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Exploring Effectiveness of E-Learning in Public Elementary Schools in District Centre Karachi with Reference to Instructional Design

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Abstract

The rapid development of digital technologies has significantly transformed educational practices, leading to the increasing adoption of e-learning in schools worldwide. In Pakistan, e-learning has emerged as an important alternative and supplementary mode of education, particularly in public elementary schools. However, the effectiveness of e-learning depends largely on the quality of instructional design, technological infrastructure, digital accessibility, and student engagement. This study aimed to examine the effectiveness of e-learning in public elementary schools in District Central Karachi with reference to instructional design. Specifically, it investigated the relationship between instructional design and e-learning effectiveness and examined the predictive role of instructional design in enhancing students' learning experiences. A quantitative research design employing a descriptive survey method was adopted for the study. Data were collected from 80 students enrolled in public elementary schools in District Central Karachi through a structured questionnaire consisting of 13 items. The collected data were analyzed using the Statistical Package for Social Sciences (SPSS) through descriptive statistics, reliability analysis, correlation analysis, and regression analysis. The findings indicated that students generally held positive perceptions regarding e-learning and instructional design. The reliability analysis demonstrated excellent internal consistency of the instrument (Cronbach's Alpha = 0.97). Furthermore, the results revealed a very strong positive relationship between instructional design and e-learning effectiveness ($r = 0.92$, $p < 0.01$). Regression analysis also confirmed that instructional design is a significant predictor of e-learning effectiveness. The study concludes that effective instructional design plays a crucial role in improving students' engagement, learning experiences, and the overall quality of e-learning in public elementary schools. It recommends strengthening instructional design practices and improving digital infrastructure to maximize the effectiveness of technology-enhanced education.

Keywords: E-learning Effectiveness, Instructional Design, Public Elementary Schools, Student Engagement, Digital Learning

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Introduction

The paper explains how e-learning has been increasingly integrated in the education systems of the people, especially in Karachi whereby digital programs have been introduced to bring in modernization in instruction practices. It brings out the impact of technological development and recent changes in education on the teaching and learning activities in the elementary schools in the society. Special consideration is given to how the instructional design can help in ensuring that the e-learning is not only technologically available but also effective pedagogically. In addition, the research problem is clearly stated in the chapter because the author focuses on the paucity of empirical data on the topic of e-learning effectiveness in elementary schools in public schools. It describes the study aim and research questions that will serve the study, which entail the instructional design practices, teacher preparedness, student engagement, and learning outcomes.

Background to the Study

Advancement of Information and Communication Technology (ICT) has revolutionized the educational systems across the world. The adoption of digital tools into the teaching and learning dynamics has transformed the conventional classroom practices and created new ways of teaching. E-learning, which can be defined as utilization of electronic technologies to gain access to educational curriculum out of a traditional classroom is now a mandatory element of the contemporary educational system. Organizations like UNESCO and World Bank all over the world insist on the value of digital learning environments to enhance access, equity, and quality in learning. The COVID-19 has further boosted the use of e-learning platforms as schools across the world move away to the online and blended learning platforms.

The e-learning process in the state elementary schools has been on the rise in Pakistan especially in Karachi. The School Education and Literacy Department Sindh has developed several programs to integrate the use of digital resources and online platforms in the public schools. But the success of e-learning highly relies on appropriate instructions design, teacher readiness, or presence of infrastructure and digital literacy of students.

Although the use of e-learning has increased in public elementary schools, educational outcomes of e-learning are dependent on the quality of instructional design in educational content delivery as well as availability of technological resources. Good instructional design involves developing learning materials in a manner that will help the students to understand, interact and engage with digital platforms. Poorly designed e-learning systems may not produce desired educational outcomes, in the context of elementary education, where the students need age appropriate, interactive and guided learning. A few empirical studies in public elementary schools of Karachi have explored the impact of instructional design on the effectiveness of e-learning implementation. Digital learning continues to grow, but there are many issues to address, including teacher readiness, infrastructure, student digital literacy, and quality of instructional materials. Thus, this study is important in that it will provide evidence-based information on the effectiveness of e-learning from an instructional design perspective that may help the decision makers, school leaders and teachers in improving the application of e-learning in public elementary schools in order to improve the learning outcomes.

Online ISSN: 3006-8886
Print ISSN: 3006-8878

Statement of the Problem

Although e-learning in District Centre Karachi is steadily being embraced in public elementary schools, there is scanty empirical evidence on its effectiveness especially when it comes to the aspect of instructional design. The problems encountered by many schools include but not limited to, poor technological structure, insufficient training of teachers, inappropriately designed digital materials and interactive teaching methods. Lack of effective instructional design framework can be a barrier in attainment of learning goals and student interaction. Consequently, this research paper aims at exploring the topic of e-learning in educational settings within public elementary schools in District Centre Karachi to determine whether learning practices in the schools have been implemented and designed efficiently to promote the learning outcomes of students.

Research Questions

The main research questions of this study are:

- What is the current status of e-learning implementation in public elementary schools of District Central Karachi?
- To what extent are instructional design principles applied in e-learning practices?
- What is the relationship between instructional design quality and the effectiveness of e-learning?
- Does instructional design significantly predict students' academic performance and engagement in e-learning environments?

Research Hypothesis

H01: There is no significant relationship between instructional design quality and e-learning effectiveness.

H02: Instructional design does not significantly predict school students' academic achievement in an e-learning environments.

H03: There is no significant difference in student engagement between e-learning programs developed with instructional design principles and those without structured design.

Purpose of the Study

This research will be aimed at formulating a full-fledged conceptualization of e-learning specifically applied to lower secondary schools in government sector of Karachi. The study attempts to improve the quality of education, as well as to make the learning process more effective and accessible to students by offering a possible and sustainable instructional design such as ADDIE or others. The study will also make contributions and suggestions to the policymakers and school administrators to aid the effective incorporation of e-learning with the instructional design in the government schools.

Justification of the Study

Being the largest urban city in the Pakistani territory, Karachi is the home to a huge number of publicly-run elementary schools that work under a variety of socio-economic conditions. Alt-

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hough in the recent years digital initiatives are launched, the gaps in technological access and training of teachers and the quality of instruction are still noticeable. Research on e-learning efficacy in this particular district situation is required to comprehend the fact that digital learning is fulfilling its purpose or is it a transient solution to conventional instruction.

Scope of the Study

The area of this research is limited to the Karachi lower secondary government schools. It dwells on the research of a model of e-learning based on instructional design such as ADDIE or any other that considers the unique needs and limitation of these schools. The research involves quantitative data gathered on a sample of 80 respondents by way of questionnaires. It investigates the perception and challenges of e-learning implementation as well as the solution to the same in this regard.

Delimitation of the Study

This research is limited to lower secondary schools in Karachi government and not the other schools including the private schools or any other level. It is more about creating an e-learning model and not an analysis of the current e-learning programs. The sample is narrowed down to 80 participants of students, which might not provide a complete range of experiences and worldviews of the whole population of teachers. Furthermore, the research is based on quantitative data and this offers detailed information but could not be generalized to all the government schools in Karachi.

Basic Assumptions in the Study

- Participants will provide honest and accurate responses.
- The selected sample of participants will be representative of the broader population of educators and administrators in government lower secondary schools in Karachi.
- The current technological infrastructure in government schools can be enhanced to support school e-learning initiatives.
- E-learning can address some of the educational challenges faced by government schools in Karachi.

Key terms in the study

1. E-learning: The use of electronic technologies to deliver educational content and facilitate learning.
2. Government Schools: Publicly funded schools that are managed by the government
3. Instructional Design: A systematic process of planning, developing, implementing, and evaluating instructional materials and learning experiences.
4. Elementary Schools: Public schools providing education typically from grades VI to VIII.
5. Effectiveness: The extent to which e-learning achieves intended learning outcomes, enhances engagement, and improves academic performance.

Literature Review

This review entails critical literature paradigm pertaining to the study. The content has been derived on different sources that are more in line with the theme and objectives of the study. With

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the rise in the field of technology, this area has come a long way and scholars have conducted studies on many themes of e-learning such as its effectiveness, implementation, challenges and future trends.

E-Learning Concept

E-learning has been termed as a pedagogical method which involves the use of digital technologies in teaching and learning. Allen and Seaman (2017) define e-learning as web-based interventions, multimedia resources, online tests, online discussions, and interactive solutions, which can improve flexibility and accessibility in learning. E-learning is not related solely to the remote method of learning; it is also blended to include the in-class training that is enhanced with the help of digital tools (Means et al., 2014).

Key Features of E-Learning:

- Accessibility to digital resources
- Interaction through virtual platforms
- Flexibility in time and pace of learning
- Self-directed learning opportunities

Instructional Design in E Learning

Instructional design can be defined as the systematic means through which the effective learning experience is developed by means of organized contents, visual presentation, activities of engagement of the learner, and assessment (Smith and Ragan, 2005). It guarantees the correspondence amid the targets of learning, content delivery, lawfulness, and the experience of the learners. Instructional design is guided by a number of models:

- ADDIE Model (Analysis, Design, Development, Implementation, Evaluation).
- Nine Events of Instruction: The Nine Events of Instruction by Gagné.
- Merrill First Principles of Instruction.
- These models focus on the learner-centered design, having clear goals, feedback, and scaffolding to achieve effective instruction

Global Perspectives on E-Learning Effectiveness in Elementary Schools

In the modern education, technology has been a revolutionary tool that has not only changed the way that education is delivered, but also the way that communication and access to learning materials occur. In education, the use of technology has enabled teachers to communicate with students and make digital learning materials more accessible, as well as to use new teaching methods. It has also played a part in the management of information systems and in the modernization of methods of instruction and learning in schools (Štrukelj et al. 2019; Urh et al. 2015). The rise of technology in elementary education worldwide represents a wider trend of leveraging technology to enhance the quality and accessibility of education. Despite the growing use of e-learning around the world, the concepts of terminology used in technology-based education are still unclear. In the literature, words like online learning, web-based learning, distance learning, digital learning and learning objects are used interchangeably, and it is not clear how they differ (Pretorius et al. 2019). This contradiction is the source of confusion for both educators and policy mak-

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ers in choosing or implementing the right technological strategies in educational institutions or for researchers. An understanding of e-learning concepts is important, especially in elementary schools where teaching methods need to be well planned to accommodate the developmental needs of young students. Research has demonstrated that in the world, the success of e-learning is not only related to the availability of technology, but also to the quality of the instructional design, teacher competence, student engagement and institutional readiness.

Academic Outcomes and Engagement

A number of international research studies have identified how effective e-learning can be for students' learning and participation in the classroom, especially if digital learning environments are designed well. Studies indicate that e-learning may play a significant role in enhancing the learning outcomes if the learning content is organized, interactive, and related to the learning goals. Based on the research of Hsu (2016), it can be seen that the use of structured learning using the internet for younger students showed better mathematical performance than students who used conventional face-to-face learning. This indicates that the e-learning interventions, which were designed well, can improve the conceptual understanding and achievement of elementary school students.

Sung, Chang, & Yang (2015) found that the blended approach of using multimedia instructional tools and regular feedback greatly enhanced primary school students' motivation to learn and knowledge retention. Younger students' learning is enhanced by the use of multimedia elements, including videos, animations, graphics and interactive exercises, catering to various learning styles and keeping students engaged. Regular feedback also enables pupils to see where they are doing well and where they need to make improvements in their learning. These results suggest that when used appropriately, e-learning positively impacts cognitive and behavioural dimensions of learning and it is a useful teaching method in elementary education.

Readiness and Professional Development

It is well understood that teacher readiness is a key element that determines the success of e-learning implementation in schools. Successful digital learning is highly reliant on teachers' skill in using technology meaningfully and effectively within their instructional practices. However, Ertmer & Ottenbreit-Leftwich (2010) assert that teachers' beliefs about technology, their own digital competencies and their instructional planning skills are important factors in determining whether technology is an effective learning tool for their students. Confident and competent teachers in the effective use of digital technologies are more likely to plan lessons that are engaging and to create effective online learning experiences. Moreover, sufficient professional development is needed to develop teachers for the changing needs of an e-learning environment. Underutilization of educational technologies and the lack of structuring of online instructional materials are often a result of insufficient teacher training, according to Koehler & Mishra (2009). Teachers might face challenges in adapting to the digital platform and might not be able to use the traditional methods effectively if they are not well-trained, impacting students' learning and engagement. Thus, continuous professional development (CPD) programs emphasizing technical skills, instructional design and classroom technology integration are imperative in enhancing the effectiveness of e-learning especially in elementary education where instructional guidance is critical.

Online ISSN: 3006-8886
Print ISSN: 3006-8878

Challenges in Implementation

Although there are many positive attributes to e-learning, there are several studies conducted around the world which have pointed out the many challenges that stand in the way of successful e-learning implementation, particularly in public school environments. The lack of technological infrastructure, such as Internet connectivity, digital device access, and technical support, is one of the major challenges (Liu et al., 2015). The limitations in the infrastructure prevent teachers and students from engaging in digital learning environments, especially in low-resource educational systems. The other important issue is that the instructional design strategies used in e-learning platforms are ineffective, which decreases the educational value of the platform (Johnson et al., 2016).

Digital content may be poorly designed and fail to engage learners, present information in confusing ways, or be lacking of appropriate interactivity necessary for effective learning. Moreover, the digital divide is a significant issue as there are gaps in technology access across various socio-economic groups, leading to unequal learning opportunities (Van Dijk, 2020). Disadvantaged students may have challenges accessing devices, internet services or learning environments at home. Such obstacles are responsible for the fact that the learning outcomes in various learning environments are not always the same and that, in the implementation of e-learning, strategic planning, equitable resource allocation and better instructional design are necessary.

E-Learning and Instructional Design in Developing Countries

Interest in the introduction of e-learning in developing countries has been growing as education systems try to improve the way teaching and learning are done using digital technologies. Developed countries have witnessed a lot of advancements in the incorporation of e-learning in mainstream education while many developing countries are still beset with various structural, economic and institutional problems that hinder the successful incorporation of e-learning in mainstream education. In these contexts, effectiveness of e-learning is not only dependent on the technological infrastructure but also on the adaptation of the instructional design strategies to the local educational realities. Internet access, the price of digital devices, teacher readiness, and curriculum compatibility are all significant factors in the success of e-learning for student learning outcomes in elementary education.

A context-sensitive approach to instructional design is needed for developing countries, where it is necessary to consider the educational, cultural and socio-economic context of the learning environment. In many developing countries, e-learning has not been as successful as one would expect in technologically advanced countries, because of problems with infrastructure, teacher training, and access to learners. Hence, the design and implementation of e-learning systems in these areas need to be based on equity, accessibility and relevance for meaningful learning experiences for young students.

Accessibility and Equity Issues

Accessibility and equity are still one of the most important obstacles which can hinder the successful implementation of e-learning in developing countries. There is a lack of internet connectivity, digital devices, electrical power and technical support systems in many educational institutions, especially public schools. These barriers result in inequitable opportunities for students and

Online ISSN: 3006-8886
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hinder effective digital learning initiatives. Rizvi and Islam (2020) highlighted that in many cases, poor e-learning usage is due to the lack of internet connections, digital devices, and teacher education in public schools. These constraints hinder schools from delivering consistent and good digital learning experiences.

Equity issues also exist if students with different socio-economic backgrounds do not have equal access to technological resources. Some learners from low-income families might not have access to a smartphone, a computer or a reliable internet connection at home, thus putting them at a disadvantage when compared to their peers. Digital inequality is directly linked to participation, engagement and achievement in digital learning. These gaps are even more evident in elementary education, where younger students may need parental monitoring and support with technology. Accessibility and equity are thus key challenges in implementing inclusive and effective e-learning in the context of developing education.

Local Curriculum Integration

Another key factor in the effectiveness of e-learning in developing countries is whether the digital materials used for instruction are consistent with the local curriculum and educational needs. Without taking into account the national curriculum requirements, e-learning systems might not support the intended learning goals and hence, the academic outcomes might be poor. Digital content must be educationally relevant, age-appropriate, and align with the educational system's expectations of the learners. The instructional content that reflects local learning goals helps students understand the concepts effectively and interact with digital learning material meaningfully. There are some researchers who believe that e-learning is more effective if local culture and languages are used as the context of instruction. Oladokun, Adebowale and Aina (2008) notice that culturally and linguistically sensitive lessons delivered digitally aid learning comprehension of young learners. Elementary students learn best when content is delivered in a familiar language, culturally appropriate contexts, and examples that relate to them. This localized approach helps to get a better understanding and promotes students' engagement and motivation. Thus, for the effectiveness of e-learning in developing countries, it is important to incorporate local curriculum standards and contextual relevance in the design of the technology.

Status of E-Learning in Public Schools

The use of e-learning in government schools in Pakistan is not very consistent. The findings of research conducted by Qureshi (2019) have shown that despite the growing use of digital tools, teachers do not receive training in instructional design, which results in the inappropriateness of content delivery and learning outcomes. Similarly, Ali & Ahmad (2021) found that primary schools with better technological support reported higher engagement levels; however, many schools faced challenges related to infrastructure, teacher preparedness, and curriculum adaptation.

Instructional Design in Pakistani Schools. Studies have shown that the Pakistani curriculum on public education has not had much emphasis on the principle of instructional design. As Shah and Farooq (2022) note, the bulk of digital content in the case of public schools is extracurricular and not coordinated with the learning goals and the evaluation systems.

Online ISSN: 3006-8886
Print ISSN: 3006-8878

Constructivism Learning Theory

According to constructivist theory, learners develop knowledge based on the active engagement with the material and the surroundings (Piaget, 1954; Vygotsky, 1978). In e-learning, the design of the instructions needs to incorporate interactive activities, scaffolding, and feedback to facilitate in-depth learning.

Technology Acceptance Model (TAM)

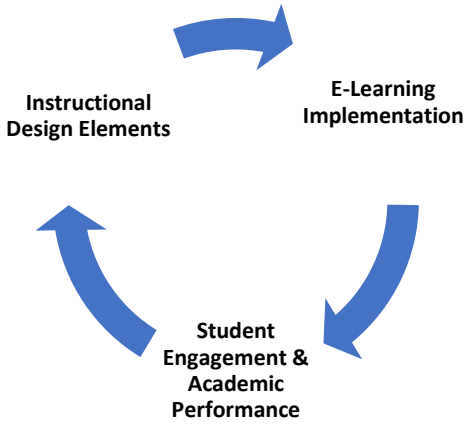
Davis (1989) suggested TAM to clarify how users accept the technology depending on their perceived usefulness and ease of use. Instructional design has a great bearing on both perceptions in the context of e-learning. Disorganized digital classes reduce the perceived usefulness with negative effects on adoption and effectiveness.

Gaps in Literature

1. Limited empirical studies in Pakistan's public elementary context.
2. Insufficient focus on instructional design quality as a determinant of e-learning success.
3. Lack of research linking teacher readiness and student outcome data within e-learning frameworks.

Conceptual Framework of the Study

Based on the literature, the conceptual framework for this study posits that:



Methodology

It is in this chapter that the methodology used in the study is explained to elaborate on the research design, population, sample and sampling method, research instrument, validity and reliability of the research instrument, data collection process and data analysis methods. This methodology will attempt to systematically study the effects of instructional design on the effectiveness of e-learning in elementary, state schools. The research design that was utilized in the study is quantitative research that employed a descriptive survey. It is stated that the descriptive survey design was suitable as it enables the researcher to gather a substantial number of respondents in order to analyze their impressions based on the effectiveness of e-learning practices and teaching

Online ISSN: 3006-8886
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and instructional design strategies of the elementary schools in the country. Another use of the survey design is that it aids in the analysis of relationships between instructional design elements and effectiveness of e-learning in teaching and learning process.

Target Population

This study focused on the target population which consisted of Government Lower Secondary Schools in Karachi. This involves in these institutions. It is aimed at learning their experiences, difficulties, and perception regarding the e-learning in terms of instructional design. By focusing on this cohort, the research will examine efficacy that considers the peculiarities of needs and limitations of governmental schools located in Karachi, which will yield feedback, which can be utilized directly to improve the quality and access to education using digital tools.

Sampling Techniques

The study population was a sample of students of public elementary schools (Grades VI-VIII) in the District Central Karachi, Sindh, Pakistan. These schools are run by the school education and literacy department (SELD) Government of Sindh. Students were involved as they are the key e-learning systems beneficiaries. The school management will be interviewed with an aim of getting the information about the problems they are experiencing in their day-to-day activities which include the store department which handles the distributions of the products and other issues that concern them which are having problems because they lack the management expertise.

Instrument Development

Data for the study was collected through a structured questionnaire developed by the researcher after reviewing relevant literature on e-learning and instructional design.

Plan of Data Collection

The following steps were taken to collect data:

1. Permission was obtained from the relevant school authorities.
2. Selected public elementary schools in District Central Karachi will be visited by the researcher.
3. Questionnaires were distributed to students.
4. Participants were informed about the purpose of the research.
5. Completed questionnaires were collected and organized for analysis.

Results

Demographic Characteristics

The demographic characteristics of the respondents included in the study are shown in Table 1. As the study is confined to students of public elementary schools of District Central Karachi, all the respondents are from the student's category. As for the gender distribution, 50% (40) of the respondents were males and 50% (40) were females, which means that there were equal representation of males and females in the sample.

Online ISSN: 3006-8886
Print ISSN: 3006-8878

Table 1: Demographic Characteristics of Respondents (N = 80)

Variable	Category	Frequency	Percentage (%)
Gender	Male	40	50.0
	Female	40	50.0
Total		80	100.0

The demographic data shows that males and females students were equally involved and the gender distribution of the respondents is balanced. This balanced sample reduces the risk of gender bias and ensures a representative sample for the students' perceptions of the effectiveness of e-learning and instructional design in public elementary schools. The equal representation also makes the study findings to be credible and reliable since the views of both genders are equally reflected in the study analysis.

Descriptive Statistics

Descriptive statistics of the statements about e-learning and instructional design are shown in Table 2. The results show that students' perception of the effectiveness of e-learning and the role of instructional design in improving the learning process in general is positive. The findings indicate that the respondents' perception of e-learning implementation (M = 2.47) and e-learning's impact on students' engagement (M = 2.47) are positive. Instructional design is also considered to be an important element to improve the quality of e-learning (M = 2.32) and to improve students' academic performance (M = 2.37). The relatively lower mean score for the statement about achieving the learning objectives (M = 2.07) also indicates that students strongly believe that the importance of effective instructional design in helping to achieve learning outcomes.

Table 2: Descriptive Statistics of E-Learning and Instructional Design (N = 80)

Statement	Mean	Std. Deviation
E-learning is effectively implemented in the institution	2.47	1.13
Instructional design improves the quality of e-learning	2.32	1.07
Students possess adequate skills to use e-learning tools	2.69	1.07
E-learning increases student engagement	2.47	1.07
Digital resources are easily accessible to students	2.70	1.22
Instructional design improves students' academic performance	2.37	0.96
E-learning is more effective than traditional teaching	2.71	0.92
Infrastructure is sufficient for e-learning	2.90	1.25
Instructional design helps achieve learning objectives	2.07	0.97
Instructional design relates to student engagement	2.52	1.04
Well-structured content improves understanding	2.39	0.96
Feedback through e-learning enhances learning	2.40	1.04
Students are motivated by proper instructional design	2.48	1.04

The results also show some aspects that need to be improved so that e-learning can be used optimally. Compensatory moderate perceptions were found for student skills with the use of e-learning tools (M = 2.69) and access of digital resources (M = 2.70), indicating that digital literacy and digital resources are important challenges. Similarly, the mean score of the statement "e-learning is more effective than conventional classroom instruction" was also 2.71, indicating that

Online ISSN: 3006-8886
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students also have mixed feelings about the effectiveness of e-learning compared to conventional classroom instruction. The mean score for infrastructure (M = 2.90) also indicates that technological facilities such as Internet connection and digital tools are still significant challenges for an effective e-learning implementation. Moreover, the findings highlight the importance of ID in students' learning experiences. Students felt that effective instructional design increases engagement (M = 2.52), increases understanding due to good structure (M = 2.39), and enhances learning through timely feedback (M = 2.40). They also recognized that suitable instructional design boosts their motivation to learn (M = 2.48). Overall, the descriptive findings indicate that students' perception of e-learning and perception of the instructional design are generally positive, but there are still some areas that need improvement, such as: digital infrastructure, accessibility of learning resources, and students' technological competence, to achieve more effective and meaningful e-learning experiences.

Reliability Statistics

Cronbach's Alpha was used to evaluate the reliability of the questionnaire to establish how internally consistent the measurement tool was. The total Cronbach's Alpha value of the 13 items used in the scale was determined to be 0.97 as shown in Table 3. This value is an excellent level of internal consistency between the items, which means that the instrument can be used to measure the constructs associated with e-learning and instructional design with high reliability.

Table 3: Reliability Statistics of the Questionnaire

Cronbach's Alpha	Number of Items
0.97	13

A Cronbach's Alpha of more than 0.90 is usually regarded as excellent, and it proves that the answers are consistent and reliable. Thus, all of them were stored to be analyzed further statistically because the scale has a very high level of reliability, and it can be used in this study. The Pearson correlation analysis results to check the relationship between instructional design and e-learning effectiveness of students are shown in Table 4. The results show that there is a very strong and positive relationship between the two variables ($r = 0.917$, $p < 0.01$), meaning that the higher the instructional design, the greater the effectiveness of the e-learning. Perceptions of well-structured and effective instructional design also led to more positive learning experiences and higher engagement in e-learning activities.

Table 4: Correlation Analysis between Instructional Design and E-learning Effectiveness

		Instructional Design	E-learning
Instructional Design	Pearson Correlation	1	.917**
	Sig. (2-tailed)		.000
	N	80	80
E-learning	Pearson Correlation	.917**	1
	Sig. (2-tailed)	.000	
	N	80	80

Correlation is significant at the 0.01 level (2-tailed).

Online ISSN: 3006-8886
Print ISSN: 3006-8878

The result of the significance value (p = .000) indicates that the relationship between instructional design and e-learning effectiveness is statistically significant and not likely to be due to chance. The high correlation coefficient indicates that there is a strong association between the two constructs, which means that the effective instructional design has a significant impact on students' perceptions of successful e-learning. The results show that the factors of course organization, learning activities and instructional strategies have a positive correlation with learning experiences in digital learning. From the findings, the null hypothesis is rejected, and the alternative hypothesis is accepted, which means that there is a significant relationship between instructional design and e-learning effectiveness. The findings give strong evidence that instructional design is one of the factors impacting the effectiveness of e-learning for students. Thus, the improvement of instructional design can have a great impact on the involvement of students, learning process, and the effectiveness of e-learning in learning institutions.

Regression Analysis

The results of the regression analysis used to investigate the predictive effect of instructional design to e-learning effectiveness of students is shown in table 5. The model summary shows that there is a very strong relationship between the independent variable and the dependent variable, as seen by the correlation coefficient (R = .917). Instructional design accounted for 84.1% of the variance in the e-learning effectiveness (R^2 = .841). In addition, the adjusted R^2 value is .839, which shows that the regression model is stable, and the standard error of the estimate is .371, which shows that the level of prediction is satisfactory.

Table 5: Regression Analysis of Instructional Design Predicting E-learning Effectiveness

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.917	.841	.839	.371

a. Predictors: (Constant), Instructional Design

Based on the results of the ANOVA in Table 6, the regression model is statistically significant (F = 517.363, p = .000) which shows that the instructional design is able to predict the effectiveness of e-learning among students. The large F-value indicates that the model accounts for a significant amount of the variability in the dependent variable and is a good fit of the observed data.

Table 6: ANOVA for variables

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	71.034	1	71.034	517.363	.000
Residual	13.456	98	.137		
Total	84.490	99			

a. Dependent Variable: E-learning, b. Predictors: (Constant), Instructional Design

The results in Table 7 also indicate that instructional design is a strong positive and statistically significant factor in the effectiveness of e-learning (β = .917, p = .000). The unstandardized coefficient (B = .904) means that every 1-unit increase in instructional design, the e-learning effectiveness will increase by 0.904 unit. The magnitude of the t-value (t = 22.746) and the confidence interval of (0.825, 0.982) are also good indicators of the power and reliability of the pre-

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dictor. These results validate that instructional design plays a considerable role in effective e-learning of the students.

Table 7: Coefficients

Model	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	.414	.099		4.166	.000	.217	.611
Instructional Design	.904	.040	.917	22.746	.000	.825	.982

The result of the regression shows that the null hypothesis is rejected and the alternative hypothesis is accepted, that is, instructional design can be stated that it significantly affects the effectiveness of e-learning. Results suggest that ID is a significant factor in determining the effectiveness of e-learning for students and it has a significant contribution in enhancing engagement, learning experiences and the educational outcomes in e-learning environments.

Discussion

Summary of Study

The primary purpose of this quantitative study was to explore the relationship between instructional design and effectiveness of e-learning among students in public elementary schools in District Central Karachi. As learning is becoming more digital and online learning is becoming more prevalent, an understanding of the impact of well-structured instructional design on students' learning experiences and learning outcomes is becoming critical. This study used descriptive survey research design with student respondents of 80. It emphasized on factors such as quality of instructional design, student engagement, digital accessibility, infrastructure and effectiveness of e-learning. The study does not only focus on the availability of e-learning, it rather focuses on the role of effective instructional design in improving the quality and success of e-learning environments.

Findings of the Research

The statistical analysis revealed a number of important results in relation to students' perceptions of e-learning and instructional design. Descriptive analysis showed that generally, the respondents had positive attitudes towards e-learning practices, while effective instructional design improves learning objectives, engagement, understanding and academic performance. Moderate responses in terms of digital infrastructure and accessibility of learning resources, however, indicate that technological constraints remain to be a barrier to the effectiveness of e-learning. Correlation analysis showed a very strong and significant relationship between instructional design and effectiveness of e-learning. Likewise, the regression analysis results showed that instructional design is a significant factor to predict the effectiveness of e-learning by contributing to a significant portion of the variation in students' learning experiences. These findings reveal that instructional design is one of the key elements to e-learning implementation success. The study also reveals that while the students are aware of the advantages of systematic learning with the aid of digital technology, problems with the infrastructure and access to digital resources are also obstacles to making the best use of digital technology. Thus, enhancing technology facilities is nec-

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essary to enhance e-learning in public elementary schools in addition to enhancing instructional practices.

Conclusion

The findings of the study are that the instructional design has a great impact on the effectiveness of e-learning for students in public elementary schools. The results show that the application of good teaching methods can make students more active, understanding, motivated, and enjoy learning. Although e-learning has a lot of educational values, it is not a matter of the availability of digital technologies but of the quality of instructional design. Hence, enhancing the instructional design practice can play a significant role in increasing the effectiveness and quality of e-learning in educational institutions.

Recommendations

It is recommended that educational institutions should take the development and implementation of effective instructional design practices to improve students' learning experience in e-learning environment as a priority. More focus should be placed on creating digital content that is interactive, learner-centered and well-structured to encourage active learning and enhance student learning outcomes.

Furthermore, policy makers and school leaders should be interested in enhancing the technological infrastructure, including access to digital learning materials and reliable internet connections to students. These infrastructural challenges will be resolved to ensure a conducive environment for e-learning to be successful. Moreover, institutions should also have regular assessments to evaluate the effectiveness of e-learning practices and use students' feedback to improve instructional practices continuously. This will help to build a sustainable, engaging and quality digital learning environment that effectively addresses students' learning needs.

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