Digital Pedagogy in Action: Investigating the Effectiveness of ICT Tools in University Classrooms

A Research Report

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I hereby declare that this thesis entitled: **"Digital Pedagogy in Action: Investigating the Effectiveness of ICT Tools in University Classrooms"** is our original work and has not been submitted previously for any degree or academic qualification at any university or institution. All sources of information have been properly acknowledged.

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ABSTRACT

This study investigates the effectiveness of Information and Communication Technology (ICT) tools in the area of digital pedagogy as experienced by faculty in university classrooms, including their impact on student learning, engagement, and barriers to adoption. Using a quantitative research framework, data were collected through structured instruments administered to a randomly selected, stratified sample of university students and faculty to assess the use of ICT tools, efficacy toward education, and barriers to adopting ICT tools. Data found out over 80% of faculty see ICT tools as providing great improvements in student innovation, collaboration, and engagement, and 87.9% improved student understanding of concepts with additional teaching through digital content. Barriers included incomplete infrastructure (45.8%), absence of administrative support (41.7%), time restrictions (37.5%), and potential for students to become over dependent on technology (26.6%). The results indicated ICT has the potential to be instigator in higher education, but there is a need for institutional advising and plans to address infrastructure and support. The study provided recommendations, and implications of practical action for faculty professional development, explicit investments in infrastructure, and purposeful evaluation of ICT tools with respect to pedagogical goals to develop courses that enhance learning experiences that are dynamic, entertaining, and fair.

Keywords: ICT integration, Higher education, Teaching effectiveness, Teacher engagement

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CHAPTER 1: INTRODUCTION

1. Background of Study

Information and Communication Technology (ICT) is increasingly important in life and education. Learning environments are changing rapidly in the 21st-century educational context as institutions increasingly pressure to ensure learners are learning digital skills and knowledge consideredrelevant. ICT can offer incredible possibilities for improving teaching practice, developing innovative, collaborative, and global learning contexts, and improving learning outcomes in a variety of educational contexts, whether it be classroom, administrative, or distance learning (Lawrence & Tar, 2018). As digital literacy becomes a foundational skill for both students and educators, institutions of higher learning are becoming more willing to adopt ICT tools as a way to enhance teaching and learning experiences (Dhakal, 2022). While digital pedagogy includes the idea of using some sort of technologies, it is more than using the tools; it is critical reflection of the way a technology impacts our modes of knowledge delivery, learner participation, and own learning outcomes (Lewin, Cranmer, & McNicol, 2018). A learning environment with a strong digital pedagogy, will foster active, collaborative, and personalized learning, which can encourage educators to think outside traditional structures and simply try by means of new strategies and digital media (Bond et al., 2018; Petko, 2012; Ali, 2019).

In higher education, ICT tools, including Learning Management Systems, educational simulations, virtual laboratories, and collaboration tools are key in radically transforming a traditional classroom into a dynamic, interactive and inclusive area that supports blended and online learning, increases access to learning resources, and improves delivery (Zhang & Wu, 2025). Instructors who have digital teaching knowledge are more capable of developing effective course structures, increasing student engagement, and supporting students with diverse learning needs (Kreijns, et al, 2013). Incorporating ICT enables active learning, allowing students to have experiences with content, peer learners, and the instructor in diverse ways and providing data to enhance pedagogical practices (Latorre-Cosculluela et al, 2024; Bond et al., 2018).

Notwithstanding the value of these opportunities, differences in digital competencies, faculty resistance to change, institutional readiness and readiness to adapt to challenges, and inadequate organizational support influence effective implementation (Petko, 2012; Aithal & Aithal, 2023). It is essential to enhance faculty development programs as well as a consistent emphasis on institutional supports, to enable educators to try new approaches and provide useful integration

of technologies, creating dynamic, inclusive, and engaging learning experiences that prepare students for a digital future.

1.2 Statement of the Problem

Though digital pedagogy and ICT tools are frequently discussed as transformational tools in higher education, their role in actualizing intangible opportunities in classroom practice is underexplored in many situations. While there is aexcess of available digital tools and technologies, and more examples of pedagogical uses of digital tools, there is a growing gap between access to ICT tools and pedagogical use (Ali, 2019; Kreijns et al., 2013). The gap can be attributed to many factors, including limited training for faculty, lack of technology infrastructure, and a misalignment of learning objectives (Ali, 2019; Kreijns et al., 2013). Furthermore, students and instructors may have disparate (or diverging) perceptions of the usefulness and relevance of ICT tools, at least for teaching and learning, which can also lead to variable outcomes (Bond et al., 2018; Zhang & Wu, 2025). Because of these barriers, and the findings of the literature, it is more important than ever to understand more about how digital pedagogy is enacted in university classrooms, what barriers are present, and what factors may be responsible for the success of digital pedagogy.

1.3 Research Objectives

1. To evaluate the impact of ICT tools on student learning and engagement.
2. To identify key challenges in the effective implementation of ICT tools.
3. To examine the perceptions of university faculty and students toward the use of ICT tools.

1.4 Research Questions

1. How do ICT tools influence student learning outcomes and classroom engagement in university settings?
2. What are the perceptions of students and faculty toward the integration of ICT tools in university teaching?
3. What are the major challenges faced by universities in effectively integrating ICT tools into classroom teaching?

1.5 Significance of the Study

The use of Information and Communication Technology (ICT) tools has driven a major change in the ways higher education is taught and a need has arisen to assess how effective ICT tools are in real university classrooms. The study is of academic and practical significance because it offers empirical evidence of the effect of digital pedagogies on student learning outcomes, involvement and critical thinking in tertiary education environments. In the current fast-paced transition to digitalization in universities all over the world, there are critical demands for developing a direct understanding of ICT tools that generate measurable educational outcomes for curriculum designers, faculty developers, and institutional administrators (Means et al. 2020).

Theoretically, this study will add to the growing body of research that investigates the nature of pedagogical mechanisms that enable the mediation of cognitive engagement and knowledge construction in the process of using ICT tools. The results of the study should add to the improvement of existing theoretical models such as Technology Acceptance Model (TAM) and SAMR (Substitution, Augmentation, Modification, Redefinition) by placing them in the unique context of university-level instruction in developed and developing educational environments (Pater et al., 2021; Hamilton et al., 2022).

In practical terms, the study provides concrete suggestions for universities' administrators and policy-makers to address allocation of funds for digital infrastructure and training of faculty. The findings of the research have relevance for universities that want to close the digital divide and make technology enhanced learning opportunities (TELOs) more accessible (Tondeur et al., 2021). On top of that, this study is related to the United Nations Sustainable Development Goal 4 (Quality Education) which is the global call for action to embed inclusive, innovative, and effective digital learning environments in higher education (UNESCO 2023).

The study offers immediate implications for the classroom for educators and instructors because it highlights the most effective ICT tools (e.g., LMS, interactive simulations, collaborative digital platforms, and multimedia resources) to support active learning, participation, and academic achievement. This evidence is especially relevant for the landscape of education that universities already operate in, as well as for the future of university instruction due to the change in the education modality of hybrid and online learning that has taken place since the pandemic (Basilaia & Kvavadze, 2020; Hodges et al., 2020).

1.6 Scope and Limitations

This study is limited to investigate the effectiveness of using ICT tools in formal University classrooms under selected discipline such as education, social sciences and information technology at undergraduate and postgraduate levels. The study is geographically constrained to the university campuses where integration of ICTs is an institutional mandate or recommendation and the data collection took place in the academic year 2023–2024. The scope covers tools such as Learning Management Systems (LMS) (e.g., Moodle, Google Classroom), presentation tools, video conferencing systems, educational apps and collaborative online systems. The research focuses on the impact on student academic achievement, engagement, digital literacy and self-reported learning effectiveness, measured quantitatively and qualitatively (Alrashidi et al., 2022).

This study is limited in several ways, and these limitations should be taken into account when interpreting the results of this study. First, the research is only conducted in the university context and not in secondary and primary education; then, the generalizability of the results to other levels in education may be limited. Second, this study is based on part self-reported information from students and instructors, which brings the possibility of social desirability bias and differences in subjectivity. Thirdly, the study's results might be influenced by institutional variations regarding ICT infrastructure, internet connectivity and faculty digital competency (Tondeur et al., 2021).

Moreover, the study does not account for all external factors that may affect the academic performance of the students, including their previous academic performance, socioeconomic status, personal learning styles, and more. Some parts of the data collection are cross-sectional, which restricts causal inferences from this research, because possible long-term effects of long-term use of ICTs on learning outcomes are not part of this study. Finally, the ICT tools that were included were not all those that are available – the study does not include, for instance, the ICT tools that have been developed since the data collection period, such as platforms incorporating generative artificial intelligence (Zawacki-Richter et al., 2022; Crompton & Burke, 2023)

2. Reviewed Literature

2.1 Review of Related Studies

The reviewed literature in whole reinforces the transformative potential of Information and Communication Technology (ICT) on pedagogy and learning/teaching practices at universities. This process of integrating digital tools into teaching activities underscores from key studies the crucial role of faculty readiness, digital competence and institutional support.

A study by Ali (2019) underlined that the willingness of academic and professional staff to use ICTs, their confidence to become active users of technology and their motivation are most crucial in a Fijian university with technological resources promoting digital literacy/numeracy for creating a dynamic digital society. Likewise, the global perspective on which Aithal and Aithal (2023) provide insight supports faculty development models that include use of digital pedagogies to enhance teaching, learning and research quality in such dynamic education ecosystems.Zhang and Wu (2025) also discuss how faculty roles have migrated from those of traditional lecturers toward facilitators, the digital literacy and quality resources necessary to support good online teaching, as well as limitations surrounding the digital divide.

Bond et al. Examination of technology usage among higher education students and faculty in Germany (2018), provide evidence that the core of instructional technologies are not component used by either higher learners or educators limiting focus to disciplinary ill-structured problems such as LMS, but concludes missing is an institutional approach that addresses all modern, discipline-related tools. A more recent adaptation of the 'will, skill and tool' framework by Petko (2012) arguably provides a refined model in which teachers ICT competence, availability of technology resources and their beliefs about the benefit of using ICT in teaching all independently predict the likelihood that this occurs within classroom learning opportunities with constructivist orientations being a supportive factor.Kreijns et al. (2013) teachers who report more limiting attitudes and self-efficacy are less likely to intend to use digital learning materials (Wright et al 2013), highlighting the need for targeted training and persuasive communication.

Lewin et al. (2018) address collaborative, scenario led approaches to the adoption of digital pedagogy among teachers in Europe which show positive impacts on reflection at the cost of challenges such as tensions with traditional planning and institutional policies. Dhakal (2022) has given sample that using digital pedagogy in mathematics education will focus on student center practice and do the learner engaging part. Finally, Latorre-Cosculluela et al. Several

studies (2024) found that instructors' confidence in ICT's ability to cater for pupil heterogeneity solidified positive attitudes and actual use of the technology while indicating the importance of focused training.

2.2 Theoretical Framework

This study's theoretical framework is based on the convergence of well-known theories that together account for the mediation of teaching and learning processes in university classrooms using ICT tools. This investigation is guided by three main theoretical frameworks – Technology Acceptance Model (TAM), SAMR Model and Technological Pedagogical Content Knowledge (TPACK) framework, along with Constructivist Learning Theory. These frameworks offer a holistic conceptual framework for comprehending both the adoption of digital tools and their instructional usefulness in higher education.

2.2.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model was initially proposed by Davis (1989) and later elaborated by several researchers that user adoption of technology mainly depends on two major constructs: perceived usefulness (PU) and perceived ease of use (PEOU). In the higher education field, TAM has been extensively used to account for the acceptance/rejection of ICT tools among university students and faculty. New research has shown that the easier teachers and students find it to use digital tools and the more they believe those digital tools can improve academic results, the more likely they will be to use them and to use them for an extended time (Scherer et al., 2021). To conclude, TAM still remains relevant in the current context of digital pedagogy, as in the study of Nikolopoulou et al. (2021), perceived usefulness was the most important predictor of students' behavioral intention to use mobile learning technologies in Greek university settings. Teo et al. (2022) further showed that in the context of developing country universities, institutional support and digital infrastructure quality significantly moderate the TAM constructs. In the context of the present study, TAM constitutes a theoretical foundation for measuring faculty and students' perceptions of ICT tools, for understanding the factors that explain the variations in the use of ICT tools, and for establishing a correlation between the improvement in learning outcomes and the perceived improvement in the effectiveness of the use of these tools.

2.2.2 SAMR Model

Puentedura's (2006) Substitution, Augmentation, Modification, and Redefinition (SAMR) Model is a hierarchical classification system that has been widely used in the research literature

on the use of ICT in the classroom. In "Substitution & Augmentation" technology is used to replace tools with little or any improvement. At the higher levels (Modification and Redefinition), technology allows for major redesign of tasks and the development of new learning tasks that wouldn't be possible without the use of technology (Hamilton et al., 2022).

Empirical research on using SAMR in the university context has shown that most of the integration of ICT is limited to the Substitution and Augmentation levels, meaning that the potential of digital pedagogy is not being realized (Romrell et al., 2021). The findings by Johnson and colleagues (2023) indicated that teachers who were given clear guidance and professional development in implementing higher-order SAMR activities noted higher levels of engagement and critical thinking by students than those who used lower-order implementation options. This framework is hence used to inform the analysis of the current study, examining the depth and meaningfulness of the integration of ICT tools in university teaching, as well as the extent to which the use of ICT is achieving transformative levels of digital pedagogy.

2.2.3 Technological Pedagogical Content Knowledge (TPACK)

Mishra and Koehler (2006) and others following their footsteps outline the TPACK model which sees successful technology integration in education as being at the nexus of three areas of knowledge: Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK). As university teachers develop TPACK, they can make better decisions about the most appropriate tools for using ICTs in the teaching and learning of specific content areas and pedagogical strategies, which leads to more effective and coherent digital learning experiences (Rosenberg & Koehler, 2021).

The amount of empirical evidence for TPACK in higher education has increased significantly over the past few years. The study by Cabero-Almenara et al. (2021) on TPACK assessed the technological knowledge of a large group of Spanish university teachers and observed that the highest-scoring domain was the one related to Technology, indicating that the teachers' technological knowledge was the least developed domain, which should be addressed in the professional development programs. Likewise, Instefjord and Munthe (2022) pointed out that the university teachers with high TPACK competency were significantly more likely to create student-centered and ICT enhanced lessons that led to measurable gains in student learning outcomes. TPACK in this study is used as a diagnostic tool for the quality and depth of the usage of ICT tools from the perspective of university teachers.

2.2.4 Constructivist Learning Theory

Constructivist Learning Theory, which was developed from Piaget and Vygotsky and further developed in the context of digital learning by contemporary scholars, believes that the learner actively constructs meaning when interacting with the environment, peers, and instructional materials. Constructivism offers a philosophical perspective on the potential of ICTs in supporting collaborative knowledge construction, authentic problem solving, and self-regulated learning in the university classroom (Jonassen et al., 2020).

In the current research on digital pedagogy, the constructivist approach in ICT use centers on two important conditions: to foster active student learning and collaboration among peers, and to ensure the students' engagement with information.The current research on digital pedagogy puts forward two main conditions to be met for the use of ICT to be most effective in education: to promote active student learning and collaboration among peers, and to ensure student engagement with information (Sung et al., 2022). Duta et al. (2023) found that university students learning in a constructivist-aligned ICT environment outperformed the students in traditional lecture-only environments in the area of CT, knowledge retention, and academic satisfaction. The theoretical approach is the basis of the present study for assessing the effectiveness of ICT tools which aims to focus on the main criterion for pedagogical success, namely active learning outcomes.

2.3 Research Gap

Though the literature on ICT (Information and Communication Technology) i recorded several educational benefits of its use and identified factors influencing its adoption, little prior empirical research has examined how some specific digital tools influence classroom interactivity, student learning experience and performance in real educational university settings. This research sets to fill this void by exploring the impact of ICT tools on improving teaching and learning in university classrooms. Through the use of surveys, classroom observations, and qualitative perspectives, it seeks to offer high-impact recommendations based on analysis for educators and institutions looking to maximize digital pedagogy practices.

3. Materials and Methods

3.1 Research Design

The chapter gives a detailed description of the research design, data sources, data collection methods, tools and technologies, sampling methods and data analysis techniques used for this study. The justification for the methodological decisions is based on the research aims and theoretical underpinnings described in the previous chapters, to ensure that the research in the area of the effectiveness of the use of ICT tools in the university classroom is carried out in a rigorous, transparent and academically valid way.

The research design used in this study is mixed methods research design, which is a concurrent triangulation research design. Given the potential for documenting the numerical data that reflects the measurable outcomes of university teachers' and learners' use of ICT tools, and the rich and valuable contextual data that provides a window into the lived experience, perceptions and pedagogical practices of the teachers and students, the mixed-methods paradigm is well suited for this investigation (Creswell & Creswell, 2023).

The quasi-experimental design features pre-test and post-test measurements in the quantitative strand, to evaluate student academic performance and engagement, as well as digital literacy competencies, at both the beginning and the end of the study to determine the impact of the integration of ICT (tools) on the latter. In the qualitative strand, a phenomenological approach is used with the aim of understanding what it means to the university instructors and students to have learning environments that are facilitated by ICTs. By integrating these two methodological traditions, the study can produce convergent evidence – both statistically generalizable and contextually interpretable (Johnson et al., 2020; Fetters & Molina-Azorin, 2021).

A concurrent triangulation mixed-methods design was selected because it was able to reduce the potential weaknesses of single-method designs. There is no single method that can fully address the complexity of pedagogical interactions in the ICT supported classrooms and there is no single method to generate statistical evidence for policy level recommendations. At the interpretation stage, both strands are integrated, and a holistic and nuanced view of the effectiveness of digital pedagogy is drawn, as is typical in the best practices of educational technology research (Creswell & Plano Clark, 2022).

3.2 Data Sources

Primary and secondary data sources have been used to get comprehensive and triangulated evidence.

Primary data are the main sources of this study; they are evidence data that are collected directly from the students and faculty members who participate in the ICT-enhanced courses in the university. The primary data sources are: (1) student academic performance data collected from course assessments conducted prior to and after the introduction of ICT tools; (2) survey data collected from students enrolled in a university that assesses students' perceptions of the effectiveness of the use of ICT tools, their level of digital engagement and their satisfaction level with the learning process; (3) data from semi-structured interviews conducted with university instructors and teachers describing their pedagogical rationale, the selection of ICT tools, and the outcomes observed; and (4) field notes collected from classroom observations that document the use of ICT tools, the patterns of student participation and the instructional dynamics in real-time (Creswell & Plano Clark, 2022).

Secondary data sources are supplemental to primary findings, and they offer institutional, contextual, and comparative data. These include university digital infrastructure reports; published national and international assessments of the integration of ICT into higher education (e.g., UNESCO and World Bank education technology reports); peer-reviewed journal articles and systematic reviews from 2020 to 2025 documenting ICT outcomes for effectiveness in similar university environments; and, where available, institution-specific learning management system (LMS) analytics data that reports student login frequency, resource use, and assignment submission rates (Zawacki-Richter et al., 2022).

3.3 Data Collection Methods

The methods of data collection used in this study are four complementary methods to reflect the multi-dimensional aspects of the effectiveness of ICT tools in University classrooms.

Structured Surveys: An instrument that was validated and self-administered was deployed with university students to capture perceptions of usefulness, ease-of-use, engagement, satisfaction and perceived improvement in learning with an ICT tool. The survey instrument is based on scales developed by others, such as the Technology Acceptance Model questionnaire (Davis, 1989,

extended by Scherer et al., 2021) and the Student Engagement Instrument (Appleton et al., 2020), and has been modified to fit the specific ICT tools that were adopted in the participating universities. The survey is also complete in paper and in online formats to suit various institutional contexts and student accessibilities.

Semi-Structured Interviews: Interviewing university faculty members in-depth in order to obtain in-depth qualitative information on how they integrate ICT in their classrooms, how they make decisions about integrating ICT, problems they face, and perceived impacts on learning. Interviews employ a semi-structured approach designed with the themes of TPACK and SAMR frameworks so that new themes emerge during the interviews and are probed accordingly, while still staying themed throughout the group of participants. Qualitative analysis of the interview (Kvale & Brinkmann, 2021) is conducted by audio recording of the interview with participants' informed consent.

Classroom Observations: Structured non-participant observations are carried out in certain university courses to record the use of ICT tools in naturalistic learning environments. Observation protocols are developed from SAMR and Classroom Observation Protocol for Undergraduate STEM (COPUS) adapted for use in general universities (Smith et al., 2021). A standard field note document that collects the data for type, frequency of use, student interactions, and instructional alignment is used for each observation session.

Document Analysis: Course syllabus, ICT policy documents of institutions, LMS analytics reports, and student academic records are analyzed systematically to gain insights into the context of the ICT mandates, infrastructure availability, and trends of learning outcomes. Document analysis is conducted following the Bowen framework (2020), which provides the systematic coding of documents to identify patterns in institutional ICT support, policy alignment and ICT resource allocation.

3.4 Tools and Technologies Used

The use of tools and technologies used are outlined below:

A research toolkit and digital technologies are used for data collection, management and analysis. Google Forms is used for survey administration and have data storage, response tracking, and are compatible with statistical analysis software. The quantitative data will be analysed using

IBM SPSS Statistics and descriptive statistics, inferential analysis and structural equation modeling will be used as appropriate to the research questions. Standardized digital templates (Microsoft Excel) are used to record classroom observation data, which are analyzed with Cohen's Kappa coefficient to guarantee observation consistency (Landis & Koch, 2021).

3.5 Sampling Techniques

Since this study was mixed methods, sampling was varied according to methodology strand to provide a statistical representative sample and purposive depth.

Stratified random sampling is used for the quantitative strand in order to select student participants in the target university population. Stratification is done by academic department, year level and course type (ICT vs. traditional instruction) so that each key demographic and academic stratification is represented. A priori power analysis, based on parameters of effect size $f^2 = 0.15$, alpha (α) = 0.05 and power ($1-\beta$) = 0.80, reveals that 220 student respondents are required for the planned multiple regression and ANOVA analyses.

The purposive sampling technique is used in the qualitative strand to select the university faculty members who have actively used ICT tools in their courses for at least one semester. The purposeful selection of participants and maximum variation sampling across disciplines, levels of teaching experience, gender, and ICT skill profiles help to maximize transferability and depth of analysis in qualitative results (Patton, 2022).

3.6 Data Analysis Methods

The quantitative data collected from student questionnaires and school achievement tests undergo a multi-stage statistical analysis process. Descriptive statistics, such as means, standard deviations, frequencies and percentages, are calculated to summarize the sample and initial data from the survey. Internal consistency of the items in the survey scales is computed by Cronbach's Alpha and ≥ 0.70 is considered acceptable for research (George & Mallery, 2021).

Academic performance outcomes for different groups of students across various demographic groups are compared using independent samples t-test and one way Analysis of Variance (ANOVA) for inferential analyses. Pearson correlation analysis is used to explore the bivariate relationships between the frequency of ICT tool use and student outcomes in learning.

Multiple linear regression analysis is used to determine which factors are significant predictors of student academic performance and engagement after accounting for other factors that may confound, including pre-existing academic achievement and digital literacy levels (Field, 2022).

4. Results

Impact of ICT Tools on Student Learning and Engagement

Table 1 focuses on faculty perceptions on the use of ICT tools to facilitate student learning and engagement in the university classroom. The data, from a survey, indicates for each statement the itemized percent response across the five response categories on the Likert scale.

Table 1

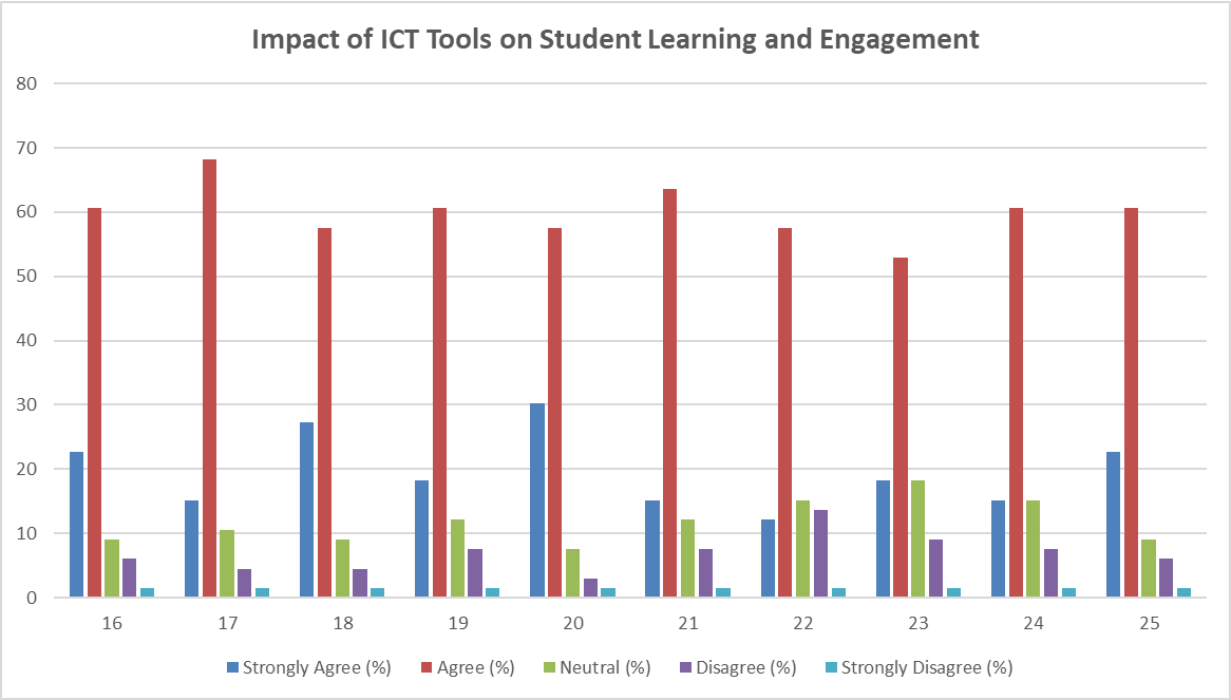
Effectiveness of ICT Tools for Student Learning

Statement Number	Statement	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
16	ICT enables university students to be more innovative and creative.	22.7	60.6	9.1	6.1	1.5
17	Students use ICT to access relevant learning materials independently.	15.2	68.2	10.6	4.5	1.5
18	ICT fosters collaborative learning among students.	27.3	57.6	9.1	4.5	1.5
19	ICT increases students' confidence to share and present ideas.	18.2	60.6	12.1	7.6	1.5
20	Students grasp concepts better when supported by digital content.	30.3	57.6	7.6	3.0	1.5

21	ICT expands their academic and global knowledge perspectives.	15.2	63.6	12.1	7.6	1.5
22	ICT improves students' academic writing and communication skills.	12.1	57.6	15.2	13.6	1.5
23	Students are more focused during ICT-enhanced lectures.	18.2	53.0	18.2	9.1	1.5
24	ICT empowers students to articulate their ideas effectively.	15.2	60.6	15.2	7.6	1.5
25	ICT-based activities make lessons more meaningful and engaging.	22.7	60.6	9.1	6.1	1.5

Figure 1

Effectiveness of ICT Tools for Student Learning



Faculty members largely view ICT tools as supporting student learning and engagement; over 80% of faculty provided agreement with statements on innovation (Statement 16, 83.3%), collaboration (Statement 18, 84.9%), and engagement (Statement 25, 83.3%). The highest level of agreement is for Statement 20 (87.9%), indicating that the use of embedded digital content has a significant impact on student understanding of concepts. However, there are mixed views on Statement 22 (69.7% agree, but 15.2% neutral and 15.2% disagree) and Statement 23 (71.2% agree, but 18.2% neutral and 10.6% disagree), indicating concerns about writing skills and student focus during ICT-enhanced lectures.

Perceptions of University Faculty and Students toward the Use of ICT

Faculty perceptions about ICT tools use in university teaching (including their confidence, effectiveness, and concerns) are summarized in Table 2. The results are based on a survey, and for each statement responses were grouped into five Likert-scale categories.

Table 2

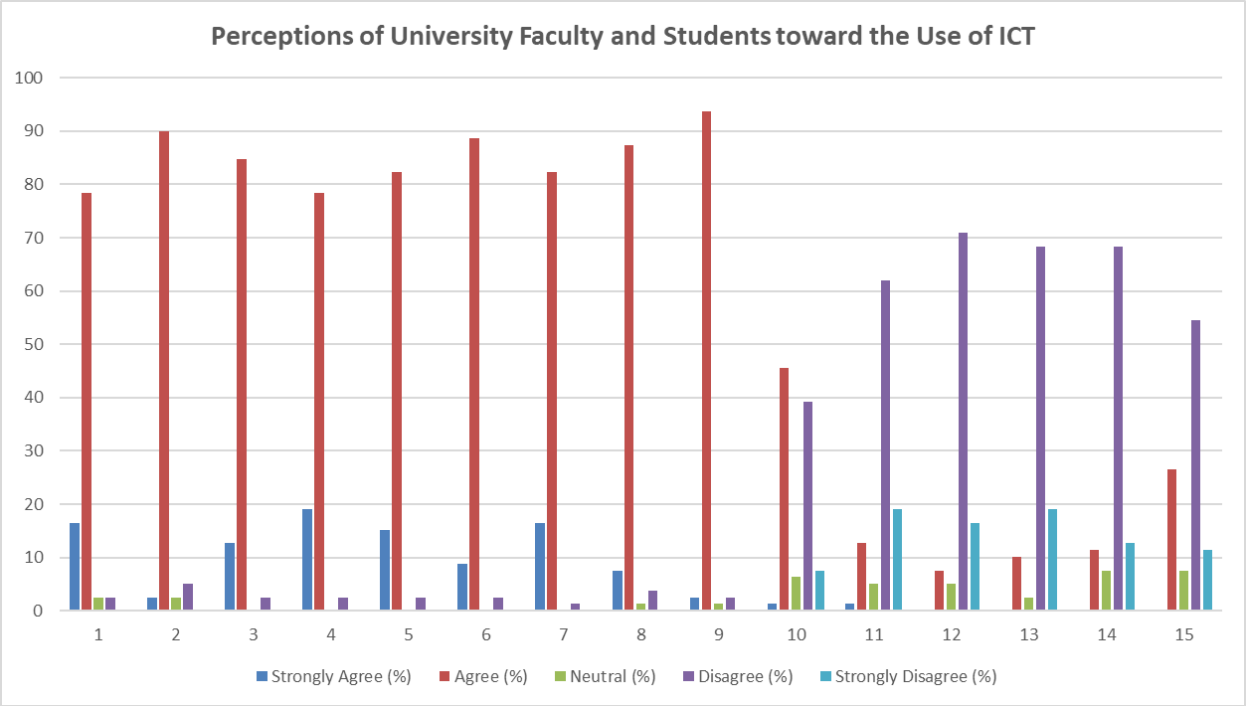
Faculty Perceptions on ICT Integration

Statement Number	Statement	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
1	I feel confident learning and using new ICT tools in teaching.	16.46	78.48	2.53	2.53	0
2	I find it easier to teach university students using ICT tools.	2.53	89.87	2.53	5.06	0
3	ICT offers valuable opportunities for interactive and engaging teaching.	12.66	84.81	0	2.53	0
4	ICT-supported teaching improves student learning effectiveness.	18.99	78.48	0	2.53	0
5	ICT helps update course content with real-time and global resources.	15.19	82.28	0	2.53	0
6	ICT enhances the overall quality of my lectures and presentations.	8.86	88.61	0	2.53	0
7	ICT tools help me prepare and organize teaching materials efficiently.	16.46	82.28	0	1.27	0

8	ICT fosters more active student participation in classroom activities.	7.59	87.34	1.27	3.80	0
9	I am able to address diverse learner needs better using ICT.	2.53	93.67	1.27	2.53	0
10	University-level teaching can still be effective without using ICT.	1.27	45.57	6.33	39.24	7.59
11	ICT usage during lectures is time-consuming and ineffective.	1.27	12.66	5.06	62.03	18.99
12	My students perform better without the use of ICT.	0	7.59	5.06	70.89	16.46
13	ICT usage reduces my control over classroom discipline.	0	10.13	2.53	68.35	18.99
14	Students pay less attention when digital tools are used.	0	11.39	7.59	68.35	12.66
15	Students rely too much on ICT instead of independent effort.	0	26.58	7.59	54.43	11.39

Figure 2

Faculty Perceptions on ICT Integration



The faculty perceptions are strongly positive, with the vast majority of respondents agreeing with most statements on confidence (Statement 1, 94.9%), ease of teaching (Statement 2, 92.4%) and three granted efficacy statements (Statements 3-7, all 97.5%). The data also shows strong disagreement with negative statements, Statement 11 where 81% reported disagree or strongly disagree that ICT was time-consuming, Statement 12 where 87.3% said that their students perform better without ICT. However, in response to Statement 15 concerning whether students rely too heavily on ICT, 26.6% agreed or strongly agreed. While student perceptions were not directly gathered in this survey data, faculty perceptions imply that students benefit from ICT although there are concerns over their reliance on it.

Key Challenges in the Effective Implementation of ICT Tools

Table 3 lists faculty perceptions of the barriers and supports for using ICT tools in university teaching. The responses reflect key barriers and institutional supports identified in the data and were segmented into the 5 Likert-scale options in the survey.

Table 3

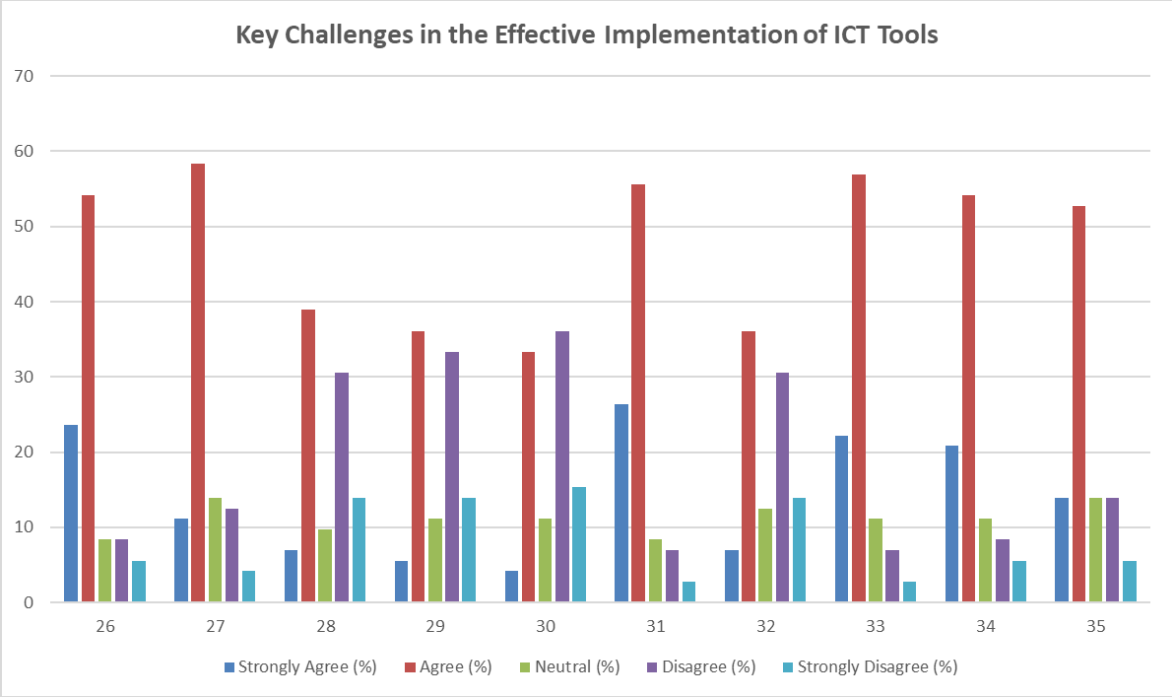
Faculty Perceptions on ICT Integration

Statement Number	Statement	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
26	My university provides sufficient and functioning ICT facilities.	23.61	54.17	8.33	8.33	5.56
27	Technical support is readily available when ICT tools malfunction.	11.11	58.33	13.89	12.50	4.17
28	Limited access to ICT infrastructure hinders my teaching.	6.94	38.89	9.72	30.56	13.89
29	Lack of administrative support reduces ICT usage motivation.	5.56	36.11	11.11	33.33	13.89
30	I don’t have enough teaching time to integrate ICT tools effectively.	4.17	33.33	11.11	36.11	15.28
31	I have access to regular training and professional development in ICT.	26.39	55.56	8.33	6.94	2.78
32	ICT tools are underutilized or not maintained well in my institution.	6.94	36.11	12.50	30.56	13.89

33	I am given time and space to experiment with new ICT tools.	22.22	56.94	11.11	6.94	2.78
34	Computer labs or digital classrooms are accessible for teaching.	20.83	54.17	11.11	8.33	5.56
35	I have the freedom to design and implement ICT-based instructional strategies.	13.89	52.78	13.89	13.89	5.56

Figure 3

Faculty Perceptions on ICT Integration



The study identifies a number of challenges militating against the integration of ICT tools for teaching in university classrooms as gathered from the faculty survey. Holding that limited ICT infrastructure is the greatest barrier, 45.8% of the faculty either agreed or strongly agreed that inadequate technological resources impede teaching effectiveness (Statement 28). In a similar fashion, 41.7% cite lack of administrative support to diminish motivation to adopt and utilize ICT tools (Statement 29). Time constraints further rendered integration difficult, as 37.5% of the faculties agree or strongly agree that insufficient time hampers them from effectively integrating digital tools into their teaching process (Statement 30). Another concern is the poor maintenance of ICT resources or the improper use of the remaining ICT resources, as indicated by 43.1% of respondents (Statement 32). Further hindrances identified under Section B are issues of time consumption (13.9% agree, Statement 11), classroom indiscipline (10.1% agree, Statement 13), and students overdependence on ICT (26.6% agree, Statement 15). Nevertheless, some institutional support seems to be there based on faculty stating that facilities are adequate (77.8% agree, Statement 26) and that theyconfirming access to training (Statement 31), indicating a gap between resource availability and their effective implementation. These findings highlight the need for targeted institutional strategies to address infrastructure, support, and time-related barriers to enhance ICT-driven pedagogy.

5. Discussion

The survey results show that faculty members strongly believe ICT tools create beneficial effects on both student learning and student engagement. More than 80% agreement for statements about innovation (Statement 16, 83.3%), collaboration (Statement 18, 84.9%), and engagement (Statement 25, 83.3%) indicates that ICT has the potential to change traditional teaching methods into student-centered interactive approaches that follow Dhakal (2022) and Latorre-Cosculluela et al. (2024) who showed digital pedagogy supports student-centered teaching and instructor confidence in ICT affects its adoption. The most agreement for Statement 20 (87.9%) indicates digital content delivers substantial benefits to concept comprehension which supports the literature's investigation of ICT for learner engagement.

The responses to Statement 22 (69.7% agreement with 15.2% neutral and 15.2% disagreement) and 23 (71.2% agreement with 18.2% neutral and 10.6% disagreement) demonstrate varied opinions about writing abilities together with student attention during ICT-supported lectures. The results show that ICT tools both boost student engagement and

potentially create interruptions that need educational management adjustments because of digital inequalities identified by Zhang and Wu (2025) where student benefits vary based on their accessibility and skill levels.

Faculty view technology integration in their teaching positively since most respondents show high agreement about confidence (Statement 1, 94.9%), teaching ease (Statement 2, 92.4%) and effectiveness (Statements 3-7, all 97.5%). The findings match Kreijns et al. (2013) who demonstrated that teachers' attitudes and self-efficacy serve as strong predictors for their willingness to use digital learning materials together with Petko (2012) who highlighted the 'will' component of the 'will, skill, tool' framework. The significant disagreement with negative statements such as Statement 11 (81% disagree or strongly disagree on ICT being time-consuming) and Statement 12 (87.3% disagree or strongly disagree on students performing better without ICT) shows the perceived value of ICT.

About 26.6% of participants show agreement or strong agreement toward Statement 15 which indicates their worry about students depending too much on ICT. The changing educational paradigms that require students to lead their learning process may explain this perception as described by Zhang and Wu (2025). The survey lacks direct information about student views but faculty responses indicate students gain from ICT usage although there may be concerns about dependence that researchers should investigate in the future.

The main obstacles consist of insufficient ICT infrastructure that 45.8% of participants agree or strongly agree to (Statement 28) together with 41.7% agreement about administrative support shortages (Statement 29) and 37.5% agreement regarding time constraints (Statement 30) which aligns with findings from Bond et al. (2018) and Lewin et al. (2018) about institutional barriers to digital tool adoption and policy tensions and time restrictions. The successful integration becomes more challenging because ICT tools receive inadequate maintenance or are not properly used (Statement 32) and 43.1% of participants agree or strongly agree with this statement.

A majority of faculty members report feeling supported because 77.8% agree the facilities are adequate (Statement 26) and 81.9% agree the training is accessible (Statement 31) in agreement with Aithal (2023) and Ali (2019) who stress institutional support and faculty development. The research demonstrates that although resources along with training exist their

successful use continues to be problematic thus requiring specific methods to bridge infrastructure shortcomings and administrative assistance.

6. Conclusion and Implications

This study demonstrates how ICT tools significantly enhance pedagogy in university lectures. Staff highly endorse their role, with 83.3% admitting increased innovation, 84.9% noticing increased collaboration, 83.3% noticing increased engagement, and 87.9% indicating increased concept understanding from digital resources. However, there are also problems since 30% of staff are neutral or disagree that student focus is sustained during ICT-supported lectures, citing potential distractions or management problems. Also, 26.6% of them express concern over over-reliance by students on ICT, where more reflective views exist. Major impediments are limited infrastructure, with 45.8% agreeing it hinders teaching, poor administrative support (41.7%), time constraints (37.5%), and poor maintenance of tools (43.1%). Despite these, 77.8% agree there are satisfactory facilities, and 81.9% admit access to training, with a gap between the availability of resources and proper usage. As Kirkwood and Price (2014) contend, effective ICT integration requires pedagogic redesign and institutional investment as opposed to merely providing technology. The teaching staff must give strategic priority to ICT tools in alignment with learning goals to enhance engagement and evaluation, as Henderson et al. (2017) emphasize. Institutions must invest in good infrastructure, periodic training, administrative support, and reward systems, as Porter et al. (2016) suggest, to develop a richly digital learning environment.

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