Identifying the Level of Teacher's Maturity in the Impactful Technology Use(ITU) in Abu Dhabi Public Schools

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ABSTRACT

The effectiveness of using educational technology in the education system, especially in math and science, has been the subject of many research projects due to its importance. However, it is clear that in many classrooms, teachers lack maturity in using technology effectively. Therefore, the purpose of this research is to assess the level of Impactful Technology Use (ITU) among science and math teachers in public schools in the Al Dhafra region of Abu Dhabi. A mixed-methods approach was used, specifically a concurrent triangulation design, with a sample of 89 science and math teachers selected through purposive sampling. The data collected included teacher questionnaires, lesson observation rubrics, teacher interviews, and class observations. The findings demonstrate a high level of maturity among teachers in their use of technology, as evidenced by their ability to meet the six conditions of ITU. This success can be attributed to the support and professional development provided by the Ministry of Education and other organizations. The research proposes a rubric framework for enhancing and measuring ITU, which can be utilized by education professionals to effectively incorporate technology and improve student learning outcomes. This study holds significant implications for teachers, school leadership teams, and educational governing bodies as it promotes a better understanding of how to achieve impactful use of educational technology. The researcher concludes that higher levels of teacher maturity are crucial in creating the necessary conditions for ITU and recommends further research to test and apply the findings to other subject areas.

Keywords
Educational Technologies, SAMR model, Rubric Framework, Impactful Technology Use (ITU).

Introduction

Educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources (Manciaracina, 2021). Given the value of educational technologies, there is great enthusiasm about how technology can transform education. According to Woodard (2019), global education technology spending will reach $252 billion by the years 2022-2023. However, technology can either help or hinder students' learning, so it is important to carefully consider the situation and evaluate it. Educational technology has become increasingly integrated into classrooms and curricula, offering many benefits. Unfortunately, educators are often hesitant or unprepared to add new technology or adapt it to their classrooms (Woodard, 2019). The researcher's first-hand observation of the difficulties educators face when implementing technology in the classroom are also presented in the works of other researchers (Belbase et al., 2021), which states that educators are not always prepared for educational technology challenges, especially when it comes to science and math.

There is an increasing awareness of the importance of using technology effectively in education, especially given the tremendous investment of money and time. This corresponds to research into the effectiveness of educational technologies, with various results being reported. Recently, many researchers, such as Rugh et al., (2019), have stated that educational technology has no statistically significant effect on student progress. Moreover, with the worldwide interest in implementing educational technologies, this raises concerns for the future of our children. It can be

concluded that simply equipping classrooms with educational technologies is not sufficient to create the significant improvements expected from them. Many other vital factors play a role in the effectiveness of these systems. Also, it is crucial to focus on the role of teachers in accepting and effectively using educational technology, as well as preparing their students to do so. Therefore, it is essential to train teachers and educators to increase their awareness of impactful technology use and empower them with the necessary skills and knowledge.

The United Arab Emirates is making significant strides in implementing educational technologies and preparing teachers. Teachers in the UAE are using a variety of educational technologies daily, such as LMS, Alef, and Alex, as required by the Ministry of Education. This highlights the importance of measuring teachers' levels in using these technologies in an impactful way. Thus, this research aims to identify the maturity level of science and math teachers in Impactful Technology Use (ITU) in Al Dhafra region public schools in Abu Dhabi. To answer the following research question: What are the levels of teachers' maturity in Impactful Technology Use (ITU) in Math and Science education in Al Dhafra region public schools?

Literature Review

Effective technology use in the classroom requires teachers' understanding and awareness of the impactful use of technology. Otherwise, technology can negatively impact learning and create a new burden for teachers. It is necessary to review literature to study available metrics in this context and modify or adapt them to fit the circumstances of Abu Dhabi public schools. These metrics can aid in measuring teachers' maturity in implementing and integrating educational technologies. Impactful Technology Use (ITU) is identified by Bakhshaei (2019) as enabling educators to develop six competencies in their students: initiative, cooperation, interaction, innovation, critical thinking, and selecting appropriate technology solutions. In this research, ITU is defined as educators' ability to select and use educational technologies to enhance their students' competencies in six categories: cooperation, interaction, innovation, critical thinking, and selecting appropriate technology tools and solutions, frequently and proficiently, with a high level of technology integration based on the SAMR model.

The Impactful Technology Use (ITU) metric is a research-based method of determining the impact technology has on student learning. Teachers can use the metric when working with school leaders, as the ITU framework allows for a clear understanding of educators' abilities to use and choose the technology in ways that improve student outcomes. As mentioned in the Google Certified Coach Curriculum (2021), this metric is a real measure of the effectiveness of applying technology in an educational context, especially when considering the 21st-century skills and attitudes that are important for students to acquire (Bakhshaei et al., 2019). As a framework, a rubric outline what performance at each level should look like, how it should be measured, and what criteria and standards must be met (Dart et al., 1998).

The SAMR model, developed by Puentedura (2013), provides a framework for measuring the impact that technology has on a single activity. Based on the work by the Institute of Arts Integration and STEAM (2017), the SAMR model comprises four parts: Substitution, Augmentation, Modification, and Redefinition. As the acronym "SAMR" denotes four distinct levels of classroom technology integration, substitution and augmentation are considered improvement techniques, while modification and redefinition are considered redefining strategies. The SAMR model is used to understand the level of technology integration in the classroom.

The Ministry of Education in the UAE implemented the E-maturity model through their Smart Learning Program, which was first established in 2017. This model assesses and trains teachers and educators on the impactful use of technology. Based on The Emirates Schools Establishment (2022), the E-maturity model was developed to address the needs of schools in a digital environment, where teachers are expected to have the skills to transfer knowledge through technology and present digital content in modern ways and strategies suitable for their students. This creates more opportunities for students in terms of innovation and creativity in educational activities. However, this E-maturity model didn't cover all six conditions of ITU identified by Bakhshaei (2019) and focused mainly on some of the educational technologies provided directly by the Ministry of Education, without considering other tools that are used daily by teachers in the classroom. Through reviewing the literature, the researcher was able to determine the six conditions of ITU, which support achieving ITU and the level of technology integration based on the SAMR model, frequency, and proficiency of using educational technologies. These conditions were common among all the main initiatives in studying and measuring the level of impactful educational technology use, with a focus on the impact technology has on the learning process and how teachers facilitate its use for their students to gain 21st-century skills and incorporate them into their learning.

Methods

In this study, the research design was a concurrent triangulation design, as it is considered the most effective method when collecting both quantitative and qualitative data simultaneously (Edmonds & Kennedy, 2017). Other reasons for utilizing this design include limited time for study and the importance of incorporating both types of information to gain a comprehensive understanding of complex systems such as education. Additionally, the researcher adopted a pragmatic worldview to overcome the limitations of using only one type of data and to attain a deeper understanding of the research topic.

The concurrent triangulation design utilized in this research is a mixed-method design that combines both qualitative and quantitative approaches. This approach involved collecting and analysing both types of data simultaneously, with the results being triangulated to produce findings. The concurrent triangulation design involved four steps: first, data collection, in which both forms of data are collected separately but simultaneously; second, data analysis and presentation, where the collected data is analysed and results are presented for each type of data separately; third, triangulation, where the results from both quantitative and qualitative data are combined to identify areas of convergence, complementarity, and dissonance relating to the research questions; and fourth, interpretation, in which the researcher interprets the findings from the previous triangulation step to reach final conclusions.

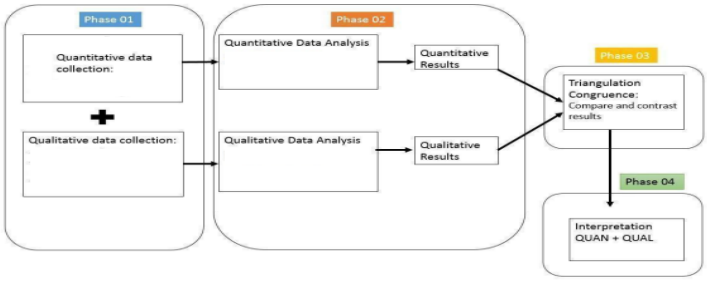

Figure 1. Concurrent triangulation design.

Sampling

The population for the quantitative aspect of this research includes math and science public school teachers in the Al Dhafra region of Abu Dhabi who use educational technologies in their teaching. The total number of teachers in this population is 435, with a division between math and science subjects. It is worth noting that all teachers employed by the Ministry of Education have similar characteristics, skill levels, training, and education levels. This is because the ministry follows the same terms of employment, onboarding, and training for all teachers, and requires them to adhere to the same code of conduct. Additionally, all teachers utilize the same educational curriculum and technologies, and the ministry equips all schools with comparable levels of infrastructure and equipment. As a result, we can consider the entire teacher population to be compatible.

The researcher will use purposive sampling, a type of non-probability sampling, in selecting participants for this study. This approach involves deliberately choosing individuals who possess specific qualities relevant to the research objectives. It is a non-random technique in which researchers determine what information they need and then seek out individuals who possess the necessary knowledge and/or experience (Tongco, 2007). For this study, purposive sampling will be used in a critical-case sampling structure, in which a single case is selected because researchers believe that it will provide valuable insights. In this context, the case is science and math public school teachers in the Al Dhafra region of Abu Dhabi with a minimum of two years' experience in using educational technologies in the classroom and have received training on their instructional use. The researcher notes that not all science and math teachers can be accurately sampled due to various reasons, such as newly appointed teachers having limited experience with educational technologies, especially those used in UAE schools, and limited exposure to training opportunities. Furthermore, some teachers are temporary and may not have been hired by the Ministry of Education under the same regulations and requirements. As a result, a total of 89 teachers were identified as suitable for the study. All these teachers received the questionnaire.

The sample size for the qualitative research portion was determined by following a set of guidelines recommended by Dworkin (2012). According to Dworkin, to effectively describe a phenomenon and address the research question, the sample size for qualitative research should be sufficiently large. However, large sample sizes can result in repetitive data, so researchers should aim to achieve saturation, which occurs when adding more participants does not increase the perspectives or information obtained. As the number of samples increases, the amount of new information does not necessarily increase, reaching a point of diminishing returns. Various publications recommend a range of five to fifty respondents as appropriate (Dworkin, 2012). Additionally, studies have shown that a sample size as small as ten can still yield productive and relevant results (Shetty, 2022). The researcher considered this guidance and, as the focus of the research was on the inductive quality rather than the quantity of data collected, set the initial sample size for teacher interviews at ten. However, this number could be increased if saturation and diminishing returns were not reached. The teachers were selected with the assistance of school leadership teams, who identified candidates based on the purposive criteria set in the sampling method. The age of the teachers was not a factor in the sample selection, as the school leaders confirmed that there were capable teachers with mature educational technology use across all age groups. However, the researcher ensured a balance between female and male teachers, as schools in the UAE are gender segregated.

Pilot study

A key component of a successful study is a pilot study, which the researcher conducted with a sample of ten teachers. This sample was representative of the research population, consisting of science and mathematics teachers who have at least two years of experience using educational technologies in Abu Dhabi schools. The teacher questionnaire was shared with the sample, and the researcher directly observed five of the teachers while they completed the questionnaire. Participants were also instructed to provide their notes on the questionnaire using a separate form. The results were used to test the reliability of the questionnaire through Cronbach's alpha test for all applicable scales. The resulting Cronbach's alpha value was 0.741495082, indicating an overall good and acceptable reliability and internal consistency, and acceptable as all values were positive and higher than 0.6 across the scales used in the questionnaire (Konting, Kamaruddin, & Man, 2009; Cortina, 1993). Furthermore, the teacher questionnaire was validated by two experts and modified based on feedback from both teachers and experts.

Research Procedure: phase 01 to phase 04

In the first research phase, the data collection process for the quantitative portion utilized a quantitative instrument, specifically a teacher questionnaire and a lesson observation rubric. The digital teacher questionnaire is divided into five sections and has an online version that can be shared through various digital platforms, such as email and WhatsApp. For the qualitative data collection, two main methods were used: lesson observation and interviews. Lesson observations were carried out in accordance with the regulations set by the Ministry of Education, while interviews were conducted in a semi-structured manner with the participating parties.

In the Second research phase the quantitative analysis of the level of teacher maturity in ITU employs descriptive statistics for the data collected from the teacher questionnaire, including different scales, and the data from the quantitative portion of the observation rubric. Furthermore, the qualitative analysis of the level of teacher maturity in ITU was done through an exploratory thematic analysis and inductive approaches were used for data analysis. The inductive method involves extracting themes from the interviewees' speeches (Wilson, 2017). Firstly, the interviews were transcribed, and codes were generated to collect evidence for each code from the transcripts. The codes were then organized into constructs and assembled into thematic categories. The data was then analysed to answer the research questions.

In the third phase of the research, the researcher utilized a triangulation method to collect and analyse both qualitative and quantitative data, which could lead to consistent, contradictory, and complementary findings. The process of triangulating for ITU included identifying key themes such as the six conditions of ITU, the SAMR model, and the frequency and proficiency of ITU. Triangulation of the six conditions of ITU yielded separate results for both research arms. And lastly, in the fourth research phase the final interpretation of the triangulated results, the researcher organized the triangulation results from the previous research phase based on the ITU themes. Based on this, the researcher examined and interpreted the triangulation results for ITU's six conditions, the SAMR model, and ITU frequency and proficiency from phase three, and reached the following interpretation.

Data Analysis

The quantitative analysis used descriptive statistics for the data collected from the teacher questionnaire, including different scales, and the data from the quantitative portion of the observation rubric. The researcher used previous research on ITU as a benchmark to align the results of this study in terms of the level of teacher impactful use. This includes the multiyear research conducted by the Dynamic Learning Project (DLP) and validated by a group of researchers (Van Ostrand et al., 2020; Ravitz et al., 2020; Bakhshaei, Hardy, Francisco, et al., 2019; Bakhshaei, Hardy, Ravitz, et al., 2019; Bakhshaei, 2019), which utilized the same ITU framework and research instrument and compared teachers who had implemented the DLP program (designed to achieve impactful technology use) with those who had not. The researcher then triangulated the quantitative results with the qualitative findings.

Table 1. Teacher questionnaire Likert scales

Subject	Scale Name	Description
Impactful Technology Use (ITU)	ITU R (Rate)	A five-point Likert scale, this scale is made out of 4 items. And it is measuring the rate and the frequency of student impactful technology use in the teaching classes.
	ITU I (Impact)	A five-point Likert scale, this scale is made out of six items. And it is measuring the student's impactful technology use in the teaching classes.
	ITU O (often)	A five-point Likert scale, this scale is made out of six items. And it is measuring the frequency of student impactful technology use in the teaching classes.
	ITU A (Agree)	A five-point Likert scale, this scale is made out of six items. And it is measuring the degree of a teacher's ability to impactfully use technology in his classes.

Table 2. Frequency and percentage of response from teachers for (ITU R) scale.

Statements of Scale ITU R	**Much fewer**		**Fewer**		**Same as before MOE EdTech**		**More**		**Much More**	
	F	%	F	%	F	%	F	%	F	%
Hours per week you used technology in your teaching practice	1	1.1	8	9	2	2.2	30	33.7	48	53.9
Days students used technology for class assignments	1	1.1	5	5.6	6	6.7	37	41.6	40	44.9
Students (number of them) using technology for various class assignments	0	0	3	3.4	6	6.7	43	48.3	37	41.6
Courses/subjects you taught using technology in your teaching practice	0	0	5	5.6	13	14.6	29	32.6	42	47.2

Table 3. Frequency and percentage of response from teachers for scale (ITU I) frequency.

Statements of Scale ITU I	**A negative impact**		**No positive impact yet**		**A small positive impact**		**A moderate positive impact**		**A large positive impact**	
	F	%	F	%	F	%	F	%	F	%
How impactful was student selection of technology for increasing student engagement and learning?	0	0	3	3.4	8	9	36	40.4	42	47.
How impactful were the uses of technology for collaboration for increasing student engagement and learning?	1	1.1	3	3.4	11	12.4	35	39.3	39	43.8
How impactful were the uses of technology for communication for increasing student engagement and learning?	0	0	3	3.4	7	7.9	32	36	47	52.8
How impactful were uses of technology for creativity and innovation for increasing student engagement and learning?	0	0	3	3.4	13	14.6	38	42.7	35	39.3
How impactful were the uses of technology for critical thinking for increasing student engagement and learning?	0	0	3	3.4	16	18	35	39.3	35	39.3
How impactful were the uses of technology for student agency for increasing student engagement and learning?	0	0	4	4.5	16	18.	39	43.8	30	33.7

Table 4. Frequency and percentage of response from teachers for ITU O

Statements of Scale ITU O	Almost Never		A few times per semester		Monthly (1-3 times per month)		Weekly (1-3 times per week)		Almost Daily	
	F	%	F	%	F	%	F	%	F	%
How often have you asked your students to select relevant technology tools or resources	4	4.5%	7	7.9%	5	5.6%	28	31.5%	45	50.6%
How often have you asked your students to use technology to collaborate	1	1.1%	13	14.6%	18	20.2%	32	36%	25	28.1%
How often have you asked your students to use technology to communicate	3	3.4%	13	14.6%	17	19.1%	37	41.6%	19	21.3%
How often have you asked your students to use technology to develop their creativity and innovation skills	1	1.1%	13	14.6%	25	28.1%	33	37.1%	17	19.1%
How often have you asked your students to use technology to think critically about what they are learning	1	1.1%	13	14.6%	17	19.1%	30	33.7%	28	31.5%
How often have you asked your students to use technology to develop their agency in taking on and completing tasks	7	7.9%	10	11.2%	15	16.9%	36	40.4%	21	23.6%

Table 5. Frequency and percentage of response from teachers for scale ITU A frequency

Statements of Scale ITU A	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree	
	F	%	F	%	F	%	F	%	F	%
I have the ability to actively engage my students In selecting relevant technology tools and resources for learning.	5	5.6%	0	0%	3	3.4%	45	50.6%	36	40.4%

I have the ability to actively engage my students In using technology to increase collaboration with one another.	5	5.6%	0	0%	5	5.6%	42	47.2%	37	41.6%
I have the ability to actively engage my students In using technology as a tool for communication skills.	5	5.6%	2	2.2 %	7	7.9%	36	40.4%	39	43.8%
I have the ability to actively engage my students In using technology as a tool for creativity and innovation skills.	5	5.6%	0	0%	7	7.9%	46	51.7%	31	34.8%
I have the ability to actively engage my students In using technology as a tool for critical thinking skills.	4	4.5%	2	2.2 %	11	12.4 %	41	46.1%	31	34.8%
I have the ability to actively engage my students In using technology to develop their agency.	6	6.7%	4	4.5 %	5	5.6%	42	47.2%	32	36%

The quantitative portion of the lesson observation rubric was utilized to create both tables 6 and 7. Table 6 presents the gathered data from observing the frequency of students' impactful use of educational technologies in the classroom. Table 7 records the quantitative observations of the level of educational technology integration in the observed classes based on the SAMR model.

Table 6. Frequency and percentage of lesson observation for (ITU PR) scale.

Statements of Scale ITU PR	**To a small extent**		**To some extent**		**To a large extent**		**To a very large extent**	
	F	%	F	%	F	%	F	%
Students select relevant technology tools or resources	0	0%	2	20%	8	80%	0	0%
Students use technology to collaborate	0	0%	0	0%	6	60%	4	40%
Students use technology to communicate	0	0%	0	0%	6	60%	4	40%
Students use technology to create and innovate	0	0%	2	20%	6	60%	2	20%

Students use technology to think critically about what they are learning	0	0%	0	0%	3	30%	7	70%
Students use technology to develop their agency in taking on and completing tasks.	0	0%	0	0%	3	30%	7	70%

Table 7. Frequency and percentage of response from teachers for scale ITU SAMR

Statements of Scale ITU SAMR	**(1) Substitution**		**(2) Augmentation**		**(3) Modification**		**(4) Redefinition**	
	F	%	F	%	F	%	F	%
Lesson start	0	0%	1	10%	7	70%	2	20%
During the lesson	0	0%	0	0%	1	10%	9	90%
Lesson closure	0	0%	0	0%	1	10%	9	90%

Qualitative analysis of the level of teacher maturity in ITU From the teachers' interviews, revealed that teachers are now using educational technology in a more impactful way than before, increasing both the frequency of teacher and student use. While there were variations in their responses, there was a consistent increase in the frequency of impactful technology use. Though the responses lacked detailed explanations, it was sufficient to understand this theme. The teachers' responses also showed a positive increase in impactful technology use, with the keyword "much more" commonly mentioned. The second question focused on the degree of impactful technology use, and the teachers responded that they now have a better and more frequent use of technology through educational tools and programs. This was consistent among the whole sample of teachers. From the entire sample, it is evident that there is a higher level of impactful technology use among teachers, with consistent responses and a significant positive impact on their use of technology in the classroom.

Analyzing lesson observation data shows that the most precise point is student agency. It is obvious that students have full agency in their learning process, and that teachers support and facilitate this through technology. Secondly, critical thinking is evident in lesson observations. In these programs, the teacher helps the students use technology to develop their critical thinking skills through lesson content, program assessment, and program design. Thirdly, there were some positive points regarding teachers helping students to innovate, be creative, and use higher-order thinking skills. Fourthly, teachers are using technology to communicate and collaborate with their students, and it is positively available using available educational technology. Lastly, in some cases, teachers provided facilitated support for students so they could choose educational technologies based on their preferred references. Fifthly, as for the level of educational technology adoption by teachers, the observer found it to be at the modification and redefinition levels based on the SAMR model. This gives a powerful indication that educational technology is being used in an impactful way in the classroom. Moreover, the observer stated that the whole sample observation shows that teachers are achieving a higher level of impactful technology use more frequently.

Results

The final findings from the triangulation and interpretation research phases state that, firstly, the convergence of data from the "Student-selected educational technologies" category supported the level of teacher maturity in empowering students to choose appropriate technology. Additionally, comparing the growth between DLP and non-DLP teachers using the DLP results as a benchmark allowed the researcher to assess the level of teacher maturity. The sample teachers demonstrated higher levels of maturity across the different scales, surpassing the DLP teachers, indicating a significant level of teacher maturity. Secondly, the results from the qualitative data and lesson observations complemented each other. For instance, it was evident that the student's ability to choose technology was a result of effective planning and preparation by the teachers. In terms of the "Student use of technology for collaboration" category, triangulation also showed a similar convergence, further supporting the level of teacher maturity in promoting collaboration among students.

The results from the qualitative arm of the research and the lesson observation complemented each other, showing that effective teacher planning played a crucial role in promoting student collaboration. Moreover, based on the quantitative data, it was observed that the daily usage percentage was lower compared to the weekly frequency for scale ITU O2. This indicated that there is room for improvement in terms of consistent use of technology. Additionally, for the "Student use of technology for communication" category, convergence was evident, further supporting the level of teacher maturity in enabling communication skills among students. However, the qualitative data and lesson observations also highlighted the need for improvement. Similarly, for the "Student use of technology for creativity and innovation" category, convergence was also evident in supporting the level of teacher maturity in fostering these skills among students. The qualitative data and lesson observations showed that teacher planning and preparation were crucial in utilizing all the features of educational technology effectively, with room for improvement in this aspect. The few areas where improvement was not suggested by either teachers or observers were "Learners applying EdTech for critical thinking" and "Students using technology to develop student agency." These areas were deemed to be effectively implemented. The triangulation of data based on the SAMR model revealed a convergence, further supporting the level of teacher maturity in impactful technology use in the classroom. The triangulation of ITU (frequency and effectiveness) also showed a convergence, indicating a significant increase in the frequency of using educational technology by teachers, leading to a positive impact.

Discussions

The results of this study indicate that science and math teachers in Al Dhafra public schools have a high level of maturity in Impactful Technology Use (ITU). The findings suggest that the technologies provided by the Ministry of Education can effectively support teachers in using technology in the classroom. This aligns with previous research highlighting the importance of support and professional development in enhancing teachers' ability to use educational technology effectively (Bakhshaei et al., 2018; Ostrand et al., 2020). Despite the positive results, there are areas for improvement and complementary points to consider. One such area is the reliance on teacher planning and preparation for students' ability to choose appropriate technologies. This indicates a limitation in achieving the condition of ITU related to student choice. Similarly, the ability of students to use technology for collaboration and communication also needs improvement, which may require more attention to teacher planning and the selection of educational technologies.

Furthermore, the results reveal that educational technology is being used in an impactful manner in the classroom, particularly at the modification and redefinition levels according to the SAMR model. This suggests that teachers are successfully integrating technology to transform and redefine their teaching practices. However, there is room for improvement in integrating technology more effectively and creatively at the start of the lesson. Finally, the ITU Frequency and proficiency indicated a positive level of teacher maturity in the classroom frequency of using educational technology and a greater positive impact. It was also noted that the weekly usage percentage was higher than the daily percentage, indicating that teachers' implementation of educational technologies varied from day to day, where it was used more frequently on some days than others. This may suggest that teachers tend to plan to use technology on certain days but not every day.

Conclusion

Considering the discussion and findings, it can be concluded that certain fundamental conditions must be met for the impactful use of educational technology by teachers and students in the classroom. While ITU may be achieved fully or partially in different educational contexts, having a clear rubric can offer a comprehensive and practical approach for teachers to achieve ITU with various available technologies. The results of this research clearly demonstrate that science and math teachers in Al Dhafra public schools exhibit a high level of ITU, with established conditions and scope for improvement to further enhance its implementation. The researcher believes that addressing these areas of improvement will lead to an increase in teacher maturity and subsequently improve ITU levels. This research holds significant importance in the context of the rapidly growing use of educational technology in the classroom and the need for its impactful integration. The findings of this study can assist teachers, school leaders, and education ministries and agencies in comprehending the level of teacher maturity in utilizing provided technologies effectively and how to practically measure it. It also provides guidance on how to improve and guide teachers in achieving ITU in their daily teaching practices.

Limitations and Future Studies

This study addressed several limitations, including the involvement of only math and science teachers, limiting the generalizability of the findings to other subjects. The researcher also observed the Hawthorne Effect, where teachers may alter their behaviour when aware of being observed. Therefore, suggestions for future research include testing the new rubric for measuring ITU. Despite the positive results for science and math teachers, the validity of the rubric should not be limited to this group or the education system in the UAE. It should be validated in other systems known for their success in student learning. One recommended group for this includes English and Arabic teachers, as language learning significantly impacts overall learning and student improvement. Furthermore, the rubric should be tested in non-public schools and in different countries and regions. To fully utilize the rubric, the researcher also proposes the creation of an automated digital platform with built-in ITU components, examples, and materials for easy access. This could aid teachers and educators in developing personalized lesson plans and educational projects using the rubric. It is also essential for future researchers using this rubric to have tailored assessment and research tools that align with ITU guidelines and conditions. This step would standardize research on ITU and reduce preparation time for future projects.

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