's) and the availability of relevant pedagogy based digital curriculum content (DCC).

Application/Improvement

The research findings of this work will be used to develop a BYOD eLearning Framework for private secondary schools in Dubai which will help school to effectively implement BYOD programs.

Keywords: - BYOD, eLearning, Technology Integration, Technology Usage, Digital Content, Virtual Learning Environments.

I. INTRODUCTION

1.1 Introduction

Bring Your Own Device (BYOD) is a concept which is quickly getting popular in many forward thinking schools globally. The term BYOD with respect to school is students bringing their own mobile devices like tablets, laptops, smartphones or any other similar device to classrooms for learning. The main idea of schools introducing BYOD are to enrich the teaching and learning experience and thus by improving student achievements by utilising younger generation student's high degree of exposure to the digital devices and inclination to use it. Adequate teachers' training, a proper framework and availability of relevant pedagogy based digital content may lead this program to a success. Letting students to bring their personal technology

mobile device to schools has given them more learning power and easiness. Giving more freedom to students to the way they like to learn is the best approach, teachers and instructor can more focus on managing the learning process rather than the source of information¹.

Schools are using BYOD based eLearning tools such as Digital Curriculum Content (DCC), Virtual Learning Environment (VLE) expecting to improve teaching & learning experience, student achievements, learning outcome and student-teacher engagement. The main issue relating to BYOD is that it is not uniformly practiced in schools where students are informally using these devices with or without the formal assent of the teachers in some schools. The reason is that there is no widely accepted BYOD framework for schools to practice it effectively.

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Therefore the problem identified is whether BYOD practice in teaching and learning process is more effective when using with the traditional method of teaching and learning process. Most of the BYOD initiatives in schools are driven by few teachers who have personal interest in it rather than a collective organisational initiative. It was also observed that teachers in different age group behave differently to this self-initiative. Younger teacher shows more interest than senior teachers in taking any technology based initiatives. These teachers adopt a methodology convenient for allowing students own device to bring to schools and use it as a complementary tool for learning. There may not be any uniform approach in same grade of students in two different divisions. Use of eLearning tools in such environment is primitive and ineffective. Success factor measurement of this type of initiatives is highly difficult. This study will give an insight to the impact of student's achievement in the traditional instructional method with BYOD and without BYOD tools and applications.

1.2 Research Objectives

The specific research objectives are:

1. To study the impact of Grade 9th student's achievement in Science and Mathematics while studying in the traditional instructional method with BYOD and without BYOD tools and applications.
2. To examine the variation in student achievement based on gender while using the traditional instructional method with BYOD and without BYOD tools and applications.

1.3 Research Questions

This study will be conducted to seek answers to the following questions.

1. What is the difference of Grade 9th student's achievement in Science and Mathematics between students study with the traditional instructional method with BYOD and without BYOD tools and applications?
2. Is the gender difference causes any variation in achievement by using the traditional method with BYOD and without BYOD tools and applications?

1.4 Significance of the Research

Outcomes of this study will provide information on what is appropriate for the purpose of BYOD implementation in selected secondary schools, technology usage level teachers and implementation, and achievement level of students as a result of the interventions of technology. This researcher emphasizes the strategy to enrich the educational experience with Mobile Learning solutions and involve new generation students on the devices they have, know and prefer, and use them any time, any place as a learning platform and get

access to all aspects of the digital learning experience. The knowledge base of the effectiveness of BYOD implementation can be enriched based on the findings from this research. This research study will help schools to increase their consciousness level of possible impact on student academic achievement and teachers' level of technology implementation because of BYOD initiatives.

II. LITERATURE REVIEW

2.1 BYOD in education

Bring Your Own Device (BYOD) and M-Learning initiatives connect the power of the devices that students own and increase student engagement and provide to student anytime, anywhere access of information². While the interaction between students and their teachers will always be a key to the educational experience, the shift to digitally-driven learning models that have proved considerable impact on the expectations and the culture in academic learning, giving birth to next revolution in school teaching. BYOD already has some attraction in schools in the U.S., this concept has yet to infiltrate in the educational institutes within the developing and developed countries. According to Sheninger, devices adopted by students are huge part of their lives and therefore, schools should teach students about the powerful tool they own but also take benefit of this resource since budgets are tight³. Studies show that over the last years there has been an intense increase in the dominance of students bringing personal mobiles devices such as laptops, tablets, and smartphones with better or more custom-made features competences than the ones issued by the schools into the classroom for BYOD in Australia and New Zealand schools⁴.

2.2 Trends in Use of BYOD in Teaching

Today's expert teachers have accepted the advancements in technology, and it's integration in education, and they use mobile devices, gadgets and social media as a means to stay connected with their students, families, and other classrooms. A study on "BYOD in K-12 classroom", by Elena Dickerson, Teacher Education Dept., University Of Texas, has stated findings from various researchers that "the common mentality of the "I teach" curriculum may be another challenge in the development and implementation of the BYOD program in K-12 classrooms"⁵. Neubert states that the conventional classroom ideology can be maintained even with the BYOD implementation program which would act as another medium to disseminate⁶.

2.3 Trends in Use of BYOD in Learning

The reasons for more popularity of BYOD was cited as student-centered and personalized learning^{7,8}. The

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important role played by mobile devices in shaping the learning trends was explored by Mobile Learning Trends Infographic in 2015. These trends with mobile devices prove that the current generation is on the brim of a new era of learning. The advancement in technology made education more interesting and meaningful to students, in spite of few, who were not willing to adopt this change. Learning through digital devices makes coordination & communication among each other easier and encourages student interactions and builds interest in learning. This kind of learning is faster as the students get immediate feedback which helps in developing and managing their thinking and actions as well as quick feedback always help the students learn faster⁹.

2.4 Digital Tools in Implementation of BYOD

Two main Digital tools highlighted are Digital Curriculum Content and Virtual Learning Environment. Many researchers drive us through various learning and teaching concepts to give an insight on these digital tools apt for the millennial. Digital curriculum thus deployed on all these digital media as mentioned above and supported by many researchers' benefits each student in their learning process and make them more successful. Learning through digital media opened up diverse opportunities to student's learning process like visualize and explore into more learning aids, concepts, apply and practice and thus enhance learning.

2.5 Learning Theories and BYOD

One learning theory is not sufficient to define BYOD. There are several theories supported the idea of BYOD and could have possibly been part of the foundation of the idea of BYOD. According to Mobi21.com, currently, there is no widely accepted learning theory that can be suitable for mobile technologies based on effective learning, pedagogy, assessment and design of new applications¹⁰. As the foundation of BYOD, the below-listed theories are worth noting.

The BYOD initiative in "Social learning theory" or "Social Constructivism" states that "students carry their own understandings to the classroom and further through interactions and experiences in the class, develop new knowledge"¹¹. Social interactions that emphasize "critical thinking", "collaboration", "communication", and "learning by doing" and the "Constructivism", "Connectivism" theories and also "We All Learn" (WAL) framework model assists and encourages learning process through technology integration thus making education more interesting and meaningful to students.

2.6 Benefits of BYOD

The benefits of BYOD in secondary schools, referred by various scholars. Allow to use student's personal devices is a cost effective benefit. A positive aspect of BYOD program is that it provides students the access from home on study materials which makes learning simpler and quicker and also reduces their burden of carrying too many books daily to school. For teachers, BYOD offers a paperless classroom making it more cost effective. In addition to highlighting the benefits of BYOD, the drawbacks with regard to BYOD noted by few researchers also are considered in this study like; An article was written by, Flanigan named, "BYOD Boundaries, a school in Fairfax County, VA" briefed that, beginning of the school year in 2011 to 2012, when BYOD was implemented, he observed that during school hours, the number of discipline referrals on cell phone usage was significantly decreased¹².

2.7 BYOD Initiatives in UAE

GEMS Education is the first education group to adopt a BYOD program in Dubai, UAE, where this study will be conducted. GEMS has announced a 'Bring Your Own Device' (BYOD) initiative in all GEMS schools in the UAE with setting up a secure Wi-Fi facility to access the school's internet and the network and permitting students and teachers from GEMS Schools to use their own devices (laptops, tablets etc.) and use them for educational purposes within the classrooms. The BYOD specifications on hardware and software are outlined and made available in GEMS schools' website for parents and students to adhere to while purchasing the device for their wards.

2.8 Summary of Literature Review

It becomes evident from the literature review that BYOD implementations in schools are getting popular day by day and stakeholders believe that BYOD implementation with the eLearning tools such as Digital Curriculum Content and Virtual Learning Environment has an impact on student achievement. It was also noted from the literature review that new generation students are more comfortable in using their own personally owned device for learning the purpose and hence having a BYOD eLearning framework for schools will be a significant step for the BYOD programs.

2.9 Conceptual Framework

Based on the findings of the literature review, a preliminary conceptual framework for the development of BYOD eLearning Framework is suggested in the figure 1.

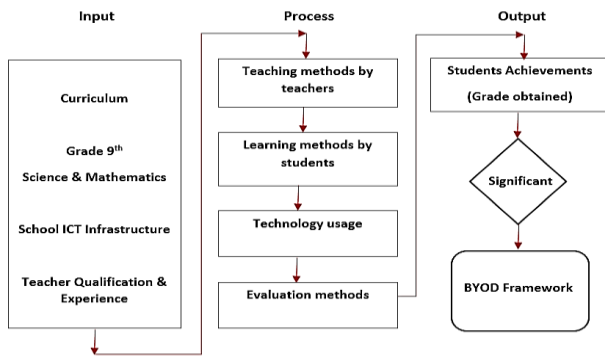


Figure 1. Conceptual Framework

Examination scores of students in Science and Mathematics of Grade 9th will be used for descriptive statistical and comparative analysis. The independent variables will be BYOD Implementations, student gender, instructional method, teachers and student level of technology implementation, student previous examination scores, student technology skills, teacher technology skills, teacher’s qualification and experience, school ICT infrastructure, parent’s background. Student achievement in Science and Mathematics of Grade 9th will be the dependent variable. The data will be used to explore the significance in student achievement in Science and Mathematics subjects while studying in the traditional instructional method with BYOD and without BYOD tools and applications. The data will also be analyzed to understand the interaction between gender and instructional method regarding achievement.

The online survey will be used to collect teachers’ data. The instrument will be administered to Science and Mathematics of grade 9th teachers to define the teacher’s level of technology practice. The result will be related to student achievement in statistical analysis for the existence of a relationship.

III. RESEARCH METHODOLOGY

3.1 Research design

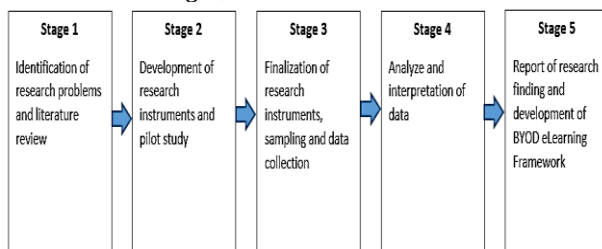


Figure 2. Research Design

The plan of this study consisted of five distinct but interconnected stages as shown in Figure 2, where the output of each stage was suitably used to inform the initiation and effective completion of the next stage. This study is based on the principles of quantitative research. This causal-comparative study will be based on independent and dependent variables. In causal-comparative research, the study emphasizes on the connection between one or more categorical independent variables and one or more quantitative variables¹³. Several studies have used causal-comparative design because of its advantage in terms of access to the large volume of data, large sample size and data collected from a larger population in a cost-effective manner and thereby adding it to the knowledge base of the design¹⁴.

3.2 Research Hypothesis

According to the trend appearing from the literature review and based on the research questions defined earlier the researchers’ makes the following alternative hypothesis:

Ha1: The students’ achievement has been significantly improved by the use BYOD tools and applications with the traditional teaching methods.

Ha2: The students’ achievement has been varying significantly in relation to gender as far as BYOD tools and applications are implemented and practiced.

3.3 Target population and sample

3.3.1 Target population of the study

The target population of this study will involve teachers and 9th Grade student from six private schools in Dubai, UAE. According to the official report¹⁵ the number of schools in Dubai during the 2015-16 academic year totaled to 173, and these schools are home to 265,299 students from 183 nationalities. Currently, a report shows Dubai private schools have about 17,000 teachers. The sample size of six schools has chosen for this study from 32 international schools following Indian curriculum in Dubai, which is about 20% of these schools and is a standard industry acceptable sampling percentage for a finite population.

Researchers also used infinite population-based sampling size method to validate the sample size of participating students. 1,800 students has arrived using that sample size formula, $Sample\ Size = (z^2 * (p(1-p))) / ME^2$. ME is margin of error and z is Z-score a constant value corresponds to confidence level. Standard survey confidence level is 95% and for confidence level of 95% the Z score is 1.96¹⁶. The standard margin error (confidence interval) is less than 2.5 % and 2.3% has taken as margin error here. Applying the above formula here will result to $((1.96)^2 * .5(.5)) / (.023)^2 = (3.8416 * .25) / 0.000529 = 0.9604 / 0.000529 = 1,815$. This number is rounded off to 1,800. Sample size of teachers, 48 has chosen to match

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student sample size representation. In other ways, about 48 teachers are required to cover Science and Mathematics subject for 1,800 students in Grade 9th.

3.3.2 Sampling and Sampling Procedure

Probability sampling method will be used as sampling strategy for this research. Barreiro and Albandoz of university of Seville recommended using probability sampling because in the case of choosing the appropriate technique will assure us that the sample will be the representative and could estimate the errors for the sampling¹⁷. This researcher will get proper permission from the school authorities to obtain the achieved examination score data for Science and Mathematics for all Grade 9th students. As mentioned earlier, approximately 1,800 students' of Grade 9th from the selected schools will be included in this study and their scores number will depend on the time of this study. The teachers for this study will be selected from the pool of teachers involved with teaching Science and Mathematics in the Grade 9th or classes. The teachers' selection will be based on purposeful sampling method. A formal consent in writing will be obtained from all teachers before their participation in this study. About 48 teachers from selected schools are expected to participate in the study.

3.4 Data collection

Students' examination scores will be collected from each of the schools. Students' examination scores and teacher details from participating schools will be coded and grouped for easy statistical analysis. Excepting for student's age, gender and exam scores, all other personal details will be excluded. The interviews with teacher included in the sample will be arranged before sending the survey instrument. This researcher will meet the teachers participating in this study and will explain them the objectives and later they will be requested to take part in an online survey on the practice of technology and its implementation. The level of usage of technology by 48 teachers included in the sample and teaching Grade 9th will be determined using survey instrument.

3.5 Research instruments

The data collecting instruments will be an online survey questionnaire for teachers and an online survey questionnaire for students. Student questionnaire and teacher questionnaire which has been developed based on the research objectives. Questionnaire will be refined in consultation with subject matter experts. Questionnaire will be tested for validity and reliability. The student questionnaire will be tested with 50 students and the teacher questionnaire will be tested with 10 teachers who have represented the population of the study. The questionnaire

will be modified according to the pilot result. The acceptable validity should be higher than 0.7. The acceptable reliability should be higher than 0.21.

3.5.1 Students' achievement

Quantitative data required for this study will be collected as examination scores of the participating Grade 9th with a focus on Science and Mathematics and subjects. Science and Mathematics subjects are offered at all grades in the participating schools. Student's examination scores (terms end scores) will be comprised of three terms scores. Each term scores will be cumulative they are based on three continuous term assessments of the students and its average.

3.5.2 Teachers' Technology Usage & Implementation questionnaire

The survey questionnaire will be used to collect usage of technology data for the BYOD Implementation from participating teachers through an online survey. This survey will be conducted after meeting all participating teachers face to face and explain them the purpose of this study.

3.6 Data analysis

IBM SPSS software or similar software will be used for the detailed analysis of Science and Mathematics subject examination scores of Grade 9th student from the contributing schools, the data analysis in this study will accomplish in two steps.

The comprehensive statistical analysis will be accompanied to study the connection between student achievement in Science and Mathematics and the teachers' level of technology implementation.

Data related to the following area will be collected and analysed:

1. Difference of Grade 9th student's achievement in Science and Mathematics between students study with the traditional instructional method with BYOD and without BYOD tools and applications.
2. Interaction between student's gender and instructional method in regard to achievement in Science and Mathematics
3. Relationship between;
 - a. Teachers and student level of technology implementation for BYOD and student achievements.
 - b. Student previous examination scores and student achievement.
 - c. Student technology skills and student achievement.
 - d. Teacher technology skills and student achievement.
 - e. Teacher's qualification and experience and student achievement.
 - f. School ICT infrastructure and student achievement.
 - g. Parent's background and student achievement.

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Students' scores in Science and Mathematics subject are the two dependent variables. MANOVA (Multivariate Analysis Of Variance) needs that the dependent variables (Student achievement) to meet parametric requirements. MANOVA will be used to examine whether multiple levels of independent variables (BYOD Implementation) are on their own, or in a grouping with any one another listed above have any effect on the dependent variables (Student achievement).

The difference in student achievement in the schools using the traditional instructional method with BYOD and without BYOD tools and applications will also be determined, and t- test will show the mean difference. The F value, Wilks's lambda, will be based on a comparison of the error variance or covariance matrix. When performing the significant test on data, the covariance will help to define the correlation between the two measures. To test the difference between students' achievement in Mathematics and Science in the schools using the traditional instructional method with BYOD and without BYOD tools and applications will be tested using MANOVA. The validity will be indication of the extent to which inferences can be correctly made based on the students' scores in both learning environments. The assumption is that there may be linear relationships among the dependent variables, Science and Mathematics achievements.

Levene Howard's test of similarity of the variance will be used to test equality of variance as it tolerates violations of normality and this will also scrutinize whether the amount of variance is respectively represented within the independent variable (BYOD Implementation) groups. The similarity of variance is that the variance of the scores in one type of school that would be equal to the inconsistency of scores in the second type school¹⁸. To avoid the restriction of this statistical analysis, outliers will be tested before performing MANOVA. Unequal sample sizes will be adjusted using IBM SPSS or similar software if any unequal sample size exists in the participating schools during data analysis. The level of usage will be determined by the Survey on teachers' technology implementation and usage. Findings specifying the different levels together with the student achievement will be analyzed using IBM SPSS or similar Software to establish the connection between teachers' level of technology implementation and student achievements.

3.7 Reliability, validity and ethical procedures

3.7.1 Reliability & Validity

The data collecting instruments will be an online survey for teachers and an online survey for students to understand stand level of technology usage. The online surveys will be developed to achieve a high level of validity and reliability. Validity is the degree to which an instrument measures what

it is purported to measure¹⁹. The degree to which an instrument consistently measures whatever it is measuring is its reliability¹⁹. Threats to internal validity of this study will be minimal since the testing will involve a large sample of student examination scores. Teaching or Instructional methods in various participating schools may be different.

3.7.2 Ethical Procedures

The data collecting from schools will be kept confidential to protect the rights of participating sample, students and teachers. Separate codes will be used for student data to protect confidentiality. To avoid any form of data leakage, all research data will be stored in the laptop of the researcher with password protection. After successful completion of this study, all research data related to samples will be deleted. Consent will be taken from the participating samples once they are identified by the schools.

3.8 Summary of research methodology

The causal-comparative research design will allow the gathering of a large amount of data proportionate for this research study. The student examination scores will be used to determine the level of student academic achievement and will give information on teachers' level of technology implementation and usage for BYOD. A descriptive statistical analysis will be used to detect the differences in the mean, the equality of variance, and a relationship between the independent variables and dependent variables. The result of this analysis will help establish the specified hypotheses. Suitable consideration will be given to ethical processes by protecting the rights of participants, specifically in the examination data of student scores.

IV. CONCLUSION AND RECOMMENDATION FOR FUTURE WORK

The main issue relating to BYOD is that it is not uniformly practiced in schools where students are informally using these devices with or without the formal assent of the teachers in some schools. The reason is that there is a lack of availability of research-based BYOD framework for schools to practice it effectively. Outcomes of this study will provide information on what is appropriate for the purpose of BYOD Implementation in secondary schools, technology usage level teachers and implementation, and achievement level of students as a result of the interventions of technology. Research findings of this work will be finally used to develop a BYOD eLearning Framework for private secondary schools in Dubai, UAE. A new BYOD framework based this research study will help schools to effectively implement BYOD Programme

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(IJERCSE)****Vol 5, Issue 3, March 2018****REFERENCES**

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