

Interplay Between Concerns-Based Adoption Model (CBAM) and Technological Pedagogical Content Knowledge (TPACK) as Employed by High School Teachers

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Abstract

This study examined the interplay between the Concerns-Based Adoption Model (CBAM) and Technological Pedagogical Content Knowledge (TPACK) as employed by high school teachers in the Basic Education Department of Tomas Claudio Colleges, Morong, Rizal. Specifically, it investigated how teachers' personal and social concerns influence their level of technology integration in classroom instruction. A descriptive-correlational research design was utilized, employing a researcher-made questionnaire checklist to gather data from 75 high school teachers through total enumeration sampling. Statistical tools such as weighted mean, frequency distribution, F-test, and Pearson's correlation coefficient were used to analyze the data. Findings revealed that the majority of respondents were female, aged 21–30 years, married, with MA units, and holding Teacher II and Teacher III positions. Most had 5–9 years of teaching experience and had participated in school-based in-service trainings on technology integration. Teachers demonstrated high levels of pedagogical knowledge and pedagogical content knowledge, while technological knowledge was comparatively lower. Social concerns showed a strong and significant relationship with all domains of TPACK, whereas personal concerns were significantly related only to foundational domains. Certain demographic variables, such as sex and educational attainment, significantly influenced selected TPACK domains. The study concluded that while teachers possess strong foundational competencies, social engagement plays a crucial role in enhancing effective technology integration. It is recommended that institutions implement structured and continuous professional development programs anchored on CBAM and TPACK frameworks. These programs should emphasize collaborative and socially oriented strategies, as well as targeted interventions tailored to teachers' profiles. Future research may consider additional variables to further explore technology integration practices.

Keywords: CBAM, TPACK, Technology Integration, High School Teachers, Descriptive-Correlational, Professional Development

1. Introduction

Education is a transformative process that enables individuals to develop knowledge, skills, values, and attitudes necessary to function effectively in a rapidly changing world. It serves not only as a means of knowledge transmission but also as a catalyst for personal growth and societal development. In the Philippine context, this mandate is clearly articulated in the 1987 Philippine Constitution, Article XIV, Section 1, which emphasizes the State's responsibility to promote quality and accessible education for all. This provision underscores the importance of relevance in education, particularly in adapting to advancements in science and technology while preserving Filipino culture and identity. In support of this mandate, the Department of Education, through DepEd Order No. 016, s. 2023, highlights the importance of a pedagogically sound curriculum under the Computerization Program (DCP). This initiative aims to transform education through effective technology integration. However, the success of such programs largely depends on teachers' competencies, particularly their Technological Pedagogical Content Knowledge (TPACK), and their readiness to adopt innovations as explained by the Concerns-Based Adoption Model (CBAM). TPACK provides the framework for integrating technology with pedagogy and content, while CBAM explains teachers' developmental concerns and responses to educational change.

Several foreign studies support the significance of these frameworks. Studies by Shambare et al. (2024), Sultan (2025), and Nzaramyimana and Umigiraneza (2024) revealed that although teachers may possess adequate technological knowledge, actual classroom integration is often influenced by contextual, psychological, and institutional factors. Similarly, Zaman and Anwar (2024) and Bilgiç et al. (2023) emphasized that teachers' perceptions, confidence, and institutional support significantly affect technology adoption, aligning closely with CBAM's personal and social concerns.

In the Philippine setting, studies by Relator (2022), Besa et al. (2025), and Merino (2025) revealed that while teachers demonstrate strong TPACK competencies, effective integration is still constrained by factors such as workload,

role ambiguity, and limited institutional support. These findings highlight that technological competence alone does not guarantee successful implementation, as affective and contextual dimensions also play critical roles.

Despite these insights, a significant research gap exists in examining the direct interplay between CBAM and TPACK, particularly in local institutional contexts. Most studies focus on either technological competence or teacher concerns independently, with limited empirical evidence exploring how these variables interact to influence instructional practices. This gap is especially evident in private secondary institutions such as Tomas Claudio Colleges. Thus, this study aims to investigate the relationship between CBAM and TPACK among high school teachers, providing a deeper understanding of how teachers' concerns influence their technological pedagogical practices. The findings are expected to inform the development of targeted professional development programs that enhance both teacher competence and readiness for technology integration.

2. Material and methods

2.1 Research Design

The study employed a descriptive-correlational research design utilizing a questionnaire as the primary tool for gathering relevant data

2.2 Locale of the Study

The study was conducted at Tomas Claudio Colleges (TCC), a private educational institution located in Taghangin, Morong, Rizal, Philippines. Committed to global competitiveness, TCC provides a comprehensive educational ladder ranging from kindergarten and elementary through junior and senior high school, extending to tertiary and graduate studies.

2.3 Respondents of the Study

The respondents in this study were 75 high school teachers. They were described in terms of age, sex, civil status, educational attainment, length of service and in-service training related to technology integration.

2.4 Sample and Sampling Procedure

The respondents of this study consisted of 75 high school teachers from the Basic Education Department of Tomas Claudio Colleges. They were selected using total enumeration sampling due to the limited number of teachers in the institution, ensuring that all qualified participants were included in the study. The respondents were described based on their demographic profiles, including age, sex, civil status, educational attainment, length of service, and participation in in-service training related to technology integration. This approach allowed the researcher to obtain comprehensive and representative data necessary for analyzing the interplay between CBAM and TPACK among the teachers.

2.5 Research Instrument

A researcher-made questionnaire checklist was utilized as the primary data-gathering instrument in this study. It consisted of three parts: Part I gathered the demographic profile of the respondents in terms of age, sex, civil status, educational attainment, length of service, and participation in in-service training related to technology integration. Part II measured teachers' personal and social concerns using a modified Concerns-Based Adoption Model (CBAM) checklist adapted to the local senior high school context, employing a 5-point Likert scale ranging from 1 (Very Low Concern) to 5 (Very High Concern), with higher mean scores indicating greater levels of concern. Part III assessed teachers' competencies across the seven domains of Technological Pedagogical Content Knowledge (TPACK)—Technological Knowledge, Content Knowledge, Pedagogical Knowledge, Technological Pedagogical Knowledge, Technological Content Knowledge, Pedagogical Content Knowledge, and overall TPACK—using a 5-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree), where higher scores indicated stronger competence. The instrument comprised a total of 90 items, with 10 items each for personal and social concerns and across TPACK domains. To ensure validity, the instrument underwent rigorous content validation by a panel of experts, including the thesis adviser, statistician, dean, professors, principal, senior high school coordinator, and teachers. Their evaluations focused on clarity, relevance, and alignment with CBAM and TPACK constructs, and their feedback was incorporated to enhance the instrument's content validity and suitability for the local educational context.

2.6 Data Gathering Procedure

The study was conducted in line with the activities provided in the Gantt chart. It was initiated by content validation of the research instrument that would guarantee the clarity, relevance, and validity of the questionnaire items. A formal request to carry out the study was made to the Office of the President of the Basic Education Department of Tomas Claudio Colleges after the validation process had been done. After giving the approval, the Head of the Basic Education Department was also consulted to ease the coordination with the target respondents. After getting the consent of the relevant offices, the researcher sent the validated questionnaire to the sampled respondents via a safe online system using Google

Forms to accomplish the effective and convenient collection of data. During data collection, the researcher firmly complied with the provisions of the Data Privacy Act 2012 where the researchers ensured that the information provided by the participants was kept confidential and anonymous. Following retrieval of the filled questionnaires, the retrieved data were then properly coded and arranged with the Statistical Package of the Social Sciences (SPSS) in order to be analyzed. The proper statistical process was used to solve each sub-problem of the research. The findings were, subsequently, discussed within the framework of the reviewed literature and theoretical concepts underpinning the research. The findings were interpreted and summarized, conclusions and recommendations developed based on the interpretation. The comments and suggestions made by the Oral Examination Committee were used to revise the manuscript after the oral defense of the study. Before the final submission, the modified paper was checked on anti-plagiarism to check on academic integrity. Lastly, the completed manuscript was sent as hard-bound copies to the Office of the Graduate Studies Program and other designated offices at the university and the research process was completed.

2.7 Data Analysis Techniques

To ensure a comprehensive analysis of the data and to address the research objectives, appropriate statistical tools were employed. Frequency and percentage were used to describe the demographic profile of the respondents in terms of age, sex, civil status, educational attainment, length of service, and in-service training related to technology integration. The weighted mean was utilized to determine the extent of the Concerns-Based Adoption Model (CBAM) in terms of teachers' personal and social concerns, as well as to assess the level of Technological Pedagogical Content Knowledge (TPACK) across its seven domains. To test for significant differences in the extent of CBAM and TPACK when grouped according to respondents' profile variables, One-Way Analysis of Variance (ANOVA) was employed. Furthermore, Pearson's Product-Moment Correlation Coefficient (Pearson r) was used to determine the significant relationship between teachers' levels of concerns (CBAM) and their TPACK competencies. These statistical methods enabled the researcher to systematically examine patterns, differences, and relationships among the variables in the study.

2.8 Ethical Considerations

This study strictly adhered to ethical standards in the conduct of research. Prior to data collection, permission was sought from the school authorities and concerned officials to ensure proper coordination and approval. The respondents were informed about the purpose of the study, and their participation was entirely voluntary. Informed consent was obtained, assuring them that they could withdraw from the study at any time without any consequences. Confidentiality and anonymity of the respondents were strictly maintained by not disclosing their identities and ensuring that all collected data were used solely for academic purposes. Additionally, the researcher ensured that no harm, discomfort, or bias would affect the participants throughout the process. All information gathered was treated with utmost respect and integrity, and results were presented honestly and objectively.

3. Results and Discussion

3.1 Profile of the Respondents in Terms of the Selected Variables

As shown in the table, the 75 respondents are primarily young professionals with a majority at 50.7% are within the age range of 21-30, while only one individual represents the age bracket of 51-59. The respondents are predominantly female at 77.3%, compared to 22.7% male. In terms of civil status, 58.7% are married, while widowed and separated or annulled individuals account for only 1.3 % each. Academically, 36% of the respondents have earned MA units, and only 1 or 1.3% holds a Doctoral Degree. Professionally, in terms of their position title, 36% are holders of the Teacher II position, while 28% are holders of the Teacher III item. As to their length of service, 48% of them have been in the service 5-9 years, while only 1 has served for 20-24 years. Notably, 50.7% of the total group has participated in school-based in-service trainings related to technology integration.

Table 1
Profile of the Respondents in Terms of Selected Variables

Age	F	%	Rank
51 – 59 years old	1	1.3	4
41 – 50 years old	12	16.0	3
31– 40 years old	24	32.0	2
21 – 30 years old	38	50.7	1
Total	75	100	
Sex			
Male	17	22.7	2
Female	58	77.3	1
Total	75	100	

Civil Status			
Single	29	38.7	2
Married	44	58.7	1
Widow/er	1	1.3	3.5
Separated/Annulled	1	1.3	3.5
Total	75	100	
Educational Attainment			
Doctorate Degree	1	1.3	4
Master's degree	21	28.0	3
with MA units	27	36.0	1
Bachelor's Degree	26	34.7	2
Total	75	100	
Position Title			
Master Teacher II	1	34.7	2.5
Master Teacher I	-	-	
Teacher III	21	28.0	4
Teacher II	27	36.0	1
Teacher I	26	34.7	2.5
Total	75	100	
Length of Service			
25 years and more	2	2.7	5
20 -24 years	1	1.3	6
15 - 19 years	3	4.0	4
10-14 years	12	16.0	3
5 – 9 years	36	48.0	1
Below 5 year	21	28.0	2
Total	75	100	
In-Service Trainings Attended			
International	1	1.3	6
National	7	9.3	4
Regional	9	12.0	3
Division	6	8.0	5
District	14	18.7	2
School	38	50.7	1
Total	75	100	

3.2 Extent of Concerns-Based Adoption Model as Employed by Teachers with Respect to the Different Aspects

The findings revealed that teachers demonstrated a moderate overall level of concern toward technology integration, with a composite mean of 3.25. Social concern ranked highest, indicating that teachers place greater importance on institutional support, collaboration, and access to resources, while personal concern remained moderate, reflecting adequate but not dominant individual readiness. This suggests that successful technology integration is largely influenced by the strength of the school's support systems rather than solely by teachers' personal competence. The results highlight the need for strengthened professional development programs, mentoring systems, and technical assistance to sustain effective classroom integration. These findings are supported by related research, such as Besa and Limpot (2023), which emphasized that effective technology use is not only dependent on teachers' TPACK competencies but also significantly influenced by institutional support and positive attitudes toward technology integration.

Table 2

Extent of Concerns-Based Adoption Model as Employed by Teachers With Respect to Social Concerns and Personal Concerns

Aspects	Overall $\bar{W\bar{X}}$	Verbal Interpretation	Rank
Social Concerns	3.50	High Concern	1
Personal Concerns	3.00	Moderate Concern	2
Composite $\bar{W\bar{X}}$	3.25	Moderate Concern	

3.3 Significant Difference on the Extent of Concerns-Based Adoption Model as Employed by Teachers as Perceived by Themselves with Respect to the Different Aspects in Terms of Their Profile

The analysis reveals that age is the only demographic variable that significantly influences social concerns regarding technology integration ($F = 2.791, p = .047$). This indicates that teachers across different age groups vary in their perceptions of institutional and collaborative aspects of technology adoption. However, no significant differences were observed in personal concerns across age groups, suggesting a consistent level of individual readiness. Furthermore, sex, civil status, educational attainment, position title, length of service, and in-service training attendance did not significantly affect either social or personal concerns. These findings imply that technology-related concerns are generally uniform across demographic categories, reflecting an institution-wide culture of digital integration readiness. This finding aligns with the findings of Rusmawaty and Sunardi (2023) who conclude that the CBAM framework shows that educators are typically concerned with the same level of issues irrespective of the demographic characteristics, this implying that the school has already achieved the situation of psychological readiness to the use of technologies. Nonetheless, it also indicates that there are considerable age-related variations in social issues related to the prevalence of support, which implies that the generational aspect is that context-dependent professional development is essential.

Table 3

Result of the F-test in the Significant Difference on the Extent of Concerns-Based Adoption Model as Employed by the Teachers as Perceived by Themselves With Respect to the Different Aspects in Terms of Their Profile

Aspects/Variables	F-value	p-value	Ho	Verbal Interpretation
Age				
Social Concerns	2.791	.047	Rejected	Significant
Personal Concerns	1.246	.300	Accepted	Not Significant
Sex				
Social Concerns	1.184	.280	Accepted	Not Significant
Personal Concerns	1.371	.245	Accepted	Not Significant
Civil Status				
Social Concerns	.539	.657	Accepted	Not Significant
Personal Concerns	.463	.709	Accepted	Not Significant
Educational Attainment				
Social Concerns	.927	.454	Accepted	Not Significant
Personal Concerns	1.099	.364	Accepted	Not Significant
Position Title				
Social Concerns	.324	.808	Accepted	Not Significant
Personal Concerns	1.485	.226	Accepted	Not Significant
Length of Service				
Social Concerns	1.615	.168	Accepted	Not Significant
Personal Concerns	.969	.443	Accepted	Not Significant
In-service trainings attended related to technology integration				
Social Concerns	1.928	.101	Accepted	Not Significant
Personal Concerns	1.754	.134	Accepted	Not Significant

3.4 Technological Pedagogical Content Knowledge (TPACK) Levels of the Teachers with Respect to the Different Aspects

As illustrated in the data, the overall assessment of the respondents' competencies across all domains yielded a composite weighted mean of 4.06, which is verbally interpreted as high level. A comparative analysis of the domains reveals that Pedagogical Knowledge (PK) holds the highest rank with a weighted mean of 4.14. This is followed by Content Knowledge (CK) and Pedagogical Content Knowledge (PCK), which both obtained a weighted mean of 4.10. Conversely, Technological Knowledge (TK) ranked last with an overall weighted mean of 3.99, though it still maintains an interpretation of high level of TPACK. The order of these findings indicates that teachers are primarily grounded in the foundational art of teaching. Pedagogical Knowledge, which ranked first shows that the teachers' strongest asset is their ability to manage classrooms and facilitate instructional time regardless of what tools are used. High scores of Content Knowledge and PCK shows an evident of a high degree of professional maturity of the teachers. However, although the data shows that Technological Knowledge rank last, even with a positive score of 3.99, still shows a specific area for institutional growth. This implies that while teachers are excellent educators, their digital skills is slightly less developed that their instructional and subject-matter expertise. This creates a technological lag where teachers sophisticated

pedagogical goals might be limited by their technical skills. This strongly aligns with the TPACK framework introduced by Mishra and Koehler (2006), effective 21st Century learning requires not only mastery of pedagogy and content, but teachers need a seamless integration of technology with these domains. The slightly lower percentage of technological knowledge suggests that although teachers have strong pedagogical and technological expertise may not yet coordinate with their instructional expertise. Furthermore, the developmental findings of Li et al. (2024), who have a systematic review, found that teachers tend to exhibit stronger pedagogical and content competencies compared to technological proficiency. Thus, the interplay among TPACK domains in this study reflects not deficiency, but developmental progression toward more intentional and fully technology-integrated instruction.

Table 4

Technological Pedagogical Content Knowledge (TPACK) Level of the Teachers with Respect to Cited Aspects

Aspects	Overall W $\bar{X}$	Verbal Interpretation	Rank
Technological Knowledge	3.99	High Level	7
Content Knowledge	4.10	High Level	2.5
Pedagogical Knowledge	4.14	High Level	1
Technological Content Knowledge	4.00	High Level	6
Technological Pedagogical Knowledge	4.01	High Level	5
Pedagogical Content Knowledge	4.10	High Level	2.5
Technological Pedagogical Content Knowledge (TPACK)	4.02	High Level	4
Composite W$\bar{X}$	4.06	High Level	

3.5. Significant Relationship Between the Perceived Extent of Concerns-Based Adoption Model and the Technological Pedagogical Content Knowledge (TPACK) as Employed by High School Teachers with Respect to the Different Aspects

The results revealed a distinct pattern in how personal and social concerns influence teachers' TPACK development. Social concerns demonstrated a consistently significant relationship across all seven TPACK domains ($p = .000$), indicating that teachers who value collaboration, institutional support, and student-centered outcomes tend to exhibit higher levels of integrated technological, pedagogical, and content knowledge. In contrast, personal concerns showed significant relationships only with foundational domains—Technological Knowledge ($p = .019$), Content Knowledge ($p = .014$), and Pedagogical Knowledge ($p = .006$)—but not with higher-order integrative domains such as TCK, TPK, and overall TPACK ($p = .254$). This suggests that while individual motivation supports the acquisition of basic competencies, it is insufficient for achieving advanced integration of technology in teaching. The findings imply that effective professional development should shift from individual, skills-based approaches toward collaborative and socially driven models that enhance institutional support and shared learning. These results align with the CBAM framework, which posits that social concerns reflect more advanced stages of innovation adoption (Rusmawaty et al., 2023), and with the TPACK framework (Mishra & Koehler, 2006; Gonscherowski et al., 2025; Phillips et al., 2026), emphasizing that meaningful technology integration is both contextual and collaborative.

Table 5.1

Computed t-value on the Extent of Concerns-Based Adoption Model (CBAM) and Technological Pedagogical Content Knowledge (TPACK) with respect to the Cited Aspects

Aspect		t-values	p-value	Ho	VI
Personal Concerns	Technological Knowledge	.270	.019	Rejected	Significant
	Content Knowledge	.282	.014	Rejected	Significant
	Pedagogical Knowledge	.316	.006	Rejected	Significant
	Technological Content Knowledge	.223	.055	Accepted	Significant
	Technological Pedagogical Knowledge	.213	.067	Accepted	Significant
	Pedagogical Content Knowledge	.256	.027	Rejected	Significant
	Technological Pedagogical Content Knowledge (TPACK)	.133	.254	Accepted	Significant
Social Concerns	Technological Knowledge	.525	.000	Rejected	Significant
	Content Knowledge	.575	.000	Rejected	Significant
	Pedagogical Knowledge	.625	.000	Rejected	Significant
	Technological Content Knowledge	.544	.000	Rejected	Significant
	Technological Pedagogical Knowledge	.577	.000	Rejected	Significant
	Pedagogical Content Knowledge	.596	.000	Rejected	Significant
	Technological Pedagogical Content Knowledge (TPACK)	.531	.000	Rejected	Significant

Table 5.2 below shows the statistical analysis revealed a highly significant and strong positive relationship between social concerns and all domains of the Technological Pedagogical Content Knowledge (TPACK) framework, with r -values ranging from .525 to .625 and p -values consistently at .000, leading to the rejection of the null hypothesis. This indicates that as teachers place greater emphasis on collaboration, peer interaction, and the impact of technology on students, their ability to integrate technology, pedagogy, and content correspondingly improves. Notably, pedagogical knowledge ($r = .625$) and pedagogical content knowledge ($r = .596$) exhibited the highest correlations, suggesting that engagement within a supportive social environment is a key predictor of effective instructional integration. These findings imply that technology integration is fundamentally a social process rather than merely a technical task, highlighting the need for institutions to prioritize collaborative professional development initiatives such as Professional Learning Communities and peer mentoring programs. Furthermore, the results are consistent with recent studies indicating that TPACK proficiency is enhanced through collaborative and context-based practices (Gonscherowski et al., 2025), while the Concerns-Based Adoption Model (CBAM) emphasizes that social concerns play a critical role in advancing teachers' adoption of innovations beyond individual readiness (Rusmawaty et al., 2023). Together, these findings reinforce the importance of fostering a collaborative culture to support holistic teacher development in technology integration.

Table 5.2

Computed t-value on the Extent of concerns-based adoption model and Technological Pedagogical Content Knowledge (TPACK) with respect to Social Concerns

	r-values	p-value	Ho	VI
Technological Knowledge	.525	.000	Rejected	Significant
Content Knowledge	.575	.000	Rejected	Significant
Pedagogical Knowledge	.625	.000	Rejected	Significant
Technological Content Knowledge	.544	.000	Rejected	Significant
Technological Pedagogical Knowledge	.577	.000	Rejected	Significant
Pedagogical Content Knowledge	.596	.000	Rejected	Significant
Technological Pedagogical Content Knowledge (TPACK)	.531	.000	Rejected	Significant

3.6. Significant Difference on the Extent of Technological Pedagogical Content Knowledge (TPACK) as Employed by Teachers as Perceived by Themselves with Respect to the Different Aspects in Terms of Their Profile

The results of the F-test revealed that most demographic variables—such as age, civil status, position title, length of service, and participation in in-service training—do not significantly influence teachers' TPACK levels, as all corresponding p -values exceeded the 0.05 level of significance. This indicates a relatively uniform level of technological, pedagogical, and content knowledge among teachers regardless of these factors. However, significant differences were observed in terms of sex and educational attainment, where certain TPACK domains and the overall TPACK showed statistically significant variations. This suggests that gender and higher academic qualifications may influence teachers' confidence, exposure, and depth of understanding in integrating technology into instruction. The findings imply that while demographic characteristics generally do not determine TPACK competence, educational advancement and gender-related factors play a role in shaping teachers' technological integration practices. These results are supported by related research, which highlights that age and length of service are not strong predictors of TPACK development, and that professional growth is more influenced by collaborative experiences, continuous learning, and contextual support rather than demographic attributes (Gonscherowski et al., 2025; Li et al., 2024). Furthermore, existing literature suggests that higher educational attainment contributes to deeper content mastery and improved pedagogical application, which enhances overall TPACK proficiency. In this regard, the findings of the present study are consistent with both the TPACK framework of Mishra and Koehler (2006) and recent studies emphasizing that effective technology integration is shaped more by professional development and learning opportunities than by demographic characteristics.

Table 6

Result of the F-test in the Significant Difference on the Extent of Concerns-Based Adoption Model as Employed by the Teachers as Perceived by Themselves with Respect to the Different Aspects in Terms of Their Profile

Aspects/Variables	F-value	p-value	Ho	Verbal Interpretation
Age				
Technological Knowledge	.336	.799	Accepted	Not Significant
Content Knowledge	.495	.687	Accepted	Not Significant
Pedagogical Knowledge	.766	.517	Accepted	Not Significant
Technological Content Knowledge	.095	.963	Accepted	Not Significant
Technological Pedagogical Knowledge	.100	.960	Accepted	Not Significant
Pedagogical Content Knowledge	.508	.678	Accepted	Not Significant
Technological Pedagogical Content Knowledge (TPACK)	.509	.678	Accepted	Not Significant
Sex				

Technological Knowledge	5.799	.019	Rejected	Significant
Content Knowledge	5.374	.023	Rejected	Significant
Pedagogical Knowledge	3.775	.056	Accepted	Not Significant
Technological Content Knowledge	5.107	.027	Rejected	Significant
Technological Pedagogical Knowledge	3.209	.077	Accepted	Not Significant
Pedagogical Content Knowledge	3.031	.086	Accepted	Not Significant
Technological Pedagogical Content Knowledge (TPACK)	4.053	.048	Rejected	Significant
Civil Status				
Technological Knowledge	.494	.687	Accepted	Not Significant
Content Knowledge	.161	.922	Accepted	Not Significant
Pedagogical Knowledge	.219	.883	Accepted	Not Significant
Technological Content Knowledge	.315	.814	Accepted	Not Significant
Technological Pedagogical Knowledge	.397	.755	Accepted	Not Significant
Pedagogical Content Knowledge	.172	.915	Accepted	Not Significant
Technological Pedagogical Content Knowledge (TPACK)	.361	.781	Accepted	Not Significant
Educational Attainment				
Technological Knowledge	2.079	.093	Accepted	Not Significant
Content Knowledge	3.624	.010	Rejected	Significant
Pedagogical Knowledge	3.708	.009	Rejected	Significant
Technological Content Knowledge	2.807	.032	Rejected	Significant
Technological Pedagogical Knowledge	2.781	.033	Rejected	Significant
Pedagogical Content Knowledge	3.415	.013	Rejected	Significant
Technological Pedagogical Content Knowledge (TPACK)	3.812	.007	Rejected	Significant
Position Title				
Technological Knowledge	.318	.812	Accepted	Not Significant
Content Knowledge	.470	.704	Accepted	Not Significant
Pedagogical Knowledge	.305	.822	Accepted	Not Significant
Technological Content Knowledge	.224	.880	Accepted	Not Significant
Technological Pedagogical Knowledge	.198	.898	Accepted	Not Significant
Pedagogical Content Knowledge	.424	.736		
Technological Pedagogical Content Knowledge (TPACK)	.257	.856	Accepted	Not Significant
Length of Service				
Technological Knowledge	.658	.657	Accepted	Not Significant
Content Knowledge	.344	.885	Accepted	Not Significant
Pedagogical Knowledge	.481	.789	Accepted	Not Significant
Technological Content Knowledge	.369	.868	Accepted	Not Significant
Technological Pedagogical Knowledge	.337	.889	Accepted	Not Significant
Pedagogical Content Knowledge	.516	.763	Accepted	Not Significant
Technological Pedagogical Content Knowledge (TPACK)	.397	.849	Accepted	Not Significant
In-service trainings attended related to technology integration				
Technological Knowledge	1.089	.375	Accepted	Not Significant
Content Knowledge	1.682	.151	Accepted	Not Significant
Pedagogical Knowledge	1.523	.394	Accepted	Not Significant
Technological Content Knowledge	1.231	.304	Accepted	Not Significant
Technological Pedagogical Knowledge	1.435	.223	Accepted	Not Significant
Pedagogical Content Knowledge	1.429	.225	Accepted	Not Significant
Technological Pedagogical Content Knowledge (TPACK)	1.398	.236	Accepted	Not Significant

4. Conclusion & Recommendations

Based on the findings of the study, it can be concluded that high school teachers demonstrate a generally positive level of both CBAM and TPACK, with social concerns emerging as the most prominent factor and pedagogical knowledge as the strongest TPACK domain. The results further reveal that social concerns have a significant relationship with all domains of TPACK, while personal concerns are associated only with foundational knowledge domains. Additionally, demographic factors such as age, sex, and educational attainment influence certain aspects of CBAM and TPACK, indicating that both personal and contextual factors contribute to teachers' technological integration practices. Overall, while technology integration is evident among teachers, it still requires strengthening, particularly in promoting higher-order, integrative practices supported by collaboration and professional development.

In light of these findings, it is recommended that the institution enhance collaborative and socially oriented professional development programs to further support teachers' growth. Training interventions should be designed to address the varying needs of teachers across different age groups, sexes, and educational backgrounds to ensure equitable development in all TPACK domains. A structured, continuous, and sustainable technology integration program anchored

on both CBAM and TPACK frameworks should also be implemented to guide teachers toward more advanced instructional practices. The proposed training program is recommended for adoption, and future research may explore additional variables and contexts to further enrich the understanding of technology integration in education.

Compliance with ethical standards

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