



EMPOWERING EDUCATION THROUGH DIGITAL TRANSFORMATION: EXAMINING THE IMPACT OF TECHNOLOGY ADOPTION ON THE LEARNING OUTCOME

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ABSTRACT

Background: One of the main factors reshaping the educational system is the digital change in the sector. Here the researcher analyzed the impact of the adoption of technology by the teachers on the learning outcome of the students.

Methods: For that, the researcher selected Technology Adoption (TA) by the teachers, Digital Literacy (DL) by the teachers, Student Engagement (SE) while using technology in the classroom, and the Learning Outcome of the students while utilizing the technology within the classroom. Here the researcher selected 60 faculties as sample for the study, who work in college and utilize technology in the classroom. The researcher used a convenient random sampling method to select samples and a well-structured questionnaire was distributed among the respondents the collected data were analyzed with the help of statistical tools like correlation coefficient, regression analysis, independent sample t-test, and ANOVA.

Results: The study discovered that teachers' digital literacy and use of technology affect students' learning outcomes. Additionally, it was discovered that there is no significant difference in the use of technology in the classroom between male and female teachers, but there is a significant difference between those in the age range of 25 and under and those over 40.

Conclusion: The study recommended that to improve the student's learning experience, the relevant authorities should provide sufficient training for instructors to become digitally literate and for teachers to utilize technology.

KEY WORDS: Digital Literacy, Student Engagement, Technology Adoption, Learning Outcome and Digital Transformation.

1.0 INTRODUCTION

The vast wave of digital change is driving a fundamental upheaval in traditional classrooms within the quickly changing educational landscape. A dynamic and interactive learning environment is being created by digital technologies, which are changing how knowledge is sent, received, and applied. The term "digital transformation" refers to this phenomenon, which represents a paradigm shift in education that cuts across traditional lines, providing creative answers to long-standing problems and creating new opportunities for cooperation and learning.

Education, which was once primarily focused on in-person interactions, chalkboards, and physical textbooks, is now situated at the nexus of pedagogy and technology. The integration of digital tools, platforms, and approaches into the educational system is known as digital transformation in education. It includes a range of innovations, such as personalized learning powered by artificial intelligence, immersive virtual reality experiences, interactive whiteboards, and online learning management systems.

Improving learning experiences is at the core of the digital transformation in education. Thanks to digital technologies, teachers may design classes that are both entertaining and tailored to the different learning styles of their students. Students' critical thinking, creativity, and active engagement are encouraged through gamified learning modules, interactive multimedia content, and real-time assessments. The digital classroom allows for cross-cultural learning and worldwide collaboration between students by overcoming physical boundaries.

Teachers now have tremendous tools at their disposal to assess student performance, spot learning gaps, and implement interventions on time thanks to digital transformation. Personalized learning routes are made possible by data-driven insights, guaranteeing that no learner is left behind. By utilizing the potential of digital tools, professional development programs equip educators with the knowledge



and abilities necessary to successfully traverse the digital environment. Online forums and virtual communities enable collaboration among educators by promoting the exchange of novel teaching techniques and best practices.

Digital literacy is just as important as traditional literacy in the digital age. By preparing them for success in a technologically advanced world, digital transformation gives students the fundamental 21st-century abilities they need, including problem-solving, cooperation, and digital literacy. Future scientists, engineers, and business owners will benefit from learning about robots, coding, and developing technologies as these subjects foster creativity and innovation.

Even while digital transformation has a lot of potential, there are certain obstacles to overcome, such as making sure everyone has equal access to technology, solving gaps in digital literacy, and protecting privacy and security online. Education stakeholders need to work together to create an inclusive and empowered digital learning ecosystem by taking advantage of possibilities and overcoming obstacles.

Education is on the verge of innovation and advancement in this age of digital revolution. By embracing the potential of digital technology, educators and students set out on a revolutionary adventure that redefines the nature of education and shapes an infinitely curious future.

2.0 REVIEW OF LITERATURE

Mohamed Hashim et al., 2022, The impactful changes process, advantage building, and digital transformation in higher education are all examined critically. It looks at higher education's digital transformation plan trends between 2014 and 2021. The drivers of digital transformation in the post-COVID-19 era are also covered here. The researcher offers empirical insights by analyzing the strategic components of evolutionary learning and conducting comparison research. The study adopts an integrated strategy, tying together evolutionary learning, digital entrepreneurship, digital competencies, reuse, and digital advantages with significant changes. the paper provides firsthand knowledge of the significant shifts influencing universities' missions and strategies for capitalizing on these shifts. To formulate ideas for more research, the paper makes a logical connection between these phenomena.

Yeung et al., 2021, evaluated the literature on the impact of digital technology use in educational settings on students' learning outcomes. In light of empirical studies on principles of effective learning, including enhanced engagement with the subject, retrieval practice, and spacing, the review aims to interpret the effects of technology. The purpose of this study is to ascertain if technology, when used primarily as a means of information presentation, is good or harmful for learning, and whether it can be advantageous when it incorporates special affordances that take advantage of effective learning principles. The significance of evidence-guided standards in determining whether and how to use technology in education is also emphasized in the article. The study concluded that When technology is primarily used to provide information, it can be neither damaging nor good for learning. However, when technology is utilized to leverage effective learning principles through unique affordances, it can be advantageous.

Dixon & Shen, 2019, examined the connection between kids' academic ability on statewide achievement exams and their computer skills in an Alabama primary school when using a technology-integrated curriculum.

A survey questionnaire and historical data from 113 primary school pupils in the fifth grade were used to get the data. The study concentrated on how technology is employed in teaching and learning and how it affects the general standard of instruction in classrooms. To improve the primary school students' learning outcomes, the technology should be integrated into the curriculum.

Sousa & Rocha, 2018, examined the universal and emerging information systems and technologies that support digital learning processes, covering a range of topics related to technological advancements in education and their effects on people, institutions, and society. The potential advantages of mobile learning for schools are also emphasized by the researcher, including financial savings, ubiquity of communications, study tools, and location-based services. The study found that the teachers' digital competency and adequate digital abilities are related to students' utilization of digital learning materials. The researcher concluded that to guarantee universal access and improve learning processes, the article emphasizes the importance of digital technology in education and learning as well as the necessity for additional research and development in this area.

Kim, 2021, evaluated the COVID-19 pandemic's impact on the digital transformation of education, with an emphasis on the industry's move to adopt digital practices and technologies. The study focused on how COVID-19 has had a significant impact on society and how it has accelerated digital disruption across a range of industries, including education. The researcher examined how new practices and technology may challenge established educational models while highlighting the necessity of embracing the digital sphere in education and highlighting the post-COVID-19 societal transition towards a digitally dominating society and its consequences for the education



sector, which could lead to the replacement of "old school" paradigms. Taking into account the societal and technological developments brought about by digitalization, the study attempts to provide insights into the digital revolution of education and its future consequences. The study found that COVID-19 has accelerated the digital revolution of education by pressuring educators to quickly adopt new digital tools and methods and the epidemic has brought attention to the necessity for educational establishments to embrace the digital sphere and adjust to new teaching strategies and technologies. The researcher concluded that the digital revolution of education will have a lasting impact, with the use of digital tools and platforms becoming more commonplace in the classroom.

3.0 OBJECTIVES OF THE STUDY

- To assess how teachers' use of technology and their level of digital literacy affects students' learning outcomes.

4.0 HYPOTHESIS OF THE STUDY

There are 8 Hypotheses based on the variables of the study. The study variables include Technology Adoption, Digital Literacy (DL), Student Engagement (SE), and the Learning Outcome (LO).

4.01 TECHNOLOGY ADOPTION (TI)

The process by which educators incorporate digital tools, applications, and platforms into their instructional strategies and practices is referred to as "technology Adoption among teachers." This adoption is essential for improving education, meeting the requirements of various student populations, and equipping students for life in the digital age. Here the researcher used 5 statements to measure the technology adoption among the teachers.

H₀₁: There is no significant difference between the male and female on the technology adoption(TA).

H₀₂: There is no significant difference between the teachers in the different age groups on the technology adoption (TA)

H₀₃: There is no significant impact of technology adoption (TA) among the teachers on the learning outcome (LO) of the students.

4.02 DIGITAL LITERACY

Teachers who possess the ability to use digital technology responsibly, critically, and proficiently to improve teaching, learning, and professional development are said to be digitally literate. Digital literacy is a vital ability that educators must have in today's quickly changing educational environment. It calls for a blend of technical proficiency, analytical thinking, and moral awareness concerning digital tools and data. here the researcher used 5 statements to measure the digital literacy of the teachers

H₀₄: There is no significant difference between the male and female in the case of Digital Literacy (DL).

H₀₅: There is no significant difference between the teachers in the different age groups on Digital literacy (DL).

H₀₆: There is no significant impact of Digital Literacy (DL) among the teachers on the learning outcome (LO) of the students.

4.03 STUDY ENGAGEMENT

The level of engagement by the students in the classroom will always depend upon many things like the nature of the subject, the attitude of the teacher, the way of teaching, the personal interest of the students, the teaching methodology adopted by the teacher, learning aids used by the teacher, etc, the teachers will adopt different methodology of teaching to get the students engagement in the classroom. Here the researcher measured the perception of the teachers on the student engagement in the classroom while adopting technology in the classroom. For that, the researcher used 6 statements;

H₀₇: There is no significant impact of Student Engagement (SE) on the learning outcome (LO) of the students.

4.04 LEARNING OUTCOME

Learning outcomes are precise declarations of what students should know, understand, or be able to do upon completion of a lesson, course, or educational program. They are also known as educational outcomes or learning objectives. These results function as an indicator of the knowledge, abilities, and skills that the pupils have acquired. Utilizing technology in the classroom may have a dramatic impact on learning outcomes by making learning more dynamic, personalized, and interactive. Adopting technology allows students to interact with multimedia that is interactive, collaborate with people all over the world, and access a wealth of internet resources that improve their comprehension and creativity. Here the learning outcomes of the students are measured by using statements which will be the perception of the teacher on the improvement in the learning outcome of the students by the digital transformation in the classroom. The statements are



H 08: There is no significant impact of technology adoption (TA), Digital Literacy (DL), and Student Engagement (SE) on the learning outcome (LO) of the students.

5.0 RESEARCH METHODOLOGY

The purpose of the study is to analyze the impact of technology adoption among teachers on the learning outcomes of the students. Here the researcher used both primary and secondary data the primary data was collected through a structured questionnaire and the secondary data was collected from magazines, newspapers, and other online websites. Technology adoption (TA) among teachers, Digital Literacy (DL) of the teachers, Student Engagement (SE), and the Learning Outcome of the students are the variables of the study. Here all the information is collected from the teachers by using a structured questionnaire. The teachers answered the questionnaire based on the technology adopted by them in the classroom, their digital literacy, students' engagement in the classroom while adopting the technology in the classroom, and their perception of the outcome of the students after their technology adoption. The researcher used a convenient random sampling method and selected the respondents from the Palakkad district of Kerala. The respondents include the faculties working in colleges and utilizing technology to facilitate teaching teaching-learning process in the classroom. Descriptive statistics, correlation coefficient, independent sample t-test, ANOVA, and regression analysis are the statistical tools used by the researcher to conclude.

6.0 ANALYSIS AND INTERPRETATION

Table 1 shows the Demographic Profile of the respondents

Gender			
		Frequency	Percent
Gender	Female	32	53.3
	Male	28	46.7
	Total	60	100.0
Age	Above 45	17	28.3
	Above 30 to 45	16	26.7
	Below 30	27	45.0
	Total	60	100.0
Region of residence	R	38	63.3
	U	22	36.7
	Total	60	100.0

Source: Primary data

The table shows that 53 % of the respondents are Female and 47 % of the respondents are Male. Then the majority of the teachers are in the age group of below 30 and the majority of them are from rural areas.

Table 2 Shows the Group Statistics for the t-test

Group Statistics					
	Gender	N	Mean	Std. Deviation	Std. Error Mean
DIGITAL LITERACY	Female	32	3.3000	.62061	.10971
	Male	28	3.6964	.74061	.13996
TECHNOLOGY ADOPTION	Female	32	3.1375	.60040	.10614
	Male	28	3.3500	.60277	.11391

Source: Primary data



The Table 3 Shows the result of the Independent Sample T-Test.

Independent Samples Test						
		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
DIGITAL LITERACY	Equal Variances Assumed	.542	.464	-2.256	58	.028
	Equal Variances Not Assumed			-2.229	52.959	.030
TECHNOLOGY ADOPTION	Equal Variances Assumed	.007	.934	-1.365	58	.177
	Equal Variances Not Assumed			-1.365	56.887	.178

Source: Primary data

The independent sample t-test indicates that the 32 females had a mean value of 3.3 and the 28 males had a mean value of 3.6 in the case of Digital Literacy (DL), and the mean shows a significant difference at the p-value < .05 (p = .028). Then in the case of Technology Adoption (TA), 32 females had a mean value of 3.13 and 28 males had a mean value of 3.35 and the means did not differ significantly at the p-value > .05 (p = .117).

Table 4 shows the result of the ANOVA

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
DIGITAL LITERACY	Between Groups	4.085	2	2.042	4.654	.013
	Within Groups	25.012	57	.439		
	Total	29.097	59			
TECHNOLOGY ADOPTION	Between Groups	4.650	2	2.325	7.791	.001
	Within Groups	17.009	57	.298		
	Total	21.659	59			

Source: Primary data

The ANOVA indicates that there is a significant difference exists in Digital Literacy(DL) among the different age groups at a p-value > .05 (p = .03) and Technology Adoption (TA) also shows a significant difference at a p-value > .05 (p = .001).

Table 5 Shows the Multiple Comparisons

Multiple Comparisons					
Dependent Variable	(I) Age	(J) Age	Mean Difference (I-J)	Std. Error	Sig.
DIGITAL LITERACY	Above 45	Above 30 to 45	.30956	.23073	.378
		Below 30	.62113*	.20509	.010
	30 to 45	Above 45	-.30956	.23073	.378
		Below 30	.31157	.20899	.303
	Below 30	Above 45	-.62113*	.20509	.010
		Above 30 to 45	-.31157	.20899	.303
TECHNOLOGY ADOPTION	Above 45	Above 30 to 45	.52059*	.19027	.022
		Below 30	.65577*	.16913	.001
	30 to 45	Above 45	-.52059*	.19027	.022
		Below 30	.13519	.17235	.714
	Below 30	Above 45	-.65577*	.16913	.001
		Above 30 to 45	-.13519	.17235	.714

Source: Primary data



The multiple comparison result shows that the significant difference in the mean value of Digital Literacy(DL) is between the age group of above 45 and below 30 at a p-value < .05 (p = .010). Then in the Technology Adoption (TA), the mean value of above 45 significantly differs from the age group of below 30 and 30 to 40 at a p-value <.05.

Table 6 Shows the result of the Correlation Coefficient

Correlations					
		Study Engagement	TECHNOLOGY ADOPTION	DIGITAL LITERACY	LEARNING OUTCOME
STUDY ENGAGEMENT	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	60			
TECHNOLOGY ADOPTION	Pearson Correlation	.877**	1		
	Sig. (2-tailed)	.000			
	N	60	60		
DIGITAL LITERACY	Pearson Correlation	.578**	.625**	1	
	Sig. (2-tailed)	.000	.000		
	N	60	60	60	
LEARNING OUTCOME	Pearson Correlation	.901**	.973**	.645**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	60	60	60	60

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

Source: Primary data

The result indicates that the Learning Outcome (LO) is positively correlated with Technology Adoption(TA), Digital Literacy(DL), and Students Engagement(SE). Then student engagement shows a positive correlation with the technology adoption among the teachers at a significant value of .000.

Table 7 shows the model summary of the regression analysis

Model Summary						
Variables	R	R Square	R Square and sig	Adjusted R Square	Std. Error of the Estimate	Sig.
STUDY ENGAGEMENT	.901 ^a	.811	.957 (.000*)	.808	.27635	.000*
TECHNOLOGY ADOPTION	.973 ^a	.946		.945	.14764	.000*
DIGITAL LITERACY	.645 ^a	.416		.406	.48558	.000*

a. Dependent Variable: Learning Outcome

The regression analysis shows that 94 % of the Learning Outcome (LO) is explained by the independent variable technology adoption. The technology adoption and the study engagement have a significant impact on the Learning Outcome (LO). Then 41 % of the variability in the Learning Outcome is explained by Digital Literacy. Overall 95 % of the change in the Learning Outcome can be explained by the Technology Adoption (TA), Digital Literacy (DL), and Student Engagement (SE).



Table 8 shows the Hypothesis test Result

H ₀₁	There is no significant difference between the male and female on the technology adoption(TA).	ACCEPTED
H ₀₂	H ₀₂ : There is no significant difference between the teachers in the different age groups on the technology adoption (TA)	REJECTED
H ₀₃	There is no significant impact of technology adoption (TA) among the teachers on the learning outcome (LO) of the students.	REJECTED
H ₀₄	There is no significant difference between the male and female in the case of Digital Literacy (DL).	REJECTED
H ₀₅	There is no significant difference between the teachers in the different age groups on Digital literacy (DL).	REJECTED
H ₀₆	There is no significant impact of Digital Literacy (DL) among the teachers on the learning outcome (LO) of the students.	REJECTED
H ₀₇	There is no significant impact of Student Engagement (SE) on the learning outcome (LO) of the students.	REJECTED
H ₀₈	There is no significant impact of technology adoption (TA), Digital Literacy (DL), and Student Engagement (SE) on the learning outcome (LO) of the students.	REJECTED

7.0 FINDINGS, SUGGESTIONS AND CONCLUSION

7.01 FINDINGS OF THE STUDY

- The males and females show a significant difference in Digital Literacy but they did not show any significant difference in the Adoption of Technology.
- The below-30 age group has more digital literacy than the others and the technology adoption is showing a significant difference in the age group of above 40 while comparing it with the age group of below 30 and 30 to 40.
- The learning outcomes of the students are more correlated with the technology adoption and the students' engagement and also correlated with the digital literacy of the teacher.
- Technology adoption has more impact on the learning outcome of the students than the digital literacy of the teacher, but the students' engagement also has an impact on the learning outcome of the student.

7.02 SUGGESTION

- The schools should adopt technological change in their schools to improve the students' engagement in learning and to improve their academic performance.
- The teachers are ready to accept the technology but everyone doesn't have adequate digital literacy. So the concerned authority should Offer extensive training courses to equip educators with digital competencies and technology-enhanced teaching approaches. To stay current with the newest technological tools and pedagogical trends, encourage educators to participate in continual professional development.
- The teachers in the age group of above 40 show a lack of digital literacy so that may be the reason behind their ignorance of the adoption of technology. So the training and development in the technology should concentrate on the teachers who are in the age group of 40.
- Curriculum developers should Include digital literacy in the curriculum and teach kids about responsible digital citizenship, internet safety, and information evaluation. Make sure educators and students are aware of the risks to cybersecurity and the value of internet privacy and security.

7.03 CONCLUSION

The study on the digital transformation in the teaching and learning process shows a transformative way of education. Through extensive analysis, it found that the technology in the classrooms reshaped the educational landscape. So the study suggested incorporating technology into the classroom and facilitating required training and development for the teachers to enhance their proficiency and digital literacy for the improved use of technology in the classroom. The digital revolution not only improves the learning outcome but also raises a generation of digitally literate, adaptive people who will thrive in a connected world. Education reform is not an optional path; rather, it is a necessary one that will guarantee our students' future readiness and the long-term health of the educational ecosystem. In addition to improving learning outcomes, educational institutions that embrace this digital revolution are raising a generation of digitally



literate, adaptive people who will thrive in a connected world. Education reform is not an optional path; rather, it is a necessary one that will guarantee our students' future readiness and the long-term health of the educational ecosystem

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