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ELEMENTARY PRACTICE TEACHERS' TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE ON REPRODUCTIVE HEALTH EDUCATION: A MIXED METHODS ANALYSIS

(Research article)

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Abstract

Reproductive Health Education (RHE) has long been recognized as a vital component of school curricula and has a crucial role in promoting sexual health and well-being. Elementary educators stand at the forefront of introducing RH concepts to young learners. Hence, Elementary Practice Teachers must develop adequate competencies to perform such a sensitive role. This study investigated the levels of Technological, Pedagogical, and Technological Knowledge on Reproductive Health Education among 94 Elementary Practice Teachers of 4 sampled Teacher Education Institutions. Quantitative and qualitative data collection and analysis were conducted independently yet concurrently using convergent parallel mixed methods design. A researcher-made survey questionnaire was used for quantitative collection, while interview guides were used for the qualitative components. Results showed an adequate level of knowledge in the TPACK domains of RHE, with no statistically significant difference across the four institutions. Key themes included the PT's recognition of its importance, the challenge of addressing stigmas and prejudices, the need for more structured and targeted training, and technological enhancement.

Keywords: Reproductive health education; TPACK, practice teachers, Elementary Education

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1. Introduction

1.1. Rationale

Reproductive Health Education (RHE) has long been recognized as crucial in advancing sexuality and human rights (UNESCO, 2009, UNESCO, 2018). It is considered an important component of school curricula that plays a vital role in promoting the sexual health and well-being of individuals across the lifespan.

Reproductive health education is a critical component of comprehensive sexuality education. It is an age appropriate, unbiased, comprehensive, and medically accurate instruction in human physiology, conception, prenatal care and development, childbirth, postnatal care, reproductive processes, contraception, sexually transmitted infections, gender identity, and relationships (Law Insider, 20., Walker et al., Citation2021). RHE was made part of the curricula with the aim of equipping young people with the knowledge, attitudes, and skills necessary to make informed decisions about their sexual health and well-being (UNESCO, 2018).

The implementation of RHE addresses critical societal challenges such as adolescent pregnancies, the spread of STIs, and sexual abuse, which disproportionately affect vulnerable groups, particularly young women and girls. Inadequate RHE can perpetuate cycles of poor sexual health, misinformation, and gender-based violence, undermining individuals' rights and societal progress (UNESCO, 2009). Thus, international frameworks have called for the systematic inclusion of RHE in national curricula, advocating for approaches that respect cultural sensitivities while upholding principles of inclusivity and rights-based education (UNESCO, 2018).

In the Philippines, the passage of the Responsible Parenthood and Reproductive Health (RPRH) Law in 2012 marked a significant milestone in institutionalizing RHE. To address urgent problems including the nation's high adolescent fertility rate and poor use of contraceptives, the law requires comprehensive reproductive health programs, including CSE (Angeles et al., 2018; Ramirez, 2019). However, the deeply embedded cultural, religious, and sociopolitical forces that determine public attitudes towards sex education make it difficult to integrate RHE into schools, as is the case in many culturally varied countries. Research emphasizes how crucial it is to create inclusive programs that respect human rights frameworks and are both culturally aware and scientifically sound (Ramirez, 2019).

A critical barrier to the effective delivery of RHE is the capacity and preparedness of educators. Research has repeatedly highlighted the inadequacy of teacher training programs, both pre-service and in-service, in equipping educators with the pedagogical skills and confidence to deliver RHE effectively (Kim et al., 2023; O'Brien, Hendriks, & Burns, 2020). Teachers often lack foundational knowledge of reproductive health topics, face limited access to resources, and express apprehension about teaching sensitive subjects, fearing backlash or inadvertently fostering misconceptions (UNFPA, UNESCO, & IPPF, 2020). This issue is particularly pronounced in elementary education, where teachers are uniquely positioned to establish a positive and age-appropriate foundation for RHE (Kirby, Baranowski, & CDC, 2007). Kim, et., al, (2023) indicated that teachers lack RH pedagogy and training on RH while they also tend to minimize and modify their teaching in fear of further stimulating student interest in sex.

Even though RHE is acknowledged to be important at the elementary school level, there is still a large research and practice gap with regard to pre-service teacher preparation. Research conducted in Western countries, including the USA, Canada, and the UK, consistently show deficiencies in teacher preparation programs for sexuality education (O'Brien et al., 2020). Similar gaps are noted in the Philippines, where the incorporation of RHE into the larger pedagogical framework is frequently overlooked in pre-service teacher preparation.

Hence, this study is conceptualized to focus on assessing the TPACK levels of elementary practice teachers. TPACK provides a comprehensive framework for understanding the integration of technology, pedagogy, and content knowledge in education (Mishra & Koehler, 2006). By applying this framework to RHE, the study aims to evaluate how pre-service teachers are equipped to deliver age-appropriate, inclusive, and impactful instruction. By examining the experiences, this research strives to contribute to improved RHE practices and ultimately, ensure all students receive a comprehensive and age-appropriate foundation in reproductive health.

1.2. Framework of the Study

This study is constructed upon the interplay of three key constructs: technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK), as encapsulated by the Technological Pedagogical Content Knowledge (TPACK) framework. This framework serves as the theoretical lens through which the integration of technology into the teaching of reproductive health education (RHE) by elementary practice teachers is examined.

Technological Pedagogical Content Knowledge (TPACK) Framework provides a lens for understanding the complex interactions between technology, pedagogy, and content knowledge in educational contexts (Mishra & Koehler, 2006). It serves as the overarching conceptual framework for examining how elementary practice teachers integrate technology, pedagogy, and content knowledge in teaching reproductive health education. (Refer to Schematic Diagram 1. TPACK of Elementary Practice Teachers on Reproductive Health Education)

Content Knowledge (CK) pertains to teachers' understanding of the subject matter they teach, including key concepts, principles, and theories (Shulman, 1986). CK in this study focuses on elementary practice teachers' knowledge of reproductive health topics, including human physiology, contraception methods, and sexual health principles.

Pedagogical Knowledge (PK) encompasses teachers' knowledge of instructional strategies, classroom management techniques, and student engagement methods (Shulman, 1987). PK in this study refers to elementary practice teachers' pedagogical approaches and strategies for delivering reproductive health education content effectively.

Technological Knowledge (TK) refers to teachers' understanding of how to effectively utilize technology tools and resources to enhance teaching and learning experiences (Koehler & Mishra, 2009).In the context of this study, TK encompasses elementary practice teachers' proficiency in using technology tools and resources to deliver reproductive health education contents.

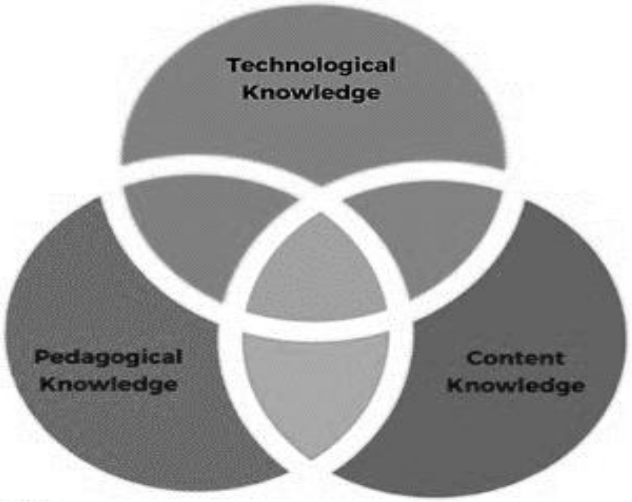

Figure 1. TPACK of Elementary Practice Teachers on Reproductive Health Education

1.3. Statement of Problem:

This study investigates the Technological Pedagogical Content Knowledge (TPACK) in Reproductive Health Education (RHE) among elementary practice teachers in four Higher Education Institutions (HEIs) in Bukidnon. Specifically, it seeks to answer the following questions:

1. What is the socio-demographic profile of the elementary practice teachers in terms of:
   a. Gender,
   b. Civil status, and
   c. Type of institution?
2. What are the elementary practice teachers' levels of:
   a. Content knowledge,
   b. Pedagogical knowledge, and
   c. Technological knowledge in RHE?
3. Is there a significant difference in the RHE-TPACK levels of elementary practice teachers across institutions?
4. What are the experiences of elementary practice teachers in incorporating RHE-TPACK into their teaching practices?

2. Method

2.1. Research Design

The research is grounded in a pragmatist philosophy (Creswell, 2014). Pragmatism emphasizes the importance of practical applications of knowledge and the use of multiple methods to gain a holistic understanding of a phenomenon (Flick, 2015).This is consistent

with the convergent parallel design, which combines quantitative and qualitative data to provide a more comprehensive analysis of the TPACK of elementary practice teachers on reproductive health education.

This study will employ a **convergent parallel mixed methods design** to investigate elementary practice teachers' TPCK on RHE. This approach, as described by [Creswell & Plano Clark, 2018], involves collecting quantitative and qualitative data **concurrently** but analyzing them **separately**. The findings from both strands are then brought together during the interpretation phase to provide a more comprehensive understanding of the research question. Moreover, figure 2 illustrates the methodological framework that will be employed by this study.

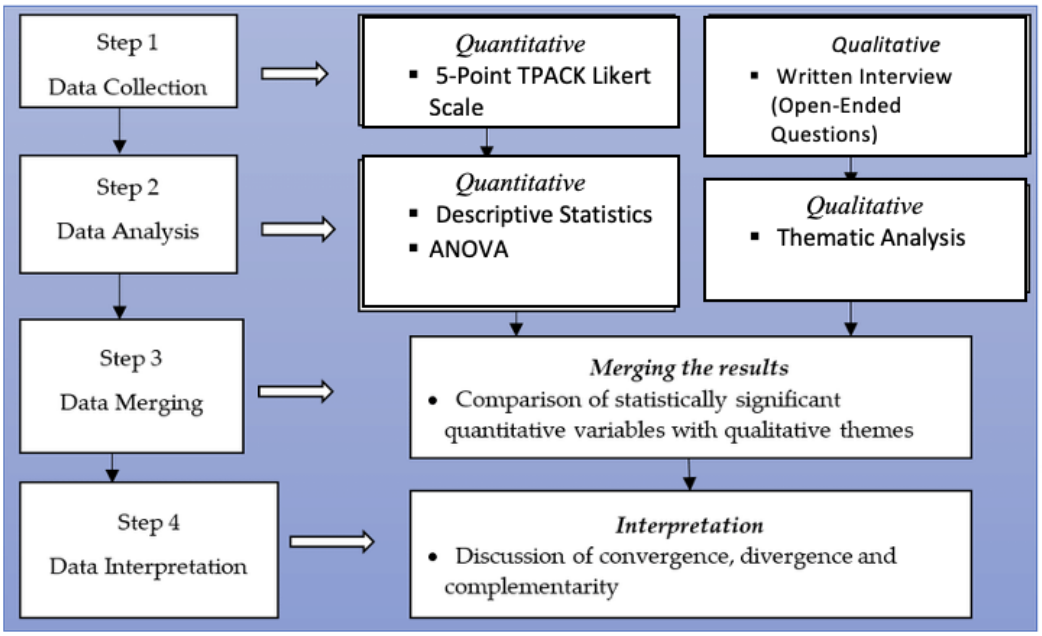

Figure 2: Convergent Parallel Mixed Methods Flow Chart

2.2. Research Locale

The study was conducted in four teacher education institutions (TEIs) in the Visayas and Mindanao, Philippines. These TEIs are offering Bachelor of Elementary Education. The selection of these TEIs is done on the basis that varied type of institutions may have specific nuances pertaining to the RHE knowledge on content, pedagogy, and technology. These 4 TEIs including; (School A) a private State University ; (School B) – a public State University, and a normal school; (School C) a private catholic institution; and, (School D) a public community college.

2.3. Research Sampling & Design

Since this inquiry examines Elementary Practice Teacher TPACK, then Elementary practice teachers were used as the sample. A total of 94 practice teachers coming from the 4 TEIs were included in the study, using the convenience sampling as the most feasible design for the researchers' context. Among the population students, some will take part in a

preliminary study to test the instruments' reliability, while the rest will participate in the final study. The aim of the preliminary study is to verify the reliability of the research instruments. This was achieved by utilizing Cronbach's alpha to assess the instruments' reliability. The inclusion criteria specified that the practice teachers are (1) officially enrolled in the internship subjects for S.Y. 2023-2024; (2) Willing to participate; (3) Can speak English Language.

2.4. Research Instruments

This inquiry used 2 forms of research instrument. These instruments are aligned to the 2 phases of the explanatory sequential mixed methods.

Phase 1: Quantitative Phase. The researcher-constructed survey questionnaire will be administered. It involved a 5-point likert scale questions designed to assess their self-reported TPACK regarding reproductive health education. The questionnaire included validated scales to measure participants' technological knowledge, pedagogical knowledge, and content knowledge related to reproductive health education. This survey instrument was content validated by 3 experts and was tested with Cronbach's alpha instrument reliability test with high results, yielding 0.887 for Content Knowledge, 0.923 for Pedagogical knowledge, 0.855 for technological knowledge in the subscale , and an over-all scale of 0.933, all exhibiting internal consistency.

Phase 2: Qualitative Phase. Individual semi-structured interviews were conducted with selected participants to explore their perspectives, experiences, and practices related to integrating technology, pedagogy, and content knowledge in teaching reproductive health education. The interviews delved into participants' instructional strategies, challenges faced, and recommendations for enhancing TPACK integration. An interview guide was used.

2.5. Data Gathering: (Preliminary, actual, and post)

The data gathering process began by seeking ethical approval from the President of the institution, granting access to the TEIs where the study was conducted. Following this, participants received detailed information that clearly explained the study's purpose, procedures, risks, and benefits. After ensuring participants' comprehension of the study and obtaining their voluntary agreement to participate, their consent was secured. Consent forms were used for documentation. The survey questionnaires were administered electronically through google forms. After data from survey questionnaire are gathered and preliminary results were reached, semi-structured interviews were then be conducted. One-on-one interviews were scheduled with participants in comfortable and private settings. With participants' consent, a tape recorder were utilized to accurately record the interviews, capturing participants' responses faithfully. As participants share their experiences, the researcher took meticulous notes during the sessions, capturing non-verbal cues, emotions, and contextual details. The recorded sessions were transcribed and were securely stored for subsequent analysis.

2.6. Data Analysis:

Quantitative Phase. Descriptive statistics, such as means, and standard deviations were calculated to summarize participants' TPACK scores. Before proceeding with inferential

statistics, the normality of the data was assessed using the Shapiro-Wilk test to ensure the assumptions of the one-way analysis of variance (ANOVA) were met. A one-way analysis of variance (ANOVA) was performed to compare the difference across institutions vis-à-vis levels of TPACK on reproductive health education.

Qualitative Phase. Thematic analysis were employed to identify patterns, themes, and insights from the interview data. The analysis process will involve coding interview transcripts, organizing codes into broader themes, and interpreting themes in relation to the research questions and theoretical framework.

Integration of Quantitative and Qualitative Data. After completing both phases of data collection and analysis, the quantitative and qualitative findings will be integrated to provide a comprehensive understanding of elementary practice teachers' TPACK regarding reproductive health education. The qualitative data will help explain and contextualize the quantitative findings, offering insights into the complexities of TPACK integration in practice.

2.7. Research Ethics:

Throughout the course of this study, the researcher will diligently adhere to ethical guidelines, ensuring the incorporation of all elements of informed consent, confidentiality, and utmost respect for the participants. Ethical approval will be sought from the research ethics committee. To ensure the rigor, trustworthiness, and credibility of the study, the researchers will meticulously follow the recommendations of Lincoln and Guba on trustworthiness, which encompass establishing credibility, transferability, and dependability.

Credibility will be ensured through the application of member checking, a process that seeks the participants' feedback on the findings to validate the accuracy of interpretations. As qualitative research does not aim for replicability, the study will provide in-depth, detailed descriptions replete with contextual information, thereby promoting the transferability of its findings to other similar contexts, thereby enhancing trustworthiness.

The study does identify certain risks, notably the potential physical and mental discomfort that participants may experience when sharing their reproductive health education integration in their class experiences. However, it's important to emphasize that these risks are outweighed by the significant benefits that emanate from this research. These benefits encompass the development of a well-researched and thoughtful organizational interventions and programs. Additionally, the risks will be mitigated by providing a safe, comfortable, and conducive area for the interviews, and participants will be offered compensation in the form of snacks. Furthermore, participants will be duly informed that their participation in the study is entirely voluntary, and they retain the right to withdraw from the interview at any time without facing any sanctions or consequences.

3. Results & Discussion

3.1. Socio- Demographic Characteristics of Elementary Practice Teachers

Table 1 shows participants from four different teacher education institutions, specifically from; (1) private state university; (2) public state university; (3) private catholic school; (4) public community college. The total number of participants across the four institutions is 94. The deliberate selection of participants from institutions is done to ensure to ensure generalizability and relevance to a wider range of educational context.

The data shows an imbalance between female and male participants, with females forming the vast majority. There are a total of 82 female participants (87.24%) compared to only 12 male participants (12.76%). The underrepresentation of males in the field of elementary education resonates to the study of Acharya & Monroe (2000) who found that societal perceptions of teaching as feminine and the lower salaries in elementary education compared to other professions were key factor of the gender imbalance. Over the passing of time, education, particularly elementary education has been perceived by society to be a woman's professions, hence in any institution, women has dominated the population of Practice Teachers (PTs).

Table 1. Socio Demographic Characteristics of Elementary Practice Teachers

Teacher Education Institution	No. of Participants	Gender	Civil Status
School A		F – 36	S – 36
(Private State University)	36	M – 0	M – 0
School B	20	F – 19	S – 20
(Public State University)		M – 1	M – 0
School C	12	F – 10	S – 11
(Private Catholic College)		M – 2	M – 1
School D		F – 17	S – 23
(Public Community College)	26	M – 9	M – 3

The socio-demographic profile also includes data on participants' marital status. This data exhibits a significant skew, with 90 participants (95.74%) identified as single and only 4 (4.26%) reporting as married. This finding aligns with the expectation that the study population consists primarily of undergraduate students, who are typically less likely to be married. The skewness of data on gender and civil compelled the researcher to focus the investigation primarily on the significant difference between the RHE-TPACK across the 4 institutions.

3.2. Elementary Practice Teachers' Level of TPCK on Reproductive Health Education

Table 2 presents the elementary practice teachers' level of Technological, Pedagogical and Content Knowledge on Reproductive Health Education. The data shows that, generally, the elementary PTs are adequately knowledgeable across the three TPACK domains vis-à-vis Reproductive Health Education (M= 3.73 , SD = 0.74) which qualitative mean, adequately knowledgeable. In this level, the PTs self-reported a good level of understanding on the core concepts of Reproductive health education.

3.2.1. On Content Knowledge

Among the specific indicators tested in content knowledge domain, understanding on the concepts of family planning & physiological changes during puberty and adolescence obtained the highest means. A study by Liang et al. (2017) highlighted that while there are areas for improvement when it comes to knowledge on RH, some participants demonstrated

stronger knowledge in specific areas like puberty and adolescence. This aligns with the possibility that teacher education programs might prioritize these topics.

This may be associated with the presence of training initiatives or curricular inclusions of these specific topics. In teacher education, physiological changes during puberty and adolescence are introduced in subjects like “Child and Adolescent Learners”, “The Teaching of Scienc and MAPEH”. Additionally, this topics may be more relatable to the PTs as they have experienced and witnessed these changes in their own lives or those of close contact. Hence, this may have contributed to their self-reported extent of knowledge on these concepts. However, low means are given to indicators related to their knowledge on “Contraception” and “them staying informed on the current researches, trends and best practices in Reproductive Health Education”. Though family planning is adequately familiar to them, contraception can be a sensitive topic and PTs might feel less comfortable discussing it due to personal beliefs, lack of specific training, or concerns about parental reactions.

Additionally, their “confidence regarding their knowledge to teach the contents related to reproductive health obtained the lowest mean (M=3.65; SD- 1.044). This implied the necessity of ongoing professional development for this PTs regarding this targeted focus. The study of Coyle et al. (2014) affirms this, highlighting the importance of ongoing professional development for teachers to ensure they are equipped with the latest knowledge and skills for effective sex education delivery. This emphasizes the need for targeted support in areas like contraception and best practices.

3.2.2. On Pedagogical Knowledge

Pedagogical knowledge is crucial for PTs and educators to effectively deliver RHE instruction that promotes student learning, positive attitudes, and healthy behaviors. Pedagogical Knowledge involves the PTs ability to understand learner’s development, delivery of effective instructional strategies, creating a safe and inclusive learning environment, and use of assessment strategies.

Data revealed that the PTs largely understand the importance of creating a safe and inclusive learning environment when teaching sensitive topics related to reproductive health (M=3.91; SD= 1.006) . This manifests awareness of the sensitivity surrounding these topics and the need to provide a learning environment where both teachers and learners can comfortably discuss sensitive topics of RH. A study by Maticka-Tyndale et al. (2017) investigated sexuality education training for teachers. They found that programs emphasizing creating safe and inclusive learning environments positively impacted teachers' confidence and ability to address sensitive topics with students. This aligns with the possibility that teacher training might emphasize safe space creation.

On the other hand, PTs scored the lowest on their awareness of national and local policies and guidelines for delivering Reproductive Health (RH) education in elementary schools (M + 3.54; SD = 1.023) **.** This suggests that PTs might not be familiar with the Department of Education (DepEd) policies and educational guidelines that exist to help them teach RH effectively. According to DepEd (2018), RH should be integrated into five subjects: MAPEH (Music, Arts, Physical Education and Health), Social Studies, Value

Education, Science, and Personality Development, across all grade levels. This approach is preferred over creating a separate RH curriculum.

Along the need for increased awareness of local policies and guidelines, the result also reveal that these PTs scored lower than other indicators in the area of effectively communicating with parents/guardians about the importance of reproductive health education and address any concerns or questions they may have. This are is deemed crucial specially when considering that for comprehensive sexuality education to serve its purpose and achieve its aims, all stakeholders must be in, specially the parents. When school through its teachers are able to communicate the importance of RHE and answers the parents' concerns about RHE, then RHE integration into the curriculum is better facilitated. Moreover, Research by Advocates for Youth (2018) highlights that adolescents who feel open to discussing sexual health with their parents are more likely to delay initiating sexual intercourse and practice safer sex. Effective communication with parents fosters a supportive environment where students can ask questions and receive guidance.

3.2.3. On Technological Knowledge

Technological knowledge in the context of RHE refers to an educator's understanding and ability to effectively integrate technology tools and resources into their teaching practice to enhance student learning about reproductive health. Undeniably, technology can make RHE lessons more interactive and engaging for students, leading to improved learning outcomes (Huang et al., 2022).

The analysis revealed that elementary practice teachers (PTs) scored highest (M=3.94) on their openness to learning and exploring technological tools and strategies for enhancing their RHE teaching effectiveness. This suggests a strong willingness among PTs to improve their technological knowledge, particularly regarding using, accessing, and potentially developing technological tools to support their RHE instruction. By embracing technology, PTs can create more engaging and interactive learning experiences.

However, there is an interesting trend in the data pertaining to the low means for this domain. Interestingly, among the 36 indicators of the 3 domains, only 2 indicators obtained a moderately knowledgeable extent. These indicators pertain to "receiving formal training or professional development in the use of educational technology for teaching reproductive health topics. (M= 3.28; SD = 1.111) & the ability to "troubleshoot common technical issues that may arise during reproductive health lessons and find solutions independently." (M= 3.46 ; SD = 0.838). While their teacher education training did not formally introduce to them the different technological tools, these PTs had to learn and explore these tools themselves as necessitated when they are already having their practice teaching/internship experience. This may imply that teacher training may enhanced their educational technology subjects/technology for teaching and learning subjects, even other major subjects to particularly involve the inclusion of innovative, digital, ICT tools.

Table 2. Mean and Standard Deviation on the Levels of TPCK on Reproductive Health Education

Variable	Mean	SD	QD
Content Knowledge (CK)			
1. I am familiar with the biological processes of human reproduction, including conception, fetal development, and childbirth.	3.71	1.012	Knowledgeable
2. I am knowledgeable about the reproductive anatomy and physiology of both males and females, including the structures and functions of the reproductive organs.	3.70	0.982	Knowledgeable
3. I understand the physiological changes that occur during puberty and adolescence	3.99	0.978	Knowledgeable
4. I can explain the menstrual cycle, its phases, and the hormonal regulation involved, in a clear and understandable manner.	3.72	0.955	Knowledgeable
5. I possess knowledge of the principles of safe and responsible sexual behavior, including consent, communication, and healthy relationships.	3.83	1.012	Knowledgeable
6. I am familiar with common reproductive health issues and concerns faced by adolescents	3.76	1.002	Knowledgeable
7. I understand the cultural and social factors that influence attitudes and behaviors related to reproductive health, such as gender norms, peer pressure, and media influence.	3.90	0.940	Knowledgeable
8. I can address sensitive topics related to reproductive health education with empathy, inclusivity, and respect for diverse perspectives and backgrounds.	3.84	0.919	Knowledgeable
9. I stay informed about current research, trends, and best practices in reproductive health education through professional development opportunities and ongoing learning.	3.65	0.924	Knowledgeable
10. I feel confident in my knowledge to teach reproductive health education effectively	3.54	1.104	Knowledgeable
11. I understand implications of physiological changes during puberty and adolescence on reproductive health.	3.67	1.072	Knowledgeable
12. I am knowledgeable on the concepts of contraception	3.65	1.044	Knowledgeable
13. I have knowledge on the different concepts related to Sexually Transmitted Diseases	3.70	0.982	Knowledgeable
14. I familiar on the varied concepts related to Pregnancy prevention	3.90	1.027	Knowledgeable
15. I understand the topics related to family planning	4.06	1.003	Knowledgeable
Sub-mean	3.78	0.848	Knowledgeable
Pedagogical Knowledge (PK)			
1. I am aware of local and national policies and guidelines regarding the delivery of reproductive health education in elementary school settings.	3.54	1.023	Knowledgeable
2. I am knowledgeable about different instructional approaches (e.g., cooperative learning, inquiry-based learning) that can be used to engage students in reproductive health education.	3.69	1.027	Knowledgeable
3. I am familiar with developmentally appropriate teaching strategies for addressing reproductive health topics at the elementary school level.	3.69	0.916	Knowledgeable
4. I understand the importance of creating a safe and inclusive learning environment when teaching sensitive topics related to reproductive health	3.91	0.935	Knowledgeable
5. I can facilitate open and respectful discussions about reproductive health topics by encouraging students to ask questions and express their thoughts and concerns.	3.85	1.026	Knowledgeable
6. I understand the ethical considerations involved in teaching reproductive health education, including confidentiality, respect for diverse perspectives, and cultural sensitivity.	3.86	0.957	Knowledgeable

7. I am proficient in using formative assessment strategies to monitor students' understanding and progress in reproductive health education	3.69	1.006	Knowledgeable
8. I can effectively communicate with parents/guardians about the importance of reproductive health education and address any concerns or questions they may have.	3.61	1.018	Knowledgeable
9. I possess the skills to adapt instructional materials and activities to meet the diverse learning needs of students when teaching reproductive health topics.	3.81	0.931	Knowledgeable
10. I feel confident in my ability to teach reproductive health education effectively and supportively, fostering students' understanding, skills, and attitudes toward reproductive health.	3.57	0.945	Knowledgeable
11. I can make necessary adjustment in my instruction in order to accommodate concerns and discussions related to Reproductive Health	3.65	1.002	Knowledgeable
Sub-mean	3.72	0.845	Knowledgeable
Technological Knowledge (TK)			
1. I am proficient in using various digital tools and applications (e.g., presentation software, educational websites) to enhance reproductive health education in my classroom.	3.82	0.892	Knowledgeable
2. I can effectively integrate multimedia resources (e.g., videos, interactive simulations) into reproductive health lessons to engage students and enhance learning outcomes.	3.85	0.915	Knowledgeable
3. I am knowledgeable about online resources and platforms (e.g., educational websites, forums) where I can find reliable information and resources related to reproductive health education.	3.79	0.902	Knowledgeable
4. I feel confident in using digital communication tools (e.g., email, messaging apps) to collaborate with colleagues and experts in the field of reproductive health education.	3.87	0.845	Knowledgeable
5. I possess the skills to evaluate and select appropriate educational software or applications for teaching reproductive health concepts effectively.	3.77	0.848	Knowledgeable
6. I am able to troubleshoot common technical issues that may arise during reproductive health lessons and find solutions independently.	3.46	0.838	Moderately Knowledgeable
7. I have received formal training or professional development in the use of educational technology for teaching reproductive health topics.	3.28	1.111	Moderately Knowledgeable
8. I am familiar with privacy and security measures when using digital resources for reproductive health education, and I take appropriate steps to protect students' confidentiality.	3.61	1.039	Knowledgeable
9. I stay updated on advancements in educational technology relevant to reproductive health education through professional literature, conferences, or online courses.	3.55	0.946	Knowledgeable
10. I am open to learning and exploring new technological tools and strategies to enhance my effectiveness in teaching reproductive health education.	3.94	0.982	Knowledgeable
Sub-mean	3.69	0.780	Knowledgeable
Overall-mean	3.73	0.740	Knowledgeable

3.3. One-way Analysis of Variance

A one-way analysis of variance (ANOVA) was performed to compare the difference across institutions vis-à-vis levels of TPACK on reproductive health education, presented in the succeeding tables.

Table 4. One-Way ANOVA Test on Content Knowledge Across Institutions

Institution	Mean	Description	F-value	p-value
School A	3.66	Knowledgeable	1.926	.131
School B	4.17	Knowledgeable		
School C	3.72	Knowledgeable		
School D	3.65	Knowledgeable		

*Significant at p<0.05 alpha level

For Table 4, a one-way ANOVA revealed that there was not a statistically significant difference in reproductive health education content knowledge between at least two groups (F (3, 90) = 1.826, p = .148). This implies that across institutions, similar content knowledge can be observed which evident on the groups individual mean scores.

Table 5. One-Way ANOVA Test on Pedagogical Knowledge Across Institutions

Institution	Mean	Description	F-value	p-value
School A	2.33	Less Knowledgeable	21.789	.000*
School B	2.80	Moderately Knowledgeable		
School C	2.80	Moderately Knowledgeable		
School D	3.06	Moderately Knowledgeable		

*Significant at p<0.05 alpha level

Table 6. Tukey Post Hoc Analysis on Pedagogical Knowledge Across Institutions

Group Comparisons		Mean Difference	p-value
School A	School A	-.47	.000*
School B	School B	-.47	.001*
School C	School C	-.73	.000*

*Significant at p<0.05 alpha level

Moreover, a one-way ANOVA presented in Table 5 revealed that there was a statistically significant difference in reproductive health education pedagogical knowledge between at least two groups (F (3, 90) = 21.789, p = .000). To check which among the groups had caused the significant differences, Tukey's test was employed and presented in Table 6. The Tukey's test for multiple comparisons found that the mean value of pedagogical knowledge was significantly different between CTU and BukSU (p=.000), CTU and SIC (p=.001), and CTU and DCPC (p=.000). The results suggest that in terms of reproductive health education pedagogical knowledge across institutions, CTU somehow needs to be enhanced compare to other mentioned institutions.

Table 6. One-Way ANOVA Test on Technological Knowledge Across Institutions

Institution	Mean	Description	F-value	p-value
School A	2.33	Less Knowledgeable	21.789	.000*
School B	2.80	Moderately Knowledgeable		
School C	2.80	Moderately Knowledgeable		
School D	3.06	Moderately Knowledgeable		

*Significant at p<0.05 alpha level

Table 7. Tukey Post Hoc Analysis on Technological Knowledge Across Institutions

Group Comparisons		Mean Difference	p-value
School A	School B	-.47	.000*
	School C	-.47	.001*
	School D	-.73	.000*

*Significant at p<0.05 alpha level

Likewise, a one-way ANOVA presented in Table 6 revealed that there was a statistically significant difference in reproductive health education technological knowledge between at least two groups (F (3, 90) = 21.789, p = .000). To check which among the groups had caused the significant differences, Tukey's test was employed and presented in Table 7. The Tukey's test for multiple comparisons found that the mean value of pedagogical knowledge was significant.

The difference between CTU and BukSU (p=.000), CTU and SIC (p=.001), and CTU and DCPC (p=.000). The results suggest that in terms of reproductive health education technological knowledge across institutions, CTU somehow needs to be improved compare to other mentioned institutions.

Table 8. One-Way ANOVA Test on TPACK Across Institutions

Institution	Grand Mean	Description	F-value	p-value
School A	3.67	Knowledgeable	1.826	.148
School B	4.07	Knowledgeable		
School C	3.64	Knowledgeable		
School D	3.60	Knowledgeable		

*Significant at p<0.05 alpha level

Meanwhile, a one-way ANOVA, Table 8 revealed that there was not a statistically significant difference in the TPCK reproductive health education between at least two groups (F (3, 90) = 1.826, p = .148). This implies that across institutions, similar TPACK levels can be observed which evident on the groups individual grand mean scores.

3.4. Themes Generated

The qualitative data collection and analysis was conducted independently yet concurrently with a quantitative study. A semi-structured, open-ended instrument and virtual interviews around 10-20 minutes was employed. The Thematic analysis generated the following themes; (1). Recognition of the Importance of RHE; (2) Challenge: Addressing Stigmas and prejudices; (3) Self-learning & discovery: Need for a formal and focused Training/Development; (4) Technological Enhancement, amongst the Elementary Practice Teachers.

Theme 1: Recognition of the Importance of RHE;
Theme 2: Challenge: Addressing Stigmas and Prejudices
Theme 3: Self-learning & discovery: Need for a formal and focused Training/Development;
Theme 4: Technological Enhancement

3.4.1. Theme 1: Recognition of the Importance of RHE;

The narratives of the participants reveal their clear understanding of the significance of RHE in the field of education. RHE allows students to successfully manage their growth and development and make educated choices about their reproductive health through the promotion of a comprehensive education, heightened knowledge of reproductive health, and responsible decision-making.

> "RHE in education provides a well-rounded and enriching learning experience that prepares students not only for academic success but also for ethical decision-making " (P3)
> "This will increase their awareness and caution when it comes to RH. Furthermore, this will aid in educating all kids about sexual and reproductive health and raising awareness among teenagers about safe sexual behaviors". (P6)
> "become responsible and knowledgeable individual who can make wise decisions about their reproductive health." (P7)

During interviews, they have shared that they understand the noble aims of Reproductive health educations. Such aligns to the perspective of the World Health Organization (WHO) which emphasizes that comprehensive sexuality education is an integral part of a holistic education that equips young people with the knowledge, skills, and attitudes they need to make informed choices about their health, well-being, and relationships (WHO, 2020). RHE empowers students to think critically, understand consequences, and act responsibly regarding their reproductive health. This self-reported recognition is already a good starting point in advocating RHE.

3.4.2. Theme 2: Challenge: Addressing Stigmas and Prejudices

Stigmas, biases and prejudices relating to Reproductive Health education among the learners, parents and larger society is a big challenge in the smooth and continued delivery of RHE. Topics about sex, sexuality, contraception, and the mere mentioning of human reproductive parts and certain principles may provoke negative judgement and un-openness to other person.

> "The experience was partly hilarious, yet the intention was mainly serious. Of course, we cannot control what reactions pupils make towards those intimate RHE concepts. But as we get past the awkward or funny portion of teaching them about human reproductive health, pupils still seem to comprehend its gravity or seriousness. My pupils especially gave examples of the unfavorable consequences of not knowing it" (P4)

> As I began the lesson, I noticed some of the learners covering their eyes or showing awkward reactions. Instead of ignoring it, I addressed the situation by reassuring them that there was nothing wrong or embarrassing about the topic. (P9)

> "Some of the learners may laugh off instead of truly learning its essence to discerning human functions (or our physiology), others just completely brush off its idea since they cannot utter out loud terms closely "It is important to Integrate RHE into teaching methods is important because it prepares young people for a healthy adulthood and breaks down stigma around these topics." (P11)

> Some parents may have reservations or concerns about the content or timing of the lessons.

As shared in the narratives, young learners show awkwardness and discomforts when being introduced to sensitive topics. Parents also have reservations and other beliefs about RH, hence, opposing its view about it. This aligns with research by Gupta et al. (2017) who found that cultural taboos and social stigmas often lead to discomfort and embarrassment among students during RHE instruction.

3.4.3. Theme 3: Self-learning & discovery: Need for a formal and focused Training/Development

The qualitative data also revealed that PTs knowledge acquisition of Reproductive Health concepts are mostly through self-learning and discovery. Several narratives highlight educators' reliance on self-learning to bridge knowledge gaps

> In order for me to use RHE-TPACK effectively, I need to have enough knowledge and information that could support me completely. Through training sessions and funding for technology resources and a commitment to promoting innovation (P5)
>
> I did not receive formal training.. I just did my own research and understanding (14)
> I known the concept through online. I saw the potention of this concept in simplifying.
>
> "I realized that we need to learn on our own as it is part of teaching. The learning that I gained in school help me in teaching, it is the foundation of my knowledge about the RHE-TPACK that helped me to seek for more about it". (P11)

Most of the narrative explicitly mention the need for training sessions. Though some concepts are familiar to them due internet exposure and information available around, a more targeted, formal training and inclusion in the course curricula may benefit the PTs. Structured learning ensures a comprehensive understanding of RHE content, best practices, and relevant policies. Additionally, formal training fosters confidence in delivering sensitive topics and utilizing technology effectively.

3.4.4. Theme 4: Technological Enhancement

The practice teachers also recognized the importance that technology has in the teaching of RHE. The use of audio-visual/multimedia materials may help ease the discussion of sensitive topics. The giving of videos may assist in explaining concepts which the teacher himself/herself has discomforts to be talked about, Also, at the learners' end, they show more enthusiasm and interest in learning these topics aided with visuals and animations. Narratives are like:

> "I used technology to show educational videos and slideshows. The students were interested and participated in the discussion." (P9)
> Incorporating technology into the classroom often causes a change in how the material is taught. (P13)
> As I shared these materials, I observed an increased level of participation and enthusiasm among my students. (P4)
> By providing various instructional materials (P16)
> In a way that I will have instructional materials including pictures and also integrate technology in discussing their topic for the learners to really understand the lesson. (P3)

> "I integrate technology in presenting my PowerPoint, and at the same time applied the paper and pencil test after discussion." (P13)

The need for TEIs in implement programs/initiatives with the aim of enhancing the PTs technological knowledge would surely help these PTs acquire more confidence in teaching RHE. This also affirms with research by Ertl et al. (2017) who found that technology-based RHE programs can significantly improve student learning compared to traditional methods. Technology can make learning more interactive and engaging, promoting active participation in sensitive topics like RHE.

These themes reflect the varied experiences, challenges, needs and strategies employed by elementary practice teachers in integrating RHE-TPACK into their teaching practices highlighting the importance of support, training, and innovative approaches to enhance reproductive health education for young learners.

3.5. Mixed Methods Integration – Joint Table Analysis

Table 9. integrates the quantitative and qualitative data to show relationship between the Elementary Practice Teachers' levels of Technological Pedagogical and Content Knowledge regarding Reproductive Health Education and the emergent themes. The commonalities are as follows:

(1) The recognition of the importance of Reproductive Health Education (RHE) resonates meaningfully with the high openness among PTs to explore technological tools and strategies. Their willingness to learn more demonstrates their understanding in the relevance of RHE. This creates a fertile ground for improvement of the RHE implementation in the Philippines specially with education practitioners such as Practice Teachers who may advocate reproductive health and who strives to enhance its delivery, so as to serve it aims. This aligns with the goals of the Responsible Parenthood and Reproductive Health Act (RHP Law) of 2012, which aims to integrate comprehensive RHE into the Philippine education system.

(2) The Challenge of addressing stigmas and prejudices go well with their self-reported need to improve communication skills to communicate with parents. It is a common truth that Philippine society is still not fully open with Reproductive health, considering we are a Christian nation, with Catholicism as the dominant religious denomination. Discussions on sex and sexuality is still considered taboo in some cultures in the Philippines, thus, creating discomfort and resistance to RHE. Also, some parents believe fear of sexualization, believing that RHE will encourage them to engage in risky behaviors and get involved with pre-marital sex upon knowledge acquisition on topics such as family planning and contraception, etc.

(3) As indicated in the narratives of the informant most of their knowledge and awareness on the topics of Reproductive health are learned independently – when they explore online materials, multimedia, info-campaigns, and when they need to study in on their own due to the need of teaching the topics during internship. This resonates with results in the quantitative analysis pertaining to the needs to deepen their knowledge on certain targeted topics of RH such as contraception; together with current trends, researches, and best practices, national and local guidelines, and use of educational technologies. The provision of a more formal and targeted trainings/professional development activities will potentially improve the level confidence that these PTs will possess regarding their knowledge to teach the contents.

(4) Lastly, technological enhancement & the improvement of PT's ability to troubleshoot technical issues in teaching RH topics. Technology offers a wide range of tools for RHE. It offers interactive simulations, educational applications, websites and presentation tools. The merging of both results exemplifies the need for TEIs to provide avenues and initiatives for PTs to develop, use and demonstrate technological tools that will help them better and effectively teach Reproductive Health.

Table 9. Joint Table Analysis of the Quantitative and Qualitative Results

Quantitative Data	Qualitative Data
Content Knowledge (***Knowledgeable)*** - Need to deepen knowledge on concepts of contraception - Need to be informed with current trends, researches and best practices - Improve confidence of their knowledge to teach the contents Pedagogical Knowledge (***Knowledgeable)*** - Enhance awareness of national and local policies and guidelines for delivering RHE - Improve skills to communicate with parents Technological Knowledge (***Knowledgeable***) - High extent of openness to learning and exploring technological tools and strategies - Need to receive formal training in the use of educational technology - Improve ability to troubleshoot technical issues in teaching RHE	**Theme 1:** Recognition of the Importance of RHE **Theme 2:** Challenge: Addressing Stigmas and prejudices **Theme 3:** Self-learning & discovery: Need for a formal and focused Training/Development; **Theme 4:** Technological Enhancement
DATA MERGING	
Commonalities **(1) Theme 1:** Recognition of the Importance of RHE High extent of openness to learning and exploring technological tools and strategies **(2) Theme 2:** Challenge: Addressing Stigmas and prejudices Improve communication skills to communicate with parents **(3) Theme 3:** Self-learning & discovery: Need for a formal and focused Training/Development Need to deepen knowledge on concepts of contraception Need to be informed with current trends, researches and best practices Enhance awareness of national and local policies and guidelines for delivering RHE Need to receive formal training in the use of educational technology Improve confidence of their knowledge to teach the contents **(4) Theme 4:** Technological Enhancement Improve ability to troubleshoot technical issues in teaching RHG	

4. Conclusion

This study revealed that the Elementary Practice Teachers (PTs) from 4 different types of institutions exhibit an adequate level of knowledge in the Contents, Pedagogies and Technologies related to the teaching of Reproductive Health. Yet, an emphasis on the enhancement of knowledge on concepts/areas such as; contraception, current trends & best practices, local and national guidelines, more technological tools and ability to communicate with parents may even more benefit the PTs. Moreover, despite the lack of statistically significant difference between the RHE-TPACK levels across institutions, significant insights were sought in qualitative analysis highlighting the recognition

on the importance of RHE, and the challenge of addressing stigmas and prejudices which hampers the smooth delivery of RH topics. The TEIs crafting of a more robust, structured, intentional, and targeted programs and initiatives specifically focusing on critical and core topics of RH may be a beneficial step to even more leverage their content, pedagogical and technological knowledge on RHE.

5. Recommendations

In light of the findings of the study, the following recommendations are given. First, there is a need for curriculum enhancement through the development of a more robust, structured, intentional, and targeted curriculum initiatives for RHE that focuses on critical and core topic. This maybe be achieved through mechanisms such as curriculum mapping to map which specific subjects RHE may be taught to incorporate topics such as trends, guidelines, etc. Moreover, recalibration of learning outcomes may be conducted to specifically require Elementary PTs to have an experience demonstrating a lesson on RH and demonstrate the use of technological tools. And, providing more avenues such as symposia and seminars covering these topics

Second, the continuation of research is vital to expand the sample size for more generalizable results and to explore additional factors such as gender and the type of course. By implementing these recommendations, TEIs can equip future elementary PTs with the necessary knowledge, skills, and confidence to deliver comprehensive and effective RHE that empowers students to make informed choices about their reproductive health.

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Declaration of Conflicting Interests and Ethics

The authors declare no conflict of interest.

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