



Available Online

Journal of Education and Social Studies

ISSN: 2789-8075 (Online), 2789-8067 (Print)

<http://www.scienceimpactpub.com/jess>

EFFECT OF E-LEARN PUNJAB APPLICATION ON CONCEPTUAL DEVELOPMENT OF STUDENTS

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ABSTRACT

Rapid changes and developments in the field of information technology are taking place, and e-marketing is growing day by day. So, teaching strategies should be adapted according to the cognition level of the students, which are helpful in developing digital skills or abilities of the learners towards learning science. Regarding this view, the study has chosen to find out the effect of the E-Learn Punjab Application on students' conceptual development. A quasi-experimental design was used. Purposive sampling was used to select 50 students of the 8th class studying in 2 sections of a Government Boys Elementary School in Sargodha District. These Sections were randomly allocated as experimental and control groups. The concept test of science (CTS) was developed to be used as a pre-test and post-test after validation through pilot testing and expert review. After the pre-test, the experimental group was treated with the E-Learn Punjab Application for six weeks, and the control group received instructions by conventional methods; after treatment post-test was conducted. The t-test and Cohen's D effect size were calculated and applied for data analysis. Results depicted that the experimental group students showed better results than the control group students in the concept test of science. It is recommended that teachers should promote the use of the E-Learn Punjab Application to teach science and other subjects at the elementary level.

Keywords: E-Learning; E-Learn Punjab application; Conceptual development; Science.

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<https://doi.org/10.52223/jess.2023.4335>

Received: September 15, 2023; Revised: December 12, 2023; Accepted: December 20, 2023

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INTRODUCTION

In science education, E-learning has proven to be an effective teaching approach. E-learning is defined by Clark and Mayer (2023) as instruction that is provided on a digital device, like a laptop, desktop, or mobile device, with the goal of assisting with learning. They distinguished two types of e-learning: synchronous (offered at a set time and led by an instructor) and asynchronous (self-learning available on demand). Constructivist learning theory makes the crucial premise that students learn by fusing new and old knowledge, with their active participation being a crucial component of this process. This is how Bodner (1986) summed up the constructivist theory: "Knowledge is constructed in the mind of the learner." Constructivist learning theory is "a good fit for e-learning because it ensures learning among learners," as Koohang et al. (2009) suggested. Constructivism is also helpful in explaining why it is so difficult for students to transform their preconceived notions about science into ones that are supported by science. Building a new theory that more fully explains students' experiences is the only way to replace an existing one (Bodner, 1986). Schools can provide knowledge and coaching to different places at once. It encourages learners to take control of their own learning and promotes the students' self-regulated learning (Elihami, 2022). Due to the growth of ICT and budget, the culture of the globe is swiftly changing. It has directly interconnected societies with each other (Baldin, 2016). Creating new opportunities and challenges has

made a pathway for individual growth and educational development. To meet international standards, there is a dire need to redesign the curriculum for academic excellence (Akram et al., 2022).

The above discussion revealed that there is a dire need to use modern Information and Communication Technology (ICT) to develop the ability and attitude of learners towards learning through the E-Learn Punjab Application. The value and effectiveness of the E-Learn Punjab Application may be examined in the instructional institutions of Punjab, Pakistan, to determine its value and effectiveness. Therefore, the 8th-grade students were selected for this study because learners of this level have higher-order thinking abilities and may have the ability to learn through the E-Learn Application if they are instructed accordingly. Keeping in view the importance of E-learning, this research is an effort to analyze the impact of E-learning on the concept development of students toward science subjects at the elementary level.

Electronic learning is the implementation of web technology to improve concept development (Al-Fraihat et al., 2020). In order to manage access to E-learning components, technological uniformity, and procedures for peer review of these resources, learners can customize their experiences using E-learning technologies, which give them the ability to control the learning process, pace of learning, and frequent communications. Students' motivation, engagement, and attendance all increase as a result of e-learning, particularly for underachievers. According to certain meta-analyses, learning outcomes are somewhat improved when face-to-face instruction and e-learning are combined (Olson et al., 2011).

The study conducted by Ural and Erkan (2015) investigated the impact of using concept maps in combination with web-based educational software to teach Structure and Properties of Matter on the academic performance of seventh-grade students in Turkey. According to their study's findings, these resources helped pupils succeed academically for three reasons: (1) In contrast to traditional learning environments, web-assisted programs offer an infinite amount of replay time and adjust to each individual's learning pace; (2) Students learn better when provided with rich audio-visual content, (3) The purpose of this learning material's design is to facilitate meaningful learning, which requires establishing connections between newly learned content and prior knowledge. Stern et al. (2008) investigated how well seventh-grade students understood kinetic molecular theory after using a dynamic software simulation. According to their findings, as compared to the students in the control group, the experimental group's learners performed noticeably better and showed better comprehension of the variations in the arrangement and mobility of molecules in the three states of matter.

As mentioned above, e-learning is not used only in elementary and secondary education. University students were given access to a chemistry learning resource created by Potter and Overton (2006). Their study's findings demonstrated that the students' attitude to it was positive. According to Erkan et al. (2016), students prefer web-based learning because to its strong visual design, the opportunity to learn step-by-step at their own speed, and the ability to review the content as needed. According to their research, students' favorable attitudes about chemistry, which are linked to their academic success, were influenced by Web-Based Learning Material (WBLM). According to research by Olakanmi (2015), pupils who used web-based computer simulations had far higher learning rates when it came to chemical reactions. This suggests that chemistry teachers should be trained to use these kinds of tools. Life has become easier because of the revolution of technology. The use of technology in every walk of life is very common. In the same way, it affects the learning process by making it easy to acquire quality education at the doorstep. According to Kanwal and Rehman (2017), e-learning has been acknowledged by the learner community much more in recent years all over the world, with a projection of about 10-15 million students enrolled in online courses.

It has been noted that many educational institutions have implemented multimedia learning tools and the internet to expand access, the standard of instruction, and student and teacher learning. Kanwal and Rehman (2017) believe that the increasing usage of the internet has made it easier for academics, educators, and learners to evaluate concepts. Kanwal and Rehman (2017) assert that sociocultural impacts

are important distinguishing factors of E-Learning. The global economy is interconnected and based on E-Learning, which is made possible by Information and Communication Technology. According to Valverde-Berrocoso et al. (2020) the following important problems best describe current E-Learning developments: i) The adoption of flexible, personalize, self-oriented learning as opposed to traditional learning or coaching, ii) Change from product-oriented education to procedural education, iii) Learning is done in groups with instructors, specialists, other students, etc.

The use of various E-Learning platforms has caused a fundamental shift in the way that power is distributed in the educational system, not just among service providers but especially in the relationship between teachers and students. The previous hierarchy is disintegrating as a community of learners, and developments in moralistic instruction are observed internationally (Valverde-Berrocoso et al., 2020). The broad usage of academic development is supported by E-learning. E-learning is more effective than conventional learning methods and offers numerous benefits. The most convenient way for students to develop their concepts in science is through the use of e-learning (Akram et al., 2022). Investing in E-Learning infrastructure and technology is a one-time investment for stakeholders, and regular upgradation & maintenance is required. It saves time for instructors as well as learners by accessing the information from anywhere (Akram et al., 2022). According to McCutcheon and Lohan (2017), e-learning helps develop new theories or practices due to the participation of multiple learners and instructors from various places. E-learning replaces paper and other learning materials that companies developed by using natural resources.

E-Learn Punjab Application

The Punjab government is always looking for modern ways to help public school students achieve better learning results. The Department of Education and PITB have been collaborating extensively to create, evaluate, and deploy E-learning technologies for public schools (eLearn, n.d). According to the website INCPAK (2018), the Board of Information in Punjab (PITB) has boosted E-Learn App, an online educational App for learning (eLearn, n.d). The authorized source for digital books is the E-Learn Application. Digital lessons, drawings, visualizations, models, and collaborative evaluations have all been included in every textbook. Usman (2014) reported that E-Learn Punjab would make learning more interactive. The research aimed to depict whether instructive organizations can practice technologies to enhance pupil's education and attention. Several nations are using E-learning to promote education. According to Hauser et al. (2022), in developing nations like Pakistan, where digitalization is still in its infancy, e-learning is not being widely used or encouraged. The present study investigates how E-Learning may benefit Pakistani students' concept development in early education.

Hypothesis of the study

H₀₁: There is no significant difference between the mean score in pre-test of the concept test of the science of the pupils of control and experimental groups.

H₀₂: There is no significant difference between the mean scores in the concept test of science of the students of control and experimental groups in the post-test.

H₀₃: There is no significant difference between the mean scores of comprehension level and application level items in the concept test of science of the students of control and experimental groups in post-test

H₀₄: There is no significant difference between the mean gain scores in the concept test of the science of the students of control and experimental groups

METHODOLOGY

The study employed a quasi-experimental research design with a non-randomized pre-test and post-test comparison group. It was performed in compliance with the timetable bindings and the willingness of the head teacher. Experimental and control groups were selected as two intact groups of grade 8th of Government Elementary School in Sargodha District.

The population consisted of all 8th-grade students studying in public-sector elementary schools in the Sargodha district. Due to an experimental study, on the basis of head teachers' and teachers' willingness and functional computer lab, a purposive sampling technique was used to select 8th-grade students of a Government Boys Elementary School (GES) in Sargodha District. This school also had a functional computer lab and a qualified IT teacher, which is a basic research need. The selected school had 50 students in the 8th class; all those were taken in the sample (N=50) and divided into two sections. Randomly, one section was selected as the experimental group and the other section was selected as the control group.

A concept test of science (CTS) was developed to assess the concept development of learners towards learning science. The six topics from the 8th grade science book published by Punjab Curriculum and Textbook Board Lahore, Government of Punjab, Pakistan, were selected to develop the concept test. This book comprises three sections: life, chemical, and physical and space sciences. Two topics from each section were selected, i.e., Nervous System from Chapter 1, Biotechnology from Chapter 3, Conservation of Resources from Chapter 4, Chemical Reactions from Chapter 5, Pascal Law from Chapter 7, and Electricity from Chapter 11. The test consisted of 25 MCQs of one mark each. Each item was selected and planned, conferring to Bloom's Taxonomy.

According to the cognitive domain levels, from all topics, 36% of items were of comprehension level, and 64% of items were of application and above level. The topic-wise distribution of items was 16% from the nervous system, 20% from the biotechnology, 12% from the conservation of resources, 28% from the chemical reactions, 12% from the Pascal law, and 12% from the electricity.

Procedure

In this experimental study, on the basis of head teachers and teacher's willingness and functional computer lab, a purposive sampling technique was used to select 8th-grade students of a Government Boys Elementary School (GES) in Sargodha which had a functional computer lab, the basic need of research. The total number of 8th-grade students in the sample was 50, already divided into two sections of 8th grade; randomly, one section was taken as an experimental group and the other section as a control group. The experimental group in the school was taught through the E-learn Punjab application by the researcher, while the researcher taught the control group routine teacher-centred teaching methods.

After making groups (experimental and control), before initiating the treatments, a concept test of science (CTS) was conducted on students of both groups as a pre-test. The pre-test results were used to determine the reference point of equivalency in students' prior knowledge. However, the results of the pre-test were not disclosed to students to avoid any competition among them. After six weeks of treatment, post-tests (Concept test of science and scale for attitude towards learning science) were administered to both groups (experimental and control groups).

The researcher administered the course of 6 weeks, and six periods of study were spent by the students during each week according to lesson plans. The lesson plans for the teaching experimental group were developed according to the E-learn Punjab application. To manage within the 45 minutes of the study session, longer topics were split into 2 or 3 portions. According to the students' level requirements, situational problems and questions were developed to answer for home-based assignments. Subsequently, explanations were debated in the class.

Data Analysis

Data collected through the concept test of science (CTS) was analyzed through the mean score, standard deviation, and difference of mean scores were computed, and an independent sample t-test was applied for significant difference between the mean gain scores (mean of the post-test minus mean of the pre-test) of experimental and control group at 0.05 level. Effect size Cohn's d was calculated for the t-test as suggested by Ellis (2010). Cohen's d value < 0.1 = trivial effect; Cohen's d value < 0.3 = small effect; Cohen's d value < 0.5 = moderate effect, and Cohen's d value ≥ 0.8 = large effect.

RESULTS AND DISCUSSION

Table 1 depicts that t value = 0.408 at p -value $0.685 > 0.05$ shows no significant difference of mean scores between the performance of students of both experimental and control groups and the null hypothesis of no difference was accepted. It revealed that the performance of students of both experimental and control groups was equivalent in the pre-test of concept test of science.

Table 1. Comparison of mean scores on concept pre-test of the pupils of control and experimental groups.

Group	N	Mean	SD	T	df	Sig. (p-value)
Experimental	25	8.60	2.1602	.408	48	.685
Control	25	8.36	1.9975			

Table 2 depicts that t value = 9.812 at p -value $0.000 < 0.05$ shows a significant difference between the performance of students of experimental and control groups, and the null hypothesis of no difference was rejected. It revealed that the performance of students of the experimental group was largely better than the students of the control group in the post-test of the concept test of science (Cohen's d effect size = $1.61 > 0.8$).

Table 2. Comparison of mean score concept post-test of the students of control and experimental groups.

Group	N	Mean	SD	T	df	p-value	Effect size d
Experimental	25	24.16	1.572	9.812	48	.000	1.61
Control	25	19.28	1.926				

Table 3 reflects that t value = 4.234 at p -value $0.000 < 0.05$ shows a significant difference between the mean scores of students of experimental and control groups, and the null hypothesis of no difference was rejected. It revealed that the performance of students of the experimental group was better than students of the control group in the mean scores of comprehension level items of concept post-test of science. The Cohen's d effect size = $1.03 > 0.8$ showed a significant difference.

Table 3. Comparison of mean scores of comprehension level items of concept post-test of the students of control and experimental groups.

Group	N	Mean	SD	T	df	p-value	Effect size d
Experimental	25	8.80	.50	4.234	48	.000	1.03
Control	25	7.72	1.17				

Table 4 depicts that t value = 9.131 at p -value $0.000 < 0.05$ shows a significant difference between the performance of students of experimental and control groups, and the null hypothesis of no difference was rejected. It revealed that the performance of students of the experimental group was better than students of the control group in the mean scores of applications and above-level items of concept post-test of science. The Cohen's d effect size = $1.57 > 0.8$ showed a large difference.

Table 4. Comparison of mean scores of applications and above level items of concept post-test of the students of control and experimental groups.

Group	N	Mean	SD	T	df	p-value	Effect size d
Experimental	25	15.36	1.25	9.131	48	.000	1.57
Control	25	11.56	1.66				

Table 5 depicts that t value = 6.11 at p -value $0.000 < 0.05$ shows a significant difference between the performance of students of experimental and control groups, and the null hypothesis of no difference was rejected. It revealed that the performance of students of the experimental group was better than that of

students of the control group in the mean gain scores of the concept test of science. The Cohen's *d* effect size = 1.30 > 0.8 showed that the difference in mean gain scores of the concept test was larger.

Table 5. Comparison of mean gain scores of concept test of students of control and experimental groups.

Group	N	Mean gain scores	SD	T	df	p-value	Effect size <i>d</i>
Experimental	25	15.56	2.873	6.11	48	.000	1.30
Control	25	10.92	2.482				

Discussion

The 8th grade pupils of the experimental group treated by the E-Learn Punjab Application depicted better outcomes in the concept test of science than the pupils of the control group treated by ordinary method. Learning through the E-learn Punjab application helped the students increase their concept development in science. The major reason is that learning through the E-learn Punjab application allows learners to actively participate in the education process and improves their concept development while watching video lectures and animations. The constructivist method states that because of their active participation, the learners created their own concepts by understanding their learning and feelings (Kar, 2022).

Educational Implications

Learning through the E-learn Punjab application is student-centered, while our teachers and students are taught through a traditional teacher-centered learning approach. The results of the study depict that the concept development of students in science learning through a student-centered approach, E-learn App, is much better than the students learning through traditional teacher-centered approach, which is why we need to shift towards a student-centered approach.

CONCLUSIONS AND RECOMMENDATIONS

Students treated by learning through the E-learn Punjab application were also better in the comprehension level questions of concept test than the students treated by traditional teaching methods because the E-learn Punjab application learning strategy enhances the understanding ability of the students. Pupils of the experimental group also showed better performance in the application and above level items of the concept test than the control group students. E-learn Punjab application helps students to develop their concepts and make them to solve daily life problems. The likely result of Elihami (2022) is that e-learning enhances the students' learning, thinking, and reasoning abilities. Due to E-learning, the learner is able to understand not only the fundamental ideas but also learn to employ them in required situations.

Research could delve into a more comprehensive examination of the integration of the E-learn Punjab Application as homework assignments, possibly extending its scope to include schools in rural areas. Potential disparities in students' socio-demographic backgrounds are worth considering, as these variations may impact their concept development. Additionally, it could provide valuable insights to explore the effects of implementing the E-learn Punjab App on students' motivation to engage with science and math, their attitudes toward the subject, and their preferences for learning methods. Furthermore, Ercan et al. (2016) have compiled a substantial body of research indicating the pivotal role of teachers and their attitudes in the teaching process, given that some teachers have expressed uncertainty regarding adopting E-learn Applications. It could be worthwhile to expand the research by investigating the influence of teachers' attitudes in the context of E-learning integration.

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