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RESEARCH PAPER

Impact of the Information and Communication Technologies (ICTS) on Academic Achievements: A Study of Undergraduate Students

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ABSTRACT

This study examines the impact of ICTs on undergraduate students' academic achievement at LUAWMS. In countries like Pakistan, ICTs have really become a significant part of higher education, especially since the goal is to make teaching and learning better. But the whole thing about whether it actually boosts performance is not clear, mostly because of problems with infrastructure and lack of training to use digital stuff well. We used a quantitative approach for this. Data was collected from 335 undergraduates; the tool questionnaire was employed based on a five-point Likert scale was used for this study. Then SPSS version 25 handled the analysis, and reliability was checked out with a Cronbach's alpha of 0.70. The findings show that ICTs use has a positive link to academic achievement, something significant. Students mentioned that better learning understanding, and more engagement in classes, and easier access to resources enhances their academic achievement. On the other hand, barriers, like unreliable internet, low digital literacy among students, and weak infrastructure overall make it hard to really benefit from ICTs. Universities in Pakistan need to focus on fixing the ICTs setup and making internet more dependable. Training for digital literacy seems crucial too, along with better policies to support all this.

KEYWORDS ICTs, Academic Achievement, Higher Education, Digital Learning, Pakistan, Undergraduate Students

Introduction

The Information and Communication Technologies (ICTs) have become a catalyst in the field of higher education, whose application has fundamentally changed the way of teaching and learning. The integration of ICTs into the curriculums can help achieve better academic achievement, foster learning in groups, and access to extensive information that otherwise could not be easily accessible (Bebell & O'Dwyer, 2010; Cheung and Slavin, 2013). In the academic world today learners are becoming more dependent on digital resources in the form of e-learning sites, online databases and virtual communications systems to aid their learning. The same tendencies are observed at Lasbela University of agriculture, Water and marine sciences (LUAWMS) where students are actively involved in using internet based resources and digital learning materials to boost their academic achievements. Nevertheless, in spite of these merits, the empirical evidence is still ambiguous. According to some studies, ICTs can either have a restricted or even a detrimental impact in cases of misuse to non-academic use or in cases when students do not have sufficient digital skills (Leuven et al., 2004; Park and Weng, 2020). This inconsistency highlights the importance of critically analyzing the actual importance of ICT in academic achievement.

The usage of ICTs in the higher education institutes of developing countries like Pakistan is still restricted by structural and institutional barriers. Poor infrastructure,

unfitting investments, and lack of training prospects are main obstacles to successful ICTs applications (Ather and Qamar, 2004; UNESCO, 2014). In spite of the policy efforts, such as those launched by the Higher Education Commission (HEC), to improve digital learning, there are still important disproportions between policy objectives and practice. Additionally, the fact that students choose to use ICTs to get amused instead of studying also compromises its possible compensations (Cotton, 1991). These contextual restraints indicate that the effectiveness of ICTs cannot be comprehensive and needs to be assessed in specific institutional contexts.

The achievement of academics in itself is a multidimensional variable that is affected by the cognitive, behavioral and environmental variables with ICTs being both an enabler and a mediator variable. ICTs facilitate individual learning, enhances student interaction, and promotes the acquisition of the critical academic skills, including research and problem-solving (Bulman and Fairlie, 2016; Pane et al., 2015). However, the success of ICTs greatly relies on the digital skills and institutional support that the students have. In the absence of these enabling conditions, investments in ICTs might not result in any significant changes in academic outcomes (Selwyn, 2016). Thus, this research fills this gap by critically reviewing the use of ICTs, its effects on academic performance and the problems encountered by undergraduate students in LUAWMS.

Literature review

ICTs and Academic Achievement

The use of Information and Communication Technologies (ICTs) in higher education is strongly linked with enhanced academic achievement. Empirical research indicates that the academic achievement of students in relation to GPA, conceptual knowledge and access to varied learning materials is boosted by ICTs (Bebell and ODwyer, 2010; Cheung and Slavin, 2013). As an example, ICTs tools, including educational software and online platforms, facilitate personalized learning, where students can learn at their own pace and overcome personal learning deficiencies. The study is conducted in the LUAWMS environment also suggest that ICTs has a positive impact on academic achievement in terms of better understanding of the subject and enhanced learning achievement of the students. Nevertheless, this correlation is not always the same. Research like Leuven et al. (2004) indicate that unregulated or excessive use of ICTs can have no or adverse effects on academic achievement. Such a contradiction implies that access is not the sole determinant of the effectiveness of ICTs but the quality and the purpose of its application, which supports the necessity of a critical assessment of ICTs integration.

ICTs, Engagement and Learning Processes

ICTs are important as indicators of active learning and engagement among students. E-learning platforms, virtual classrooms, and multimedia tools are elements of digital technology that promote collaboration, critical thinking, and independent learning (Pane et al., 2015; Genlott and Grönlund, 2016). There is evidence that students who have more access to ICTs are more motivated, more engaged in it, and academically engaged, and these factors are the major predictors of academic achievement. Moreover, ICTs facilitates flexible learning systems where students have access to educational resources in all places and at any time, and thus, enhances autonomy and self-directed learning. Nonetheless, the success of ICTs in improving engagement will be determined by the way it is incorporated into the teaching practices. Inadequately designed online learning systems can be unmotivating and unable to facilitate meaningful learning. Thus,

the use of engagement is a mediating variable between ICTs use and academic achievement, which means that ICTs do not necessarily lead to better results without pedagogical coordination.

Challenges and Digital Divide

In spite of its potential, there are structural and behavioral constraints that limit ICTs integration in education. Among them are poor infrastructure, lack of access to high-quality internet, and low digital literacy, especially in developing nations like Pakistan (UNESCO, 2014; Ather and Qamar, 2004). Other issues to which students express their difficulty in LUAWMS include lack of connectivity, training, and distractors caused by non-academic use of ICTs. Also, the digital divide brings disparities in the access to ICTs resources, denying the students with disadvantaged backgrounds and opportunity. Their effect is minimized by behavioral aspects, including the use of ICTs to have fun as opposed to studying (Park & Weng, 2020). Such results imply that ICTs will not be able to achieve its potential in enhancing academic performance in the absence of these barriers. The integration of ICTs thus involves the development of infrastructures as well as behavioral control in order to achieve the full potential of ICTs in education

Material and Methods

This research paper takes a quantitative, cause -and -effect research design with a survey as the research method to test the correlation between ICT use and academic performance among undergraduate students.

Population and sampling

The population of the study included undergraduate students of Lasbela University of Agriculture, Water and Marine Sciences (LUAWMS). Purposive sampling was used to sample 335 students in various faculties in order to have diversity in academic disciplines. This sampling method helped to collect data efficiently, and it might not be possible to generalize the findings to any other study setting. The chosen sample size was sufficient in terms of statistical analysis and compromises a wide-ranging angle of the ICTs use tendencies, academic achievement and the challenges faced by the students in a university atmosphere.

Instruments and measures

Data collection was conducted using a structured questionnaire which utilized a five-point Likert scale format. Some of the significant variables, including ICTs use, academic performance (CGPA) and the constraints to the use of ICTs, were measured using the questionnaire. This questionnaire, based on previous work, and, as the LUAWMS setting where it was applied, was the scope that the responses were drawn. The Cronbach alpha reliability test result showed a value of 0.7 which indicated good internal consistency and therefore the tool was deemed suitable for collecting reliable and valid responses from the student regarding their practices and understandings of ICT.

Data collection procedure

Physical distribution of the questionnaire was carried out with the undergraduate students; anonymity and confidentially were assurance, and was voluntarily done. The information was gathered during a fixed period of time, filled responses were coded and entered to analyze through software; SPSS 25.

Data analysis

The data was analyzed using SPSS 25. The relationship between ICT usage and students' academic success was examined through descriptive statistics, correlation analysis and inferential test for testing hypothesis and finding significant associations.

Limitations and bias control

The issues arising from purposive sampling would include the potential for selection bias, and a loss of generality. The potential exists for stimulus as there is the opportunity to obtain self-reported measures. Low and much less bias were achieved using reliability testing, rigorous data collection procedures, and valid capacity scales.

Reliability

The reliability of the instrument was tested using Cronbach's alpha, yielding a value of $\alpha = 0.70$, indicating acceptable internal consistency. This suggests that the questionnaire is reliable for measuring ICT use, academic achievement, and related variables. Reliability was further strengthened by adapting items from previously validated studies, ensuring consistent responses across the sample.

Validity

The validity of the instrument was verified through content, face, and construct validity. Content validity was established using the development of literature-based questionnaires about ICT use, study processes, engagement, and challenges. The validity of the faces was verified through expert evaluation to ensure clarity and consistency. Construct validity was verified by matching items with established concepts and prior research, as well as pilot testing to refine and refine the instrument prior to final data collection.

Hypotheses

H0: ICTs usage has no significant impact on academic achievement.

H1: ICTs usage has a significant impact on academic achievement.

Results and Discussion

The description shows that ICTs tools are prevalent among the students in terms of their academic applications including research, online lectures and assignments. The majority of the respondents indicated moderate to high levels of CGPA indicating that there is a possibility of a positive relationship between ICTs usage and academic achievement. In general, ICT seems to be a necessary element of the everyday academic life of students.

Table 1
Descriptive Statistics of ICTs Usage and Academic achievement

Variable	Mean	Std. Dev	Minimum	Maximum
ICTs Usage Score	3.85	0.72	2.1	5
Academic achievement (CGPA)	3.41	0.56	2.2	4

ICTs Usage and Academic Achievement

These findings show that Hypothesis 1 (H1) is statistically significant, and the positive correlation between ICTs use and academic achievement is statistically significant. Students who indicated increased use of ICTs tools were likely to score better in CGPA. This implies that ICTs enable enhanced learning experiences by providing access to digital materials, collaborative and flexible learning spaces. In addition, students can access real time information as well as interactive learning facilities, which help to increase comprehension and memorization of academic ideas.

Table 2
Correlation between ICTs Usage and Academic achievement

Variables	ICT Usage	Academic Achievement
ICTs Usage	1	0.612**
Academic achievement	0.612**	1

The results can be compared to previous research that has identified that ICTs integration positively affects student learning and achievement (Cheung and Slavin, 2013; Genlott and Grönlund, 2016). On the same note, a study conducted by Ishaq et al. (2020) shows that the use of ICTs in Pakistani universities has a positive impact on academic achievement. This supports the claim that ICTs is an important instrument in the contemporary educational systems.

Challenges in ICTs Use

Although there are benefits, the students have cited various difficulties in the use of ICTs. The most prevalent problems were low internet connectivity, absence of technical education and obstructions by non-academic tasks like social media. Such obstacles have the capacity to constrain the efficiency of ICTs in improving the performance of the students and may cause disparities between the students who have varying access.

Table 3
Challenges Faced in ICT Usage

Challenge	Frequency (%)
Poor Internet Access	42%
Lack of Training	28%
Distractions (Social Media)	30%

These are in line with Adarkwah (2021), who revealed infrastructural constraints and digital inequalities to be the main obstacles in developing nations. Also, Andoh (2012) states that insufficient skills and institutional support may impede the successful ICTs integration. These issues need to be addressed to make the most out of ICTs in education.

Use of ICTs and student engagement

Further review indicates that the use of ICTs greatly enhance student engagement, such as through online discussions, collaborative learning, and multimedia content access. Students who were more motivated and active learners had been using

ICTs frequently. This implies that ICTs do not only facilitate academic achievement but also helps in improving the entire learning process.

Table 4
ICTs Usage and Student Engagement Levels

ICT Usage Level	Low Engagement (%)	Moderate Engagement (%)	High Engagement (%)
Low	45%	35%	20%
Medium	20%	50%	30%
High	10%	30%	60%

This reveals that ICTs usage and engagement are closely related, which proves the point that digital tools benefit interactive and student-centered learning (Al-Ansi et al., 2019). The higher level of use also leads to better academic results, which confirms the general efficiency of ICTs in education. These conclusions emphasize the need to effectively incorporate ICTs in teaching.

Discussion

ICTs Usage and Academic Achievement

The results of this research prove the fact that ICTs have a positive impact on academic achievement of students. The findings show that there is a strong correlation between the use of ICTs and the improvement of CGPA levels in relation to the first hypothesis. It is consistent with the existing studies, which emphasize that the application of digital tools improves learning outcomes and academic achievement (Cheung and Slavin, 2013; Ishaq et al., 2020). ICTs give the opportunity to create personalized, flexible and student-centered learning environments where learners can access information at any time and interactively consume content. Moreover, ICTs facilitates shared learning and real-time feedback, thereby enhancing knowledge and memorization. Other research like Genlott and Grönlund (2016) also point out that technology-enhanced learning boosts academic achievement when well applied. Thus, the results strengthen the idea that effective incorporation of ICT in education greatly boosts academic achievements.

ICT Usage Patterns

The research shows that students actively engage in the use of ICTs tools mainly in academic activities such as online research, digital resources and learning platforms. This confirms previous results that ICTs have been an indispensable part of contemporary education (Al-Ansi et al., 2019). Nevertheless, the findings also reveal that the quality of the ICTs usage among the students differs. Although some students are effective in using ICTs to learn, others are involved in less productive activities thus this could limit academic benefits. This echoes the assertion by Comi et al. (2017) that the effects of ICTs are not only limited to access but also on the application of the technology. It is not enough to simply grant access to technology without making sure that students learn the right strategies of using it. Therefore, the usefulness of ICTs in improving academic achievement has unlimited relation to intended and concentrating use.

Challenges in ICTs Adoption

Even though there are optimistic consequences, there are a number of hurdles that prevent the well-organized use of ICTs. Some of the structural obstacles that are recognized in the study are insufficient internet connectivity and poor infrastructure, and behavioral problems include interruption and misuse. These findings can be aligned with

Adarkwah (2021), who also classifies the digital distribute and the infrastructural limitations in emerging settings.

Similarly, Andoh (2012) identifies that lack of training and digital skills is a main restraint to ICTs incorporation in education. Digital literacy is an essential component that decides the success of ICTs usage. Lack of proper skill indicates that students do not take advantages from available resources. Such complications indicate that the positive potential of ICTs cannot be completely grasped unless the technological and human-related hindrances are overwhelmed. Hence, to make the most of the ICTs impact, it is essential to boost the infrastructure and digital capability.

Practical Implications

The findings reveal that educational institutes must invest in ICTs infrastructure, fast internet connection, and digital literacy. Furthermore, conduct of training sessions must be organized to promote digital literacy of students and instructors. The focus of the policymakers should be on sound ICTs integration policies and immediate implementation those policies. Teachers play a vital role to convince students using ICTs for academic achievement. Emerging institutional support in terms of digital services and internet accessibility can enhance student participation, learning effectiveness and overall academic achievement and also sustainability in adopting technology for educational purpose.

Conclusion

To conclude, ICTs significantly improve students' academic achievement especially where it is well integrated in the learning activities. This paper highlights that ICTs propose dynamic, collaborative, and inventive learning environments, which improve students' academic achievement. ICTs use is however limited due to the infrastructure, digital literacy, available resources and the patterns of usage. These factors are major capacities that need to be addressed to take full advantage of ICTs in academic environment. Additionally, the research points out the importance of planned and well-justified ICTs arrangement in higher institutional institutions.

Recommendations

This research study is also restrained to one university location, and this could limit the external validity of the findings. Moreover, self-reported data can report biasness in responses. The studies of the future may be in a longitudinal arrangement to pathway the long-term implications of ICTs use in academic achievement. The sample size might be extended to other institutions and geography to enrich reliability. Additionally, the future research on the impact of digital skills as a facilitating variable and consider qualitative approaches to gain a further profound understanding of the proficiencies of students' academic achievement.

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