Decoding Concerns: Raspberry Pi Adoption in Primary Educational Landscape

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ABSTRACT

This study seeks to understand teachers' technology adoption by examining their concerns regarding the integration of Raspberry Pi as an instructional tool. The Concerns-Based Adoption Model served as the theoretical framework to assess the levels of concern associated with this technological innovation in teaching and learning. The findings reveal that teachers exhibited varying degrees of concern related to technology adoption. Additionally, results from an independent t-test showed that neither academic qualification nor school location significantly impacted teachers' concerns. However, a one-way ANOVA revealed that participants' teaching experience significantly influenced their stages of concern. By examining the adoption process from the teachers' perspectives, more effective and relevant educational support measures can be developed.

Keywords: CBAM, Stages of Concerns, technology adoption, Raspberry Pi, learning tools

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Introduction

It is VUCA World and change is inevitable. The advent of the Industrial Revolution 4.0 (IR4.0) has profoundly transformed how people work (Abdelmajied, 2022). IR4.0 has the potential to enhance productivity through smart and intelligence features. The rapid changes in economic and industrial growth at the global level are simultaneously affecting the landscape of education worldwide. In education, change happens with the advent of any new system, the introduction of technological innovations and soft landing of curricula transformation. In addition, there has been increasing attention on integrating programming education in elementary schools (Yusof et al., 2021; Allsop, 2019) in recent years. The IR4.0, characterized by rapid advancements in robot automation, artificial intelligence, big data, and other emerging technologies, presents significant challenges to national education systems (Yusof et al., 2021; Badrulhisham et al., 2019). Hence, relying on outdated educational methods will hinder our ability to address the challenges of the IR4.0, causing the students to lag behind. Therefore, education must align with industrial developments to balance educational outcomes with workforce demands and to counter unemployment issues.

In the 21st century, the challenge of equipping students with robust STEM skills remains significant, particularly for those in high school and university (Alam et al., 2021; Lavi et al., 2021). The global emphasis on STEM stems from its pivotal role in national development and the necessity for countries to remain competitive in an increasingly digital world. As digitalization advances in education, early exposure to relevant technologies can better prepare primary school students for future careers. Hence, teaching digital literacy, including programming and coding, at an early stage is crucial. Through programming and coding education, young learners engage in computational thinking, which encompasses critical thinking, creative imagination, and problem-solving skills (Cindy & Aslam, 2021; Turker & Pala, 2019). This early education not only imparts fundamental concepts of computation and information but also fosters an understanding of digital systems and their application.

Introducing robotics kits in primary and secondary education is seen as an effective way to engage students in STEM. In computer education, coding has always been one of the basic and compulsory modules in the syllabus. Therefore, coding is an essential skill to master STEM with interactive and fun learning environment (Zainal et al., 2018). One of the coding tools that had been applied in Malaysian secondary school is Arduino (Zainal et al., 2018; Ling & Ling, 2019). It functions as an independent microprocessor to direct robotic devices operation (Sahin, 2018) and coupling with Raspberry Pi to support the programming language. By incorporating coding tools in their instructional practice, teachers can create an interactive learning environment where students develop critical CT skills. These skills are not only essential for computer science but are also increasingly valuable across various disciplines, fostering innovation and creativity in problem-solving, and enabling students to see the real-world impact of their coding efforts (Sentence & Waite, 2022; Copsey-Blake, 2021; Major et al., 2021).

In Malaysia, the introduction of a core science and technology policy began in early 1967 to meet the demand for science-oriented graduates (Ong et al., 2021). A 60:40 ratio for Science to Arts was established as a foundation for the development of science and technology (Academy of Sciences Malaysia, 2017). This policy is reinforced by the government's commitment to achieve its goals through the Science, Technology and Innovation Policy and Vision 2020. The introduction of Malaysia Education Blueprint (2013), 4IR Policy (2021), and Digital Education

Policy, DEP (2023) targeted development plans to strengthen STEM education in the public schools to meet the future workforce needs considering the IR4.0. The policies aimed to focus on enhancing teachers' capacity and role based on the need for all teachers to be trained to accept and use IR4.0 technologies in teaching and learning. Therefore, recognizing the importance of computational thinking (CT) skills, the Malaysia Ministry of Education has initiated efforts to integrate the skills into the existing standard curriculum (MOE, 2013; 2012). The revised syllabus known as primary standard curriculum (KSSR) and secondary standard curriculum (KSSM) aim to introduce basic computing skills while incorporating problem-solving, logical thinking, and lifelong learning skills tarting from primary to secondary school level. (Yusof et al., 2021).

Problem Statement

Despite the integration of programming education into the primary school curriculum in Malaysia, many teachers face significant challenges due to a lack of competency in four key areas: programming knowledge, programming skills, attitude towards programming, and proficiency in digital pedagogy (Hudin, 2023). These challenges are exacerbated by teachers' concerns about adopting new technologies, including a lack of confidence and familiarity with digital tools and teaching methods. The recent curriculum changes, which require teachers with limited or no programming background to teach programming, further complicate the situation.

Digital divide is one of the contributing factors to achievement gap between rural and urban students' performance in public examination (MOE, 2013). Sarawak with high numbers of rural schools is at the losing end if the digital divide had not addressed adequately. The digital divide refers to any disparity in access to basic or advanced ICT tools, such as laptops, computers, or any other handheld mobile device, as well as other external factors, such as internet penetration and its application (Chung et al., 2019; Dawood, 2019; Gong, 2020).

Educators are grappling with educational reform as they are now expected to integrate coding skills and competencies into their instructional practices. Previously, RBT teachers have received extensive training in technical areas such as carpentry, gardening, sewing, and entrepreneurship (Hudin, 2023) skills for former subject known as Kemahiran Hidup (KH). Therefore, addressing teachers' concerns in adopting technology becomes increasingly important due to the complexities of the technology.

To ensure teachers are ready with the educational technologies change, RBT subject teachers all over Sarawak was given a preliminary training to implement Raspberry Pi as learning tool in their lesson. This training aimed to prepare the teachers to be well versed, proficient, and knowledgeable to impart the ICT to skills to the students. With regards to new programs and curricular reform, teachers' feelings, thoughts, concerns, and consideration exert a powerful influence for a successful implementation (Hall & Hord, 2006). However, teachers are grappling with the educational reform as they are expected to harness coding skills and competencies to apply in their instructional practice in the classroom setting. For this reason, due to the technology's complexities, it becomes increasingly important to address teachers' concerns in their technology adoption. Thus, by addressing teachers' concerns on technology adoption, their continuous struggle will not result in technology abandonment or otherwise, our future generation will be greatly at stake.

The selected teachers taught RBT subjects in selected primary schools all over Sarawak. To accomplish this study, an online survey, the Stages of Concerns Questionnaire (SoCQ), was distributed to RBT teachers in Sarawak primary schools that had been attending the first phase of preliminary course on Raspberry Pi. The research questions (RQ) were as follows.

RQ1: What stages of concern profiles do teachers exhibit when adopting Raspberry Pi as a learning tool in the classroom?

RQ2: What are the relationships, if any, between teachers' concern profiles with respect to their school location, academic qualification, and the number of teaching years with technological innovation in computer education?

Alternative and null hypotheses were generated based on RQ2.
H_{O2}: There is no significant difference between the mean scores of each stage of concern with teachers' school location, academic qualification, and years of teaching with technological innovation in computer science.

H_{A2}: There is a significant difference between the mean scores of each stage of concern with teachers' school location, academic qualification, and years of teaching with technological innovation in computer science.

Literature Review

STEM Education in Malaysia

Along with technological integration and the significant changes in curricula, students were introduced to new learning concepts such as Science, Technology, Engineering and Mathematics (STEM), computational thinking, coding, robotics, and other relevant digital skills at an unprecedented rate. In Malaysia, the Ministry of Education initiated the STEM program in the 1970s. However, according to Halim and Meerah (2016), the current ratio of STEM to non-STEM students remains far from the target ratio of 60:40. This gap is attributed to students' lack of awareness of the importance of STEM learning and its practical relevance, along with a content-heavy curriculum.

The Ministry of Education (MOE), in collaboration with the Ministry of Science, Technology and Innovation (MOSTI) and the Ministry of Higher Education (MOHE), is developing a National STEM Action Plan involving various government agencies and private sectors in Malaysia. This comprehensive plan addresses STEM awareness, education, infrastructure, research, career opportunities, and data collection to determine the required number of STEM graduates and courses.

As part of this action plan, the STEM Education Initiative aims to promote lifelong learning, integrating formal education based on the national curriculum, non-formal learning through co-curricular activities, and informal learning from early childhood to the industry level. The goal is to achieve 60% of upper secondary students pursuing STEM-related streams and to nurture STEM-literate students capable of logical thinking, technological adeptness, problem-solving, innovation, and creativity.

To support the initiative, measures include enhancing the curriculum, new learning approaches, improving teachers' skills, and building public and student awareness of STEM. According to Shahali, Ismail and Halim (2017), specific strategies include organizing colloquiums and conferences on STEM to create awareness and provide networking opportunities for school administrators, teachers, and researchers, developing interactive videos in collaboration with Massachusets Institute of Technology (MIT) and the University of Technology Malaysia (UTM) to aid in teaching STEM subjects, creating exemplar STEM resources with project-based learning modules, implementing a STEM Teachers Competency Assessment to evaluate and enhance teachers' knowledge and skills and providing practical science training for primary and secondary school teachers.

STEM education, as defined by Bahrum, Wahid, and Ibrahim (2017), involves the application of pedagogical methods rooted in design and engineering technology to teach science and mathematics, integrating educational technology and engineering practices concurrently. Scholarly interpretations of STEM education highlight its multifaceted nature, with some researchers emphasizing the interdisciplinary connections and practical applications, while others focus on the theoretical underpinnings and pedagogical strategies (Sanders, 2009). The Malaysia Education Blueprint (2013-2025) represents one of the early efforts to enhance STEM education, aiming to increase student interest and raise teacher awareness. However, the effectiveness and implementation of such initiatives remain subjects of ongoing academic debate, reflecting diverse perspectives on how best to achieve these educational goals.

Technology Adoption Barriers and Concerns

According to Ertmer (1999), there are two types of barriers to teachers' adoption of new technology in the classroom: (i) external factors such as resources, access, professional development, and school support, and (ii) internal factors such as teachers' beliefs, pedagogical approaches, and competency with the technology. However, in another study by Ertmer et al. (2012), external barriers were removed in most schools. The authors further argued that instructors' pre-existing views, attitudes, and technological competence were the biggest obstacles to teachers' use of technology.

The researcher recommended that, in addition to teaching teachers how to effectively use technology, professional development should concentrate on modifying teachers' beliefs. It is mainly because teachers' beliefs influence their perceptions and judgments that affect their pedagogical decision-making and actions in the class (Baek, Jones, Bulger, & Taliaferro, 2018; Ertmer, 2005). However, to understand technology adoption in computer education, it is important to address challenges in the adoption process.

The study of these challenges sheds additional insight on teachers' resistance to technology. Previous research using the CBAM framework to understand teachers' adoption of technology suggested that teaching experience affects how teachers respond to innovation (Abd Iksan, 2019; Gudyanga and Jita, 2018; Abd Aziz, 2017), technology training programs (Yueh, 2018; Abd Aziz, 2017; Thang et al., 2014; Saidin and Lim, 2013), and academic qualifications (Ling and Wah, 2015; Paramesveran and Nasri, 2018; Senin and Nasri, 2018). Therefore, the dimension of this framework regarding teachers' concerns regarding technology adoption may provide greater insights into teaching and learning efficiency especially in RBT subject.

Concerns-Based Adoption Model (CBAM)

Change is a process. Therefore, to allow change, the process must be addressed positively and efficiently to ensure smooth transition and adoption of any innovation. Understanding the different issues experienced during the process of change is crucial, particularly in the management of change. If these issues are not addressed, innovation may be destroyed. Therefore, the concerns-based adoption model (CBAM) was created to specifically address the many issues encountered throughout the implementation of any new innovation.

The CBAM is a model used to evaluate curricular reforms and innovation in the education system (Hall and Hord, 2006). CBAM originated from the work of Frances Fuller at the Research and Development Center for Teacher Education at the University of Texas in the late 1960s. The model was applied to understand how teachers react to the deployment of educational innovations (Hall et al., 1973). CBAM offers a thorough understanding of the change process and the reactions involved. The approach also considers several concerns and the extent to which participants use innovation. It describes seven different stages of concern that a teacher might experience during a change in adopting innovation. In the context of this study, it refers to the introduction of Raspberry Pi as a learning tool in RBT subjects, as outlined in the Malaysian Computer Science and Technology Design curriculum.

Based on the work of Hord et al. (2006), CBAM emphasized six assumptions: (i) change should be a process, (ii) change is accomplished by individuals, (iii) change is a personal experience, (iv) individuals go through different stages in how they feel about reforms and in their capacity and ability to align their practices with those reforms, (v) change should be comprehended in operational terms, and (vi) policymakers and those enforcing innovations must focus on individuals, innovation, and the context in which this interaction takes place.

The concerns-based adoption model consists of three instruments: the SoCQ, innovation configuration instrument, and levels of instrument used. To measure the intensity of concerns related to implementation of an innovation, a 35-item Stages of Concern Questionnaire (SoCQ) was created by Hall, George, and Rutherford (1979). The discussion below concerns the instrument used in this study, the Stages of Concerns Questionnaire (SoCQ).

The seven SoCs are Stage 0: Awareness, Stage 1: Informational, Stage 2: Personal, Stage 3: Management, Stage 4: Consequence, Stage 5: Collaboration, Stage 6: refocusing. According to Table 1, there are four categories in which seven stages are grouped. Stage 0: Awareness belongs to an unrelated or unconcerned level; Stage 1: Informational and Stage 2: Personal belong to self-level; Stage 3: Management belongs to task level; Stage 4: Consequence; Stage 5: Collaboration; and Stage 6: Refocusing belongs to the impact level (Hall and Hord, 2020; 1987).

In the Malaysian educational context, especially in schools, studies on CBAM are related to changes in educational practices and curricula. The studies were conducted based on teachers’ concerns regarding technology integration (Senin and Nasri 2019; Abd Aziz, 2017; Thang et al., 2014; Ismail, 2014; Saidin and Sam, 2013) and curriculum change (Puteh et al., 2011; Ling and Wah, 2015; Lim and Goh, 2015; Puteh et al., 2016; Paramavesran and Nasri, 2018; Yueh, 2018; Kee and Iksan, 2019). However, various concerns about educational changes and curricular reforms are related to teachers' sentiments, thoughts, and reactions in adopting new programmes and innovations in their classrooms. Thus, teachers’ technology adoption has significant meaning because of how people react to it and any potential issues that may arise along the way.

Table 1: The Stages of Concerns about an innovation

Fuller Stages	Stage of Concern	Descriptions
Impact	Stage 6: Refocusing	The individual focuses on exploring ways to reap more universal benefits from the innovation, including the possibility of making major changes to it or replacing it with a more powerful alternative.
	Stage 5: Collaboration	The individual focuses on coordinating and cooperating with others regarding use of the innovation.
	Stage 4: Consequence	The individual focuses on the innovation's impact on students in his or her immediate sphere of influence. Considerations include the relevance of the innovation for students; the evaluation of student outcomes, including performance and competencies; and the changes needed to improve student outcomes.
Task	Stage 3: Management	The individual focuses on the processes and tasks of using the innovation and the best use of information and resources. Issues related to efficiency, organizing, managing, and scheduling dominate.
Self	Stage 2: Personal	The individual is uncertain about the demands of the innovation, his or her adequacy to meet those demands, and/or his or her role with the innovation. The individual is analyzing his or her relationship to the reward structure of the organization, determining his or her part in decision making and considering potential conflicts with existing structures or personal commitment. Concerns also might involve the financial or status implications of the program for the individual and his or her colleagues.
	Stage 1: Informational	The individual indicates a general awareness of the innovation and interest in learning more details about it. The individual does not seem to be worried about himself or herself in relation to the innovation. Any interest is in impersonal, substantive aspects of the innovation, such as its general characteristics, effects, and requirements for use.
Unrelated	Stage 0: Awareness	The individual indicates little concern about or involvement with the innovation.

(Source: George et al., 2006, p. 8)

Research Methodology

This study focused on understanding teachers' stages of concern regarding the adoption of Raspberry Pi in their instructional practices. To gather data, the researchers employed the survey method, using a tool called the Stages of Concerns Questionnaire (SoCQ). The SoCQ consisted of 35 items, each of which the participants rated using a 0-7 Likert scale, indicating their level of agreement or concern. The scale ranged from 0 (indicating no concern) to 7 (indicating a high level of concern).

The questionnaire aimed to assess the teachers' stages of concern, which refer to the different phases individuals go through when faced with a technological change or innovation. These stages can vary in intensity and encompass various aspects of concern, such as practical implementation, perceived impacts, and personal feelings about adopting Raspberry Pi in their teaching.

The SoCQ also included additional sections to gather demographic information about the participants. This information included details like the school location, their academic qualifications, and their teaching experience. These demographic sections allowed the researchers to analyze how factors such as school location, academic qualifications, and teaching experience might influence the teachers' stages of concern.

The study's participants consisted of 35 primary school teachers who were currently integrating Raspberry Pi into the subject of RBT in the Kuching, Samarahan, and Serian Divisions of Sarawak. These teachers had previously attended a preliminary course on Raspberry Pi conducted by Sarawak Information Systems (SAINS), indicating that they had some level of familiarity with the technology.

By using the survey method and the SoCQ, the researchers were able to gather valuable data on the concerns of these teachers throughout the stages of technology adoption. The findings from this study can provide insights into the factors that influence teachers' acceptance and integration of Raspberry Pi in their instructional practices, thereby helping educational policymakers and institutions develop targeted strategies to support teachers during this process.

Data Analysis

The profiles of the teachers were generated into percentile scores based on the SoCQ raw data in a spreadsheet and plotted on a graph. Descriptive data analysis for means and standard deviations was performed to determine respondents' concern profiles. An independent t-test was used to determine the differences between teachers based on school location and academic qualifications. A one-way ANOVA was used to determine the differences based on the teaching experience group. An alpha level of $p < .05$ was set for the ANOVA test. A post hoc test, Tukey's Honest Significant Difference (HSD) test, was carried out to assess the significance of differences between pairs of group means in teaching experience.

The research questions, procedures, and data analyses of this study are presented in Table 2.

Table 2: Data analysis according to the research questions

Research Questions	Procedure	Data Analysis
RQ1: What stages of concern profiles do teachers exhibit when adopting Raspberry Pi as a learning tool in the classroom?	SoCQ 35 samples	Frequency, Percentile, Mean, Standard Deviation
RQ2: Do significant differences exist between teachers' concerns profiles with respect to their school location, academic qualification and the number of teaching years with technological innovation in computer education?	SoCQ 35 samples	Independent sample t-test and One-way ANOVA

Results and Discussion

Teachers' Concern Profiles

The teachers who attended the course on Raspberry Pi answered the questionnaire, and 35 teachers answered the online survey. The detailed demographic backgrounds of the teachers are shown in Table 3.

Table 3: Demographic Background of Teachers

		Frequency (N=35)
Academic Qualification	Graduate	24
	Non-graduate	11
School Location	Urban	16
	Rural	19
Teaching Experience	Less 10 years	13
	10- 20 years	17
	More than 20 years	5

For the first research question, profiles of the teachers were generated into percentile scores based on the SoCQ raw data in a spreadsheet and plotted onto a graph. Figure 1 summarises the analysis of teachers' stages of concern profiles when adopting Raspberry Pi in their instructional practice. The findings of this study indicate that all RBT teachers are users of technology, as no teachers at Stage 0. This indicates that Raspberry Pi is of high priority and is central to the thinking and work of teachers.

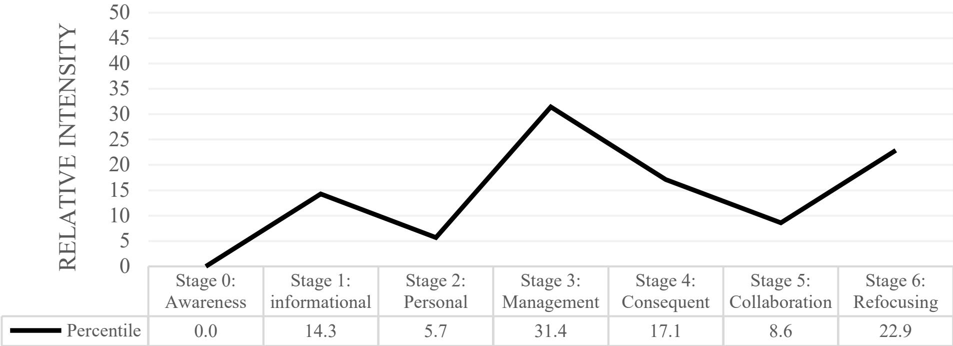

Figure 1: Teachers' stages of concern on the adoption of Raspberry Pi

The highest percentage level occurred in Stage 3 (31.4%), followed by Stage 6 (22.9%) and Stage 4: Consequent. A high Stage 3 reflected teachers' intense concerns about the management, time, and logistical aspects of the task of introducing and adopting Raspberry Pi in their teaching (George, Hall, & Stiegelbauer, 2013). This implies that teachers are more focused on the process and planning of Raspberry Pi as a learning tool in their instructional practice. The second highest profile, Stage 6, implied that the teachers might have some better ideas to carry out the task and to do things differently, either in a positive or negative way towards adopting Raspberry Pi in their teaching. The third highest profile was Stage 1, indicating that teachers were interested in learning more about Raspberry Pi. In this situation, teachers are more attentive to the general features, impacts, and needs of Raspberry Pi in RBT subject.

Relatively, the low values in Stage 5 suggest that teachers are less concerned with coordinating and collaborating with other teachers regarding the use of Raspberry Pi. The dip in Stage 2 implied that teachers were more confident about their adequacy to adopt raspberry Pi in their teaching and about the demands of integrating technology. Hence, the low percentage in Stage 5 and Stage 2 demonstrates that teachers have the right skills to impart knowledge and focus on sharing knowledge with their colleagues.

School Location

An independent samples t-test was employed to test the differences in the stages of concern between urban and rural schoolteachers. The analysis of the data showed that there were no significant mean differences, t (35) = 1.004, p = .323. The mean stage of concern score for urban schoolteachers (M = 4.25, SD = 1.438) was slightly higher than the mean for rural schoolteachers (M = 3.68, SD = 1.827). Effect (d) was .341, indicating a small effect.

Table 4: Results of Independent Sample t-Test between urban and rural schools' teachers

Variable	n	Mean	SD	t	sig-t
Stages of Concerns				1.004	0.323
Urban School Teachers	16	4.25	1.438		
Rural School Teachers	19	3.568	1.827		

It was further hypothesised that teachers in rural areas would demonstrate higher task concerns due to limitations such as the digital divide, basic facilities, and the socio-economic background of their students. However, the results failed to support the conclusion that the stages of concern scores between the urban and rural school teachers were significantly different. In other words, irrespective of their school location, the teachers were facing similar stages of concern in adopting Raspberry Pi in their lessons.

Teachers' Academics Qualification

To ascertain any significant mean difference between graduate and non-graduate teachers, an independent sample t-test was employed. The results indicated no significant mean differences, t(35) = 1.184, p = .245. The mean stage of concern score for graduate teachers (M = 4.17, SD = 1.685) was slightly higher than that for rural school teachers (M = 3.45, SD = 1.572). Effect (d) was .431, indicating a small effect.

Table 5: Result of Independent Sample t-Test between graduate and non-graduate teachers

Variable	n	Mean	SD	t	sig-t
Stages of Concerns				1.184	0.245
Graduate Teachers	24	4.17	1.685		
Non-graduate Teachers	11	3.45	1.572		

The analysis results failed to support the conclusion that the stages of concern scores of graduate and non-graduate teachers were significantly different. Both groups show the highest concern in task concerns, as teachers are continuously seeking ways to achieve their teaching objectives and prepare for their content to adopt Raspberry Pi in their instructional practice.

Teaching Experience

Data on teaching experience were grouped into three categories: less than 10 years (n = 13), 10–20 years (n = 17), and more than 20 years (n = 5). The data depicted teachers with less than 10 years of experience had concerns at Stages 3 to 6, which indicated that they had concerns about the Task and Impact of Raspberry Pi in their instructional practice. Teachers with 10 to 20 years of experience were spread from Stage 2 to Stage 6, and their highest concern was at Stage 3. The third group consisted of teachers with more than 20 years of experience, indicating that their concerns about Raspberry Pi were mainly around Stages 1 to 3. This result suggests that teachers with more than 20 years of experience only indicated a general awareness of Raspberry Pi; however, they are uncertain about the demands of the innovation and have issues related to efficiency, organising, managing, and scheduling their instruction.

A one-way ANOVA was conducted to compare differences based on teaching experience. There were significant mean differences in teaching experience among the three groups (less than 10 years, between 10 and 20 years, and more than 20 years) at the $p<.05$ level [F (2, 33) = 3.511, p = .042, η^2=.18]. Post hoc comparisons using the Tukey HSD test indicated that the mean score for less than 10 years of teaching experience (M = 4.77, SD = 1.166) was significantly different from that of teachers with 10 to 20 years of teaching experience (M = 3.364, SD = 1.730). The mean score for teachers with 10 to 20 years of teaching experience (M = 3.364, SD = 1.730) was significantly different from that of teachers with more than 20 years of teaching experience (M = 2.80, SD = 1.483). The effect size is (η^2 =.18), indicating a large-size effect.

Table 6: Result of Analysis of Variance

Variable	n	Mean	SD	t	sig-t
Stages of Concerns				7.815	0.002
Less than 10 years	13	4.769	1.166		
Between 10 – 20 years	17	3.353	1.656		
More than 20 years	5	2.000	1.000		

In other words, each group of teachers expressed different concerns pertaining to technological adoption in their classrooms. However, based on CBAM, teachers would indicate shifts from self-concerns to task concerns and impact concerns during their teaching service duration. Therefore, it would occur as a result of adding more experience, confidence, and shedding of concerns along the way.

Conclusion

In this study, the researchers investigated the concerns of teachers regarding the adoption of technology in public schools in Sarawak. The study revealed that the highest concerns among the respondents were observed at Stage 3, followed by Stage 6 and Stage 1. These stages represent different aspects of concern related to technology adoption, such as the practical implementation of technology (Stage 3), the potential impacts on teaching and learning (Stage 6), and personal concerns about using technology (Stage 1).

The fact that teachers showed widespread concerns across Task, Impact, and Self-concerns implies that technology adoption involves multifaceted challenges that need to be addressed comprehensively. This insight is valuable for understanding the factors influencing technology adoption among teachers in the region.

Moreover, the study's findings lay a solid foundation for preparing teachers to effectively integrate technology into their instructional practices. By understanding the specific concerns that teachers face, education authorities and institutions can design targeted professional development programs to support teachers in embracing technology-based instructional practices.

The study emphasizes the importance of supporting teachers in accepting and adapting to change with regard to technological adoption in the classroom. It highlights that addressing teachers' concerns is essential for successful technology integration. If these concerns and struggles are left unaddressed, teachers may feel overwhelmed or frustrated, which could lead to them abandoning the use of technology in their teaching practices.

To ensure the successful implementation of technology in education, the study suggests that it is crucial to develop relevant measures and strategies to address teachers' concerns effectively. By doing so, educational policymakers and administrators can create a conducive environment for technology adoption, leading to enhanced teaching and learning experiences for students.

In conclusion, this study sheds light on the concerns of teachers regarding technology adoption in Sarawak's public schools. The findings underscore the importance of supporting teachers and providing appropriate resources to help them overcome challenges related to technology integration. Addressing these concerns will ultimately contribute to the effective use of technology in the classroom and improve the overall quality of education in the region.

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