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Assessing the TPACK Implementation of Selected Private Senior High School in San Mateo, Rizal Towards Developing a Teaching Model

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***Abstract*—** This study assessed the TPACK implementation of selected private senior high schools in San Mateo, Rizal towards developing a teaching model. In this study, mixed methods were used. Qualitative and quantitative analyses were used through a survey questionnaire and interview questions as research tools to summarize the level of implementation, factors, perspectives, and challenges faced by the respondents in the implementation of the TPACK framework in the classroom.

Based on the summarized research results, despite the lack of resources and materials in the classroom, the student respondents perceived the TPACK implementation of teachers to be useful and engaging. Rather, teachers and administrators should focus on improving their technological, pedagogical, and content knowledge to assist the technological demands/skills in the learning process. This can be possible through the proposed KANR (Know-Apply-Need-Response) Model designed by the researcher inspired by the TPACK Framework.

***Keywords*—** TPACK Framework, TPACK implementation, KANR Model.

INTRODUCTION

In recent years, incorporating technology into education has become crucial for enhancing learning experiences. As the educational landscape evolves, the demand for teachers to have a blend of content knowledge, pedagogical skills, and technological expertise has increased. This is especially important in senior high school education, where students must develop essential digital skills for higher education and the workforce.

The Technological Pedagogical and Content Knowledge (TPACK) framework, developed by Mishra and Koehler (2006), offers a comprehensive model for educators to effectively integrate technology into their teaching practices. This framework emphasizes the convergence of three fundamental areas of knowledge: technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK). For educators in senior high schools, mastering the TPACK framework is crucial to ensure that technology is not just an additional tool but a vital component of the teaching and learning process.

Teacher education programs have established standards and recommendations to ensure that future educators acquire sufficient technical skills. However, there is a growing emphasis on the pedagogical use of technology rather than just basic technological proficiency (Erstad et al., 2021). Despite advancements in this area, scaling and modernizing teacher training programs remains a challenge, as many programs are outdated and lack adequate hands-on learning experiences. Although some emerging companies offer online certifications, many of these are of questionable quality (Kologrivaya & Shleifer, 2022).

In the Philippines, a technology gap exists in numerous schools, hindering students' access to technology in the classroom (Yours Humanly, 2024). Senior high school students particularly need to recognize the importance of digital literacy, as evidenced by studies conducted in the DepEd Rizal area (Delima et al., 2022). Furthermore, the COVID-19 pandemic has revealed significant deficiencies in the Philippine educational system, emphasizing the need for enhanced digital competency among teaching staff (Abella & Dela Rosa, 2023).

Addressing these issues necessitates a reevaluation of current teacher training programs and the implementation of frameworks like TPACK to close the gap between technology, pedagogy, and content knowledge. Providing adequate training and professional development is essential for equipping teachers with the confidence and knowledge to effectively utilize technological resources, curate online content, and leverage digital platforms for education (Varthana, 2021).

This research focused on assessing the integration of the TPACK framework in senior high schools in the Philippines, specifically in selected private senior high schools in San Mateo, Rizal. By exploring the challenges and opportunities in applying TPACK, this study aimed to develop a teaching model that can enhance the knowledge and skills of educators, leading to improved teaching practices and better learning outcomes for senior high school students.

RESEARCH QUESTIONS

This study aimed to assess the implementation of the technological pedagogical and content knowledge (TPACK) framework to develop a teaching model.

Specifically, it aimed to answer the following questions:

1. What is the teachers' implementation level in the use of the TPACK framework?
2. What factors affect the implementation of the TPACK framework in the classroom?
3. What are the students' perspectives on the TPACK implementation?
4. What are the challenges in the implementation of the TPACK framework in the classroom?
5. What teaching model can be derived from the answers of the respondents?

Theoretical Framework

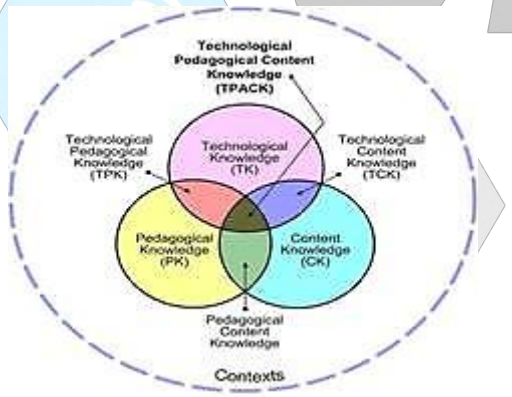


Figure 1. *TPACK: Technological Pedagogical Content Knowledge Framework by Dr. Serhat Kurt (2019).*

Technology has become an increasingly crucial element in students' lives, both in and out of the classroom, as it enhances their understanding of complex concepts and promotes collaboration among peers. Kurt (2019) notes that, due to these advantages, current educational practices encourage teachers to integrate technology into their classrooms. However, many educators face challenges in this area. Barriers such as cost, access, and time can significantly hinder implementation, while a lack of knowledge about how to effectively leverage technology across different subjects poses an additional obstacle.

To address this need, Mishra and Koehler (2018), researchers at Michigan State University, developed the TPACK framework, which provides a theoretical basis for effective educational technology integration. Since its introduction in 2006, TPACK has become a leading theory in the realm of educational technology, influencing both research and professional development efforts.

The TPACK framework encompasses several domains: Content Knowledge (CK), Pedagogical Knowledge (PK), Technological Knowledge (TK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Pedagogical Content Knowledge (PCK). These domains outline how the TPACK framework can be effectively observed and applied in classroom settings. This framework is used as a basis to assess the TPACK implementation in selected private senior high schools in San Mateo, Rizal which is reflected in the conceptual framework of the study. To evaluate, the survey questionnaire and interview questions were made and categorized based on the domains of the TPACK framework. The answers of the respondents were also interpreted and analyzed based on the TPACK domains in this theory. The interpreted data were used to design a teaching model which was the aim of the researcher of this study.

Conceptual Framework

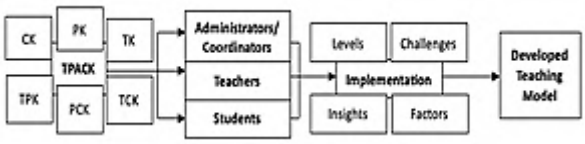


Figure 2. *The conceptual model which guided the researcher in conducting the study is shown in Figure 2.*

The conceptual model of the study is composed of (4) four frames. The first frame comprises the TPACK Framework: CK for Content Knowledge, TK for Technological Knowledge, PK for Pedagogical Knowledge, PCK for Pedagogical Content Knowledge, TPK for Technological Pedagogical Knowledge, and TCK for Technological Content Knowledge. The second frame consists of the respondents of the study: the administrators/coordinators, teachers, and students

in the (10) ten selected private senior high schools in San Mateo, Rizal. The third frame contains the implementation of the TPACK framework in terms of levels, insights, factors, and challenges, and the fourth frame, is the aimed output of this study: the developed teaching model.

The conceptual model of the study represents how the processes were observed by the researcher. The TPACK framework categorized by its domains reflected on the theoretical framework was used to assess the administrators/coordinators, teachers, and students through their implementation of the framework based on the levels, insights, challenges, and factors, which were the basis for developing a teaching model that may support teachers in improving technological integration and usage in the classroom.

Scope and Delimitations

The study focused on the analysis of the TPACK implementation in (10) ten selected private senior high schools in San Mateo, Rizal for the school year 2024-2025 towards developing a teaching model.

The respondents were selected from different private senior high schools in San Mateo, Rizal. Due to the unavailability of some target respondents and data privacy policy approval, the respondents were considered based on their willingness to participate in the study. These respondents comprised of 20 students, 20 teachers, and 14 administrators/coordinators for the interview questions and 72 senior high school teachers for the survey questionnaire. They were given a survey questionnaire, and the selected respondents were interviewed regarding their level of implementation, insights, factors, and challenges on the TPACK framework which is solely the basis for designing a teaching model. Considering the Data Privacy policy implemented in selected private senior high schools in San Mateo, Rizal, the survey questionnaire and interview questions were provided either in person or in Google Forms which were based on the preferences of the selected respondents of the study. This was ensured to address ease and comfort for the selected respondents. These respondents were chosen regardless of their expertise, major, gender, and/or length of stay/service in their respective schools.

Methods

This study used a mixed-methods design. The researcher collected and analyzed both qualitative and quantitative data simultaneously and analyzed separately used as bases to design a teaching model. This method is defined in this way:

In this study, a mixed-methods design was used to further understand the implementation of the TPACK framework in terms of insights, levels, challenges, and factors based on administrators/coordinators, teachers, and students of selected private senior high school students in San Mateo, Rizal. The researcher aimed to clarify these considerations through a survey questionnaire and interview questions. The qualitative and quantitative results were used to design a teaching model that can be considered in improving teachers' technological, pedagogical, content, and knowledge.

The research method was determined based on the researcher's aim, aligned for analyzing and developing a TPACK teaching model.

Context and Respondents

This study had (10) ten selected private senior high schools in San Mateo, Rizal. Due to the unavailability of some target respondents and data privacy policy approval in selected private senior high schools in San Mateo, Rizal, the respondents were considered based on their willingness to participate in the study. The respondents were selected 14 administrators/coordinators, 20 teachers, and 20 students for the interview questions, and 72 senior high school teacher respondents for the survey questionnaire.

Since the study aimed to gather the level of implementation, factors, challenges, and insights of teachers on TPACK implementation towards developing a teaching model, the respondents were chosen regardless of their expertise, major, gender, and/or length of stay/service Although, in this study, the data privacy policy implementation and answering preference of the respondents were considered. A survey questionnaire was distributed to 72 teacher respondents, and interview questions were provided to 20 student respondents, 20 teacher respondents, and 14 administrator respondents through their preferred mode, either in-person or Google forms, which were the basis for developing a teaching model.

Research Instruments

This study used a survey questionnaire and interview questions to assess the TPACK implementation of

selected respondents in (10) ten selected private senior high schools in San Mateo, Rizal.

An adapted TPACK survey questionnaire from Australasian Journal of Educational Technology (AJET) was used by the researcher to know the level of implementation of teacher respondents on the TPACK implementation. This instrument contained statements per domain, which answered the level of teachers' implementation of the TPACK framework. The adapted questionnaire contains 33 statements.

The interview questions, which aimed to know the insights of 20 student respondents and the challenges and factors in the implementation of the TPACK framework, were gathered from 14 administrators/coordinators and 20 teachers. The interview questions were categorized based on the different domains of the TPACK Framework.

The said data gathering instruments contained statements/questions that were categorized based on the domains of the TPACK Framework: TK (Technological Knowledge), CK (Content Knowledge), PK (Pedagogical Knowledge), TPK (Technological Pedagogical Knowledge), TCK (Technological Content Knowledge), PCK (Pedagogical Content Knowledge).

For the validation, the research instruments were presented to three (3) internal expert validators of the Graduate School of the College of Education, Arts, and Sciences of the National University, Manila. The instruments were checked, analyzed, and approved through a certificate of validation attached to this research study.

RESULTS AND DISCUSSIONS

Level of Implementation of the TPACK Framework

Overall Mean and Standard Deviation with Verbal Interpretation for the Level of Implementation of the TPACK Framework

Category	N	Mean	SD	Verbal Interpretation
Technological Knowledge (TK)	5	3.90	0.174	Great Extent
Content Knowledge (CK)	4	4.05	0.105	Great Extent
Pedagogical Knowledge (PK)	7	4.43	0.0476	Great Extent
Pedagogical Content Knowledge(PCK)	6	4.30	0.0408	Great Extent
Technological Content Knowledge (TCK)	5	4.08	0.0706	Great Extent
Technological Pedagogical Knowledge (TPK)	6	4.06	0.0392	Great Extent
Overall	**6**	**4.14**	**0.193**	Great Extent

The overall mean for Technological Knowledge (TK) is 3.90, with an SD of 0.174 and verbal interpretation of Great Extent. For the Content Knowledge (CK) category, the overall mean is 4.05, with an SD of 0.105 and verbal interpretation of Great Extent. The overall mean for Pedagogical Knowledge (PK) is 4.43, with an SD of 0.0476 and verbal interpretation of Great Extent. The mean for Pedagogical Content Knowledge (PCK) is 4.30, with an SD of 0.0408 and verbal interpretation of Great Extent. The mean of Technological Content Knowledge (TCK) is 4.08 with an SD of 0.0706 and verbal interpretation of Great Extent. The Technological Pedagogical Knowledge (TPK) mean is 4.06 with an SD of 0.0392 with the verbal interpretation of Great Extent. The highest mean is under Pedagogical Knowledge with a mean of 4.43 and SD of 0.0476, verbal interpretation is a Great Extent. While the lowest is 3.90 under Technological Knowledge with an SD of 0.174 and verbal interpretation of Great Extent. The overall mean is 4.14 with an SD of 0.193 and a verbal interpretation of Great Extent. According to RTI International (2024), teachers' implementation of the core elements of the TPACK framework can be developed and reinforced during the lesson planning process. TPACK knowledge can be analyzed with a simple Self-Reflection exercise. This information helps teachers identify knowledge areas that may need attention or additional support needed to plan effective lessons.

Factors Affecting the Implementation of the TPACK Framework

Technological Knowledge - The selected respondents signify that administrative support and availability of resources are needed to further integrate technology in the classroom.

Pedagogical Knowledge – The openness to further learning technology, as well as incorporating different activities and tools that are relevant and aligned to the subjects taught can enhance the integration of technology in the classroom.

Content Knowledge – Technological tools are integrated into designing enjoyable and interesting topics for the students to further learn the subjects and the tools used.

Technological Pedagogical Knowledge – Appropriateness of the integration of technology into the subjects can lead to an advantageous way of learning for the students. Whereas lack of resources and accessibility hinder technological advancement.

Technological Content Knowledge – Teachers are empowered by technology especially when proper knowledge and usage are with the use of the tools.

Pedagogical Content Knowledge – The technological tools are key in equipping teachers and students. Connecting to other professionals can also lead to further understanding of the technological tools in the classroom.

It can be determined that a support system, with proper technical skills and knowledge of technology, can assist teachers and students to further discover learning through technology and the advancement of skills. This supports the research study of Masongsong, J. M., et. al. (2023) that teachers can enhance their effectiveness in inclusive education by seeking professional development opportunities, collaborating with colleagues, reflecting on and adapting instructional approaches, embracing diversity, staying informed about research and best practices, and utilizing resources like special education professionals and instructional mentors. Future research should focus on the efficacy of teacher preparation programs and inclusive education-focused interventions.

Students' Perspectives on the Implementation of the TPACK Framework

Technological Knowledge (TK) - The selected student respondents affirmed that different types of technological devices, tools, and applications are frequently by the students and teachers in the classroom. Their level of comfort with the use of technology influences the policy implemented in the classroom as well as the awareness of the proper use of technology. It is concluded that the use of technology in the classroom positively contributes to their learning of the subjects presented.

Pedagogical Knowledge (PK) - In terms of their perspectives on the teaching approaches of teachers in the classroom, it can be concluded that the learning styles of the selected student respondents are accommodated and engaged through the integration of different technological and traditional tools used by their teachers in the classroom.

Content Knowledge (CK) - In conclusion to the answers of the selected student respondents, it can be said that they relate and understand the discussions through different activities and approaches used by their teachers.

Pedagogical Content Knowledge (PCK) - The selected student respondents elaborated on the different approaches, techniques, and tools used in presenting subject matters to the teachers. They also highlighted that there are activities they use in the classroom to engage students and promote interaction.

Technological Content Knowledge (TCK) - According to the selected student respondents, the integration techniques of teachers through technology are perceived to be useful and ease of accessibility is observed.

Technological Pedagogical Knowledge (TPK) – The selected student respondents perceived the integration of different techniques to be useful with the observation of technological tools. They also answered that other learning platforms and internet sites are used in the learning process for the students.

It can then be determined that the perspectives of the selected student respondents in the implementation of TPACK framework in the classroom are perceived to be useful, engaging, and interactive. In the study of Kamran, F., et. al. (2023), it is suggested that incorporating interactive teaching methods promotes critical thinking skills, collaboration, active engagement, and self-efficacy. Their study emphasizes the importance of implementing interactive teaching methods in education and provides insights for instructors to create supportive learning environments. Proper planning, facilitation, and training are essential for effective implementation. The study contributes to the literature on interactive teaching methods and student learning outcomes.

Challenges to the Implementation of the TPACK Framework

Technological Knowledge (TK) – According to the selected respondents, due to different situations in life, not everyone can afford to have and use the tools needed. What they do is switch back to traditional approaches and provide other plans to continue the planned lessons for the students.

Pedagogical Knowledge (PK) – The challenges the respondents face pertain on how to monitor the proper use of technology by their students. They also mentioned the need to expose students to different

technological tools with the proper guidance and support needed. The selected respondents also added that they equip themselves in terms of traditional and current approaches and activities for students through training. Aside from this, they communicate with the parents of the students to establish the proper use of technology.

Content Knowledge (CK) – According to the respondents, the lack of skills required limits them from understanding technology which affects the content discussions. Although the respondents acknowledge the need to be flexible and attend professional development programs to improve the content of their discussions.

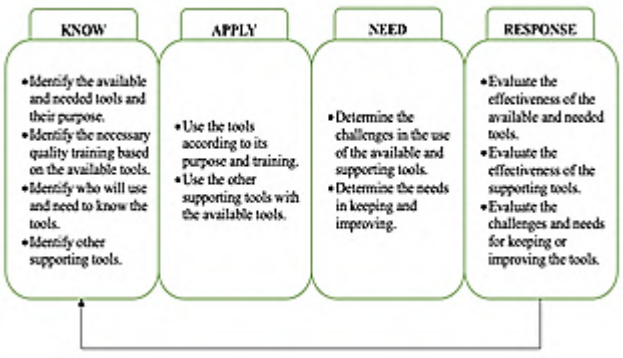
Pedagogical Content Knowledge (PCK) – As gleaned from the answers of the respondents, the choice of technological tools can be challenging in terms of alignment, appropriateness, connection, and preparation. They also established their adjustments that conduct communication with students, through support and feedback.

Technological Content Knowledge (TCK) – As stated by the respondents, the difficulties in finding technological tools such as alignment and limited resources and training are faced by them. To deal with such challenges, they consider training, tools testing, and guiding students on the use of technological tools to further understand the lessons discussed by the teachers.

Technological Pedagogical Knowledge (TPK) – Ensuring the connection and appropriateness of the activities used to teach the lessons is a challenge the selected respondents face in the classroom. They reiterate that approaches should address the different learning styles of students. This challenge is faced because of a lack of training and lack of facilities. Ensuring that students have equal access to technology, planning, and scheduling of communication, and feedback provisions are also practiced by the selected respondents.

It can therefore be concluded that the selected respondents lack further training and professional development to use different technological tools in teaching and learning. Although the selected respondents provide other plans to continue the planned lessons, it can be gleaned that their skills in integrating technology shall be improved to improve ways of catering to the needs of the different learners they have in the classroom. According to Herrity, J. (2024), as technology advances and workplace strategies evolve, there comes a need for professionals to align with these changes in terms of knowledge and skills. One of the best ways to enhance knowledge and skills is through training. Providing employees with relevant and consistent training can help improve performance and efficiency in the workplace.

Proposed KANR Teaching Model



This teaching model is designed based on the TPACK framework and on the gathered evidence from the selected respondents in selected private senior high schools in San Mateo, Rizal. This teaching model is presented this way:

KNOW:

TPACK Domains:

Technological Knowledge (TK): This phase highlights on identifying the necessary tools for integrating technology in the classroom, aligned with the school's objectives and vision.

Pedagogical Knowledge (PK): This phase attends to the necessity for quality professional development and training for teachers and students on how to use these tools, ensuring they align with the school's pedagogical ways.

Content Knowledge (CK): This part ensures that technology aligns with the content being discussed. It is not about managing technology for technology's sake but making sure that it aligns with the curriculum and improves learning results.

Objective: The goal of this part is to make informed decisions on which tools to implement and provide the needed training to use them efficiently. Involving stakeholders, such as parents and administrators, ensures steadiness in using these tools.

APPLY:

TPACK Domains:

Technological Pedagogical Knowledge (TPK): This is where the tools are implemented. The tools should not only be used according to their intended purpose but should also be monitored to see if they meet the learning and teaching objectives.

Technological Content Knowledge (TCK): The chosen technology should assist the subject content effectually. Teachers should be guided on how to use tools that align with the topics being discussed.

Objective: This phase focuses on implementing the tools in the classroom, making sure that teachers and students use them as intended, while also evaluating any secondary tools that can support the learning process.

NEED:

TPACK Domains:

Feedback on TK, PK, and CK: This part gathers feedback from teachers, students, and other stakeholders on the tools that are being facilitated.

Technological Pedagogical Content Knowledge (TPACK): In this part, a thorough understanding of how technology assists pedagogy and content emerges. The necessity for further training or tool development is identified based on real- applications and challenges faced during application.

Objective: The primary purpose is to assess any challenges, gather feedback, and identify what improvements are needed to improve the teaching and learning processes.

RESPONSE:

TPACK Domains:

Evaluation and Adaptation of TK, PK, CK: This part examines how well the tools are functioning in practice. Feedback from the "Need" phase is used to make decisions on which materials to keep, mend, or replace.

TPACK Framework: The full integration of technological, pedagogical, and content knowledge is examined, ensuring that the technology not only assists teaching but also enhances content delivery and student learning.

Objective: This phase confirms that the tools are continually evaluated for effectiveness and that necessary improvements are made to mend or refine their usage in the classroom.

The KANR model connects with the TPACK framework by ensuring:

Know: The appropriate tools are selected based on content and pedagogical needs. Apply: Tools are executed in a way that supports both teaching and learning. Need: Ongoing views to identify areas for improvement. Response: Evaluations are made to enhance or change tools as needed.

This model of knowing, applying, assessing needs, and responding ensures that technology integration in the classroom is meaningful and effective.

This teaching model aims to promote understanding and address the needs of teachers and students using the TPACK framework considering the KANR Approach which contributes to the knowledge of the academic approaches. In the article by upEducators, (2022), using different models of teaching in the classroom is significant for several reasons. Firstly, it caters to different learning styles, allowing students to engage with the material in a way that best suits them. Secondly, it helps teachers to be more flexible in their approach, adapting to the needs of their students and the demands of the curriculum. Additionally, using different teaching models encourages critical thinking, problem-solving, and collaboration, which are essential skills for success in today's world. Finally, it keeps the classroom environment dynamic and engaging, preventing

students from becoming bored or disengaged. In short, incorporating various teaching models can enhance the learning experience for students and make the teaching process more effective and enjoyable for both students and teachers.

CONCLUSIONS

Based on the summarized research results, the following conclusions can be drawn:

1. The level of implementation of the selected teacher participants on the use of the TPACK framework is verbally interpreted to Great Extent which can mean that despite the lack of further understanding of the TPACK framework, the concepts, and practices of this framework are considered in the classroom learning setup.
2. The teacher and administrator/coordinator respondents affirmed that the support system, with proper technical skills and knowledge of technology, can help teachers and students improve learning.
3. The selected student respondents supported that the different teaching approaches, technological and traditional tools, and teaching materials are perceived to be useful and engaging in the learning environment.
4. The teacher and administrator/coordinator respondents express that there are numerous challenges encountered during the learning approaches to students. While these challenges persist, the respondents elaborated on different teaching approaches they use to cope with these pressing issues
5. The KANR (Know-Apply-Need-Response) teaching model can be used to reestablish the further understanding of teachers, students, and administrators on the use of the TPACK framework to promote technical skills and adaptations in the learning processes.

RECOMMENDATIONS

After a thorough analysis of the information and content collected from the selected respondents, combined with existing literature, the following recommendations were formulated:

1. The TPACK framework shall be used through the proposed teaching model to strengthen the technical skills of teachers, students, and administrators in learning and integrating technology in the classroom combined with traditional approaches and tools. This framework shall be considered through training and professional development which shall aim to provide quality and effective use of technology.
2. Acknowledging the factors that hinder the implementation of technology integration in the classroom shall be addressed through the promotion of professional development training, support system, and technical knowledge awareness of teachers, students, and administrators.
3. With the result of the perspectives of students on the level of implementation of the TPACK framework, they find the techniques, tools, and materials to be useful in the classroom. Teachers shall focus more on the technical and practical usage of tools to maximize the effective use of technology integration in the classroom learning approach.
4. Lack of technical and practical skills in the use of technology can be a root cause issue in integrating technology in the classroom. Acknowledging the challenges of implementation of the TPACK framework can help teachers identify what to improve in the teaching approaches to students. A culture of innovation and flexibility shall be promoted to strengthen the technical skills of educators.
5. The KANR (Know-Apply-Need-Response) Model can assist teachers, students, and administrators in the careful design and use of technological tools in the classroom. This can further enhance the technical and practical skills needed by teachers in integrating technology in the classroom.

Acknowledgment

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