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ANALYSIS OF TPACK CONTENT IN THE CURRICULUM OF EDUCATIONAL STUDY PROGRAMS IN HIGHER EDUCATION

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Abstract

This study aims to analyze the structure and depth of Technological Pedagogical Content Knowledge (TPACK) content in higher education curriculum documents, with a case study at the Faculty of Tarbiyah, Institut Asy-Syukriyyah, consisting of the Primary School Teacher Education (PGMI) and Islamic Education (PAI) Study Programs. The research focuses on how the curricula of the two study programs include aspects of content knowledge (CK), pedagogical knowledge (PK), technological knowledge (TK), and their integration within the TPACK framework. This research uses a qualitative descriptive approach, using document analysis, interviews, and observation as data collection techniques. Data were collected from curriculum documents used in the 2024-2025 academic year at the Faculty of Tarbiyah, especially the PGMI and PAI Study Programs. Interviews were conducted with the dean of the Tarbiyah Faculty, the heads of the PAI and PGMI study programs, two lecturers, and two students, as well as observations of lecture implementation in the same academic year**.** The data were analyzed using qualitative methods validated through source and technique triangulation, then interpreted based on the seven TPACK components. The results show that the curricula of both study programs meet national standards, aligning graduate profiles, learning outcomes, courses, and semester learning plans (RPS). The depth of CK and PK emerges as the main strengths: PGMI emphasizes multidisciplinary content and basic teaching strategies, while PAI emphasizes mastery of Islamic sciences and teaching methodology. Meanwhile, TK and TPACK integration remain limited, mainly appearing as the use of simple digital media and online learning systems. Integration at the levels of PCK, TCK, TPK, and TPACK is still partial and not yet systematically embedded in the curriculum. This study implies that strengthening TPACK integration in curriculum design is essential to better prepare pre-service teachers for the digital era. Future research could expand the analysis to a broader range of teacher education programs in Indonesia, and further examine the effectiveness of TPACK-based curriculum interventions in improving teaching competence and student learning outcomes.

Keywords Curriculum, TPACK, Higher Education, PGMI, PAI.

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INTRODUCTION

In the era of rapid globalization and digital transformation, higher education institutions are required to prepare graduates with competencies that meet both global and national standards. Teachers and curriculum, as the core of education, are increasingly expected to integrate technology into their pedagogical practices to enhance student engagement and learning outcomes. In the Indonesian context, these demands are reflected in national education policies and accreditation standards that encourage higher education institutions, particularly teacher education programs, to ensure that graduates are digitally literate, pedagogically competent, and professionally adaptive to the challenges of digital education.

Within this context, the TPACK framework (Technological Pedagogical Content Knowledge) has emerged as a highly relevant model for analyzing and strengthening teacher preparation curriculum. Technological pedagogical content knowledge (TPACK) is a development of the PCK concept in which there are three main domains that are the objects of study, namely the integration of content mastery competencies, pedagogical competencies, and technological competencies in learning (Harris et al., 2009). Simply put, the discussion of TPACK relates to the effective integration of technology in the delivery of materials and learning management. Subsequently, the TPACK concept has become a framework used to analyze teacher competency content related to professionalism and how technology is integrated into learning.

College graduates are required to have a profile that is appropriate to their field of study, including graduates of education study programs who are prepared to become qualified educators (Aulia et al., 2023; Kemenag, 2019; Wahyudin, 2016). For educational study programs that will prepare their graduates to become teachers, the curriculum implemented in their academic activities should also prepare them for this (Oksari et al., 2022; Suastika et al., 2022). Therefore, analysis of the curriculum currently implemented by education study programs at universities needs to be conducted using an appropriate framework.

Based on data from the Ministry of Education and Culture, nationally, there are 29,413 study programs at universities in Indonesia, according to the 2020 Higher Education Statistics report. Of this total, 21% or 6,032 study programs are in the field of education, with the number of registered students for 2020 amounting to 1,831,748 students (Kemendikbud, 2020). This number is a significant number compared to other study programs listed in PDDIKTI statistics. This data demonstrates the potential for improving the quality of education in Indonesia.

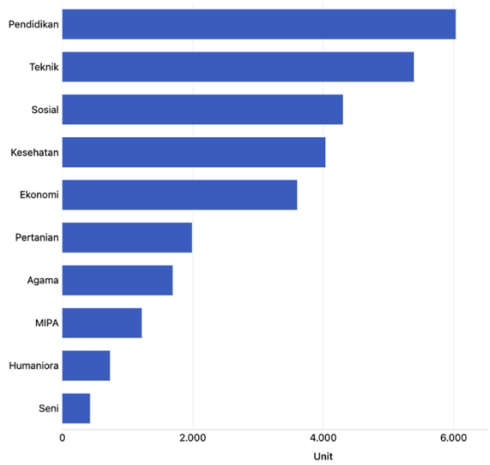

Figure 1. Number of Study Programs by Field of Study Group

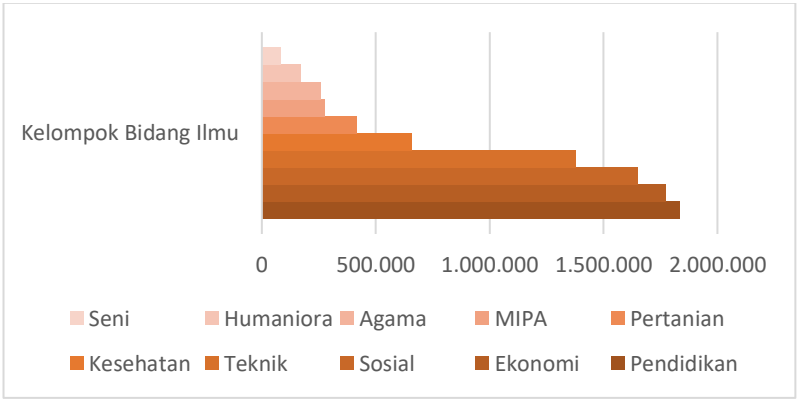

Figure 2. Number of Registered Students by Subject Group

This enormous potential is not directly proportional to the quality of education currently perceived. For example, looking at the 2022 PISA report data released by the Ministry of Education and Culture itself, it is clear that in the three main domains evaluated—mathematics literacy, reading literacy, and science literacy Indonesia performs far below average. In fact, it falls below other Southeast Asian countries like Singapore, Malaysia, and Thailand (Kemendikbudristek, 2023). Learning quality data released by the Ministry of Education and Culture through the Indonesian Education Report also shows that the learning quality score is only in the moderate category. This is despite an increase from the previous data for elementary schools (SD/MI/equivalent), with a score of 6.35 from 2021 (59.04), junior high schools (SMP/MTs/equivalent) with a score of 2.16 from 2021 (58.53), and senior high schools (SMA/SMK/MA/equivalent) with a score of 1.62 from 2021 (59.44) for 2023 (Kemdikbud, 2023).

Despite the numerous contributing factors, the author is interested in examining how curriculum relevance contributes to this problem. The curriculum is a vital aspect of the educational process. (Gumilar et al., 2023; Kennelly et al., 2011; Munir & Kholid, 2022; Tampubolon et al., 2022).

In this regard, a question arises: are the curricula prepared and implemented in higher education institutions inadequate or unable to produce graduates with the competencies necessary to become qualified educators? To find the answer, research into curriculum analysis in higher education institutions is crucial.

Several previous studies have revealed that integrating TPACK in learning can improve pedagogical competence, mastery of content (teaching materials), and mastery of technology, as well as increase teacher confidence during the teaching and learning process (Can et al., 2017; Carpenter et al., 1988; Farikah & Al Firdaus, 2020; Harris et al., 2009; Maryono, 2016). TPACK competencies also intersect with four competency domains that professional teachers must master, particularly pedagogical and professional competencies. These domains overlap with the discussion within the TPACK domain (Saifudin & Sukma, 2018; Suyamto et al., 2020). TPACK analysis has also been conducted in various countries, with one focusing on specific study programs or content within higher education, particularly on prospective elementary education teachers preparing to teach, specifically final year students in elementary education programs at several universities. For example, Mawarwati's research confirmed that their TPACK skills were only in the moderate category (Yanti & Mawarwati, 2023), Fitriadi's research shows that the average value of the TPACK competency domain is low (Rahmadi, 2019), and also several other studies, both at home and abroad (Can et al., 2017; Eichelberger & Leong, 2019; Kim & Lee, 2018; Rahmadi, 2019; Saienko et al., 2020). The study of TPACK is used because of its accuracy in measuring a teacher's preparation before entering the world of education.

These studies provide an illustration that teachers' TPACK abilities have a low average value (Rahmadi, 2019); The length of experience a teacher has in teaching is not directly proportional to the teacher's level of TPACK ability (Lestari, 2015); Teachers' TPACK capabilities in planning and implementation are limited to the use of simple technology such as infocus, whiteboards, and other stationery (Lestari, 2015). This raises the question of whether their university education adequately taught the fundamentals of teaching. Analyzing the TPACK content in this curriculum can determine whether the university has prepared its graduates with a sound mastery of content, pedagogy, and technology.

Previous studies on TPACK have predominantly focused on teachers' readiness and classroom practices, highlighting how technological, pedagogical, and content knowledge shape instructional effectiveness. However, there remains a significant gap in the literature regarding the

extent to which TPACK is explicitly embedded within higher education curriculum, particularly in teacher education programs in Indonesia. Most existing research examines individual teacher competencies rather than analyzing the structural integration of TPACK within curriculum design.

This study seeks to fill that gap by analyzing the presence and depth of TPACK in the curriculum of teacher education programs at the higher education level, with a specific focus on PGMI and PAI at Institut Asy-Syukriyyah. By evaluating how curriculum documents incorporate CK, PK, and TK, as well as their intersections, this research contributes to a more comprehensive understanding of how teacher preparation can be systematically strengthened through curriculum design. Thus, the novelty of this study lies in its emphasis on curriculum-level analysis of TPACK implementation in Indonesian higher education, an area that remains underexplored in existing scholarship.

Based on this background, this study aims to specifically analyze the structure and depth of TPACK content in the curriculum documents of teacher education programs in higher education. Especially with a specific focus on the Faculty of Tarbiyah, Institut Asy-Syukriyyah, consisting of the Primary School Teacher Education (PGMI) and Islamic Education (PAI) Study Programs. By doing so, this study seeks to provide insights into the extent to which higher education curricula have prepared future educators to meet the demands of teaching in the digital era, and to offer a reference point for policymakers and institutions in improving curriculum design.

METHOD

This study employed a field research approach, employing a descriptive qualitative approach. A more detailed discussion of the research object, data sources, data collection techniques, research instruments, and data analysis techniques can be found below.

Research Object

This research focuses on the Institut Asy-Syukriyyah, focusing on the Faculty of Islamic Education (Tarbiyah), which has two study programs: the Islamic Religious Education (PAI) Program and the Islamic Teacher Training and Education Program (PGMI). The Asy-Syukriyyah Institute was selected based on several considerations. First, both study programs within this faculty are accredited by the Indonesian Institute of Islamic Studies (LAMDIK). Second, they are located in one of the major cities in the Greater Jakarta area. Third, the integration of pedagogical competencies, content knowledge competencies, and technological competencies is a key strength

of both universities. This is reflected in the institutions' vision, mission, and objectives.

Data Collection Sources and Techniques

The primary data sources for this study consist of three main components. First, the curriculum documents of two study programs (PGMI and PAI) used from 2022 until the time of this research, namely the 2024-2025 academic year. This data includes graduate profiles, learning outcomes, course structures, syllabi, and semester learning plans (RPS). These data were analyzed to identify how TPACK elements are formally embedded throughout the curriculum documents. Second, semi-structured interviews were conducted with key stakeholders, namely the dean of Tarbiyah, the head and secretary of the study programs, as well as lecturers and students. Two lecturers and two students from each study program were selected as data sources. Third, classroom observations were conducted to obtain data on curriculum implementation in the 2024-2025 academic year. Observations were made during lectures in each study program, especially in several core courses of each program, such as PAI Learning Design, IT-Based Learning, and Thematic Learning. This course is considered to represent the core courses in curriculum implementation and is conducted after the Mid-Semester Exam (June 16-22, 2025) to properly capture the implementation of TPACK in learning.

Data Analysis Techniques

Data obtained in the field were processed using qualitative analysis (Creswell & Plano-Clark, 2007). The research's qualitative data were identified and then validated using two techniques: source triangulation and technical triangulation. The validated data were then interpreted using the TPACK framework (seven domains) to reach conclusions. The qualitative data obtained from the research were analyzed using descriptive and document analysis.

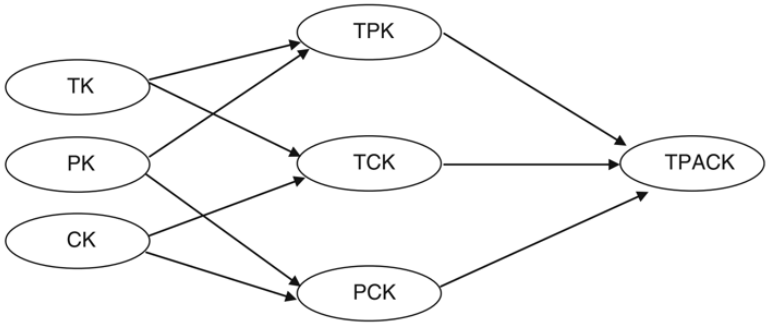

Figure 3. Seven Components of TPACK Analysis

FINDINGS AND DISCUSSION

Findings

PGMI Study Program of Institut Asy-Syukriyyah

a. Basis for Curriculum Development

The PGMI Study Program curriculum is based on the vision of producing professional elementary school teachers with Islamic character and adapting to developments in science and technology. The curriculum development is based on national higher education standards, the KKNI (National Qualifications Framework), and the needs of the community that uses graduates. PGMI's distinction lies in its emphasis on integrating pedagogical competencies, multidisciplinary content, and learning technology skills, ensuring graduates not only master basic material (mathematics, science, social studies, and language) but also manage it using modern, digital-based pedagogical approaches. These findings are based on the Curriculum Document of PGMI (and PAI) on the Faculty of Tarbiyah, STAI Asy-Syukriyyah 2022 (now Institut Asy-Syukriyyah).

Figure 4. Curriculum Document of PGMI and PAI Study Program

The Dean of the Faculty stated, "This curriculum was developed based on input from many parties, including stakeholders and curriculum experts. One of the major visions is to integrate modernity into learning." This statement seems relevant to the existing curriculum structure. Both study programs appear to integrate technology-based learning. According to the Dean of the Faculty of Tarbiyah, the PGMI curriculum was developed with an emphasis on integrating pedagogical competencies and mastery of the multidisciplinary content required by elementary school teachers. The Head of the PGMI Study Program added that this curriculum is designed so that students not only master theory but also are prepared for teaching practice from the outset. Interviewed students stated that this vision is evident in the significant emphasis on field practice.

b. Course Structure

The PGMI curriculum is divided into general courses, education, basic sciences, PGMI field sciences, and elective courses. This structure is characterized by a significant proportion of education courses, particularly those related to elementary school learning methodology. Several instructional technology courses are also available, although they are limited in number and not explicitly linked to each content cluster. This is particularly true in the PGMI study program, where the proportion of courses in the course structure is evident. This is evident in the "*Kajian*" and "*Pembelajaran*" courses, where the *Kajian* course focuses on mastering content, while the *Pembelajaran* course focuses on mastering pedagogy.

Interviews with students revealed that they found the diversity of courses beneficial, although some felt the education course load was more dominant. Classroom observations indicate that some courses have begun to integrate digital media, but this is still limited to presentation applications and simple learning videos. A key advantage is that this program has adopted a hybrid learning model. Students participating in online learning are also provided with laptops, audio equipment, external cameras, and the premium Google Meet platform for education. This demonstrates the management's commitment to integrating technology into learning.

c. Semester Course Plan and Learning Syllabus

Based on a document review, the PGMI Semester Course Plan includes active learning strategies. Interviews with lecturers indicate that the faculty is directed to consistently incorporate aspects of student-centered learning in its preparation. However, field observations indicate that the application of digital technology in learning remains sporadic, largely dependent on the initiative of individual lecturers.

The PGMI Study Program's Semester Course Plan and syllabus are designed to guide learning outcomes aligned with the study program's CPL (Competitive Learning Plan). Generally, the Semester Course Plan includes active learning strategies, such as discussions, presentations, and microteaching practices. However, the integration of digital technology is only included in certain Semester Course Plans, resulting in uneven implementation of TPACK.

d. Teaching Materials and Evaluation

As previously explained, the PGMI study program has adopted a hybrid learning model. Students participating in online learning are also provided with laptops, audio equipment, external cameras, and the premium Google Meet platform for education. This demonstrates the

management's strong commitment to integrating technology into learning. Based on observations made by researchers, during lectures, students have become accustomed to this hybrid learning model. Students who participate in online lectures receive the same learning portion and rights. They also conduct online presentations with the audience present in class. So, the absence of students taking online lectures does not become an obstacle for them in learning.

Based on interviews with the lecturers and students, and reinforced with observation in the class, PGMI teaching materials are dominated by conventional materials in the form of textbooks and printed modules. Efforts to use digital media have begun, but are still limited to PowerPoint-based presentations or simple learning videos. Evaluations emphasize cognitive assessment, while project-based assessments that integrate technology and pedagogy are still rare.

During the observation, it was seen that lecturers provided teaching materials dominated by modules or papers, although some lecturers had started to develop digital teaching resources. Students reported that learning evaluations are more often conducted through written tests, while project-based assessments that integrate technology are only occasionally assigned. In classroom practice, the delivery of learning is still largely dominated by the use of projectors. The availability of projectors in almost every classroom makes their use very common, yet the potential of other technological tools beyond projectors has not been fully explored.

Interviews with lecturers confirmed that while projectors are considered the most practical medium, their use rarely goes beyond displaying lecture slides, with limited attempts to integrate interactive or web-based platforms. Students also expressed that they often experience repetitive lecture formats centered on projector presentations. Classroom observations supported these findings, showing that although projectors are consistently used in almost all sessions, there was minimal utilization of more interactive technologies such as online quizzes, digital simulations, or collaborative learning applications.

PAI Study Program of Institut Asy-Syukriyyah

a. Curriculum Development Basis

The Islamic Religious Education Study Program (PAI) curriculum is based on the vision of producing Islamic religious educators with broad insight, Islamic character, and the ability to integrate Islamic values with the needs of 21st-century learning. The curriculum is based on the KKNI (National Qualifications Framework), LAMDIK standards, and the needs of madrasas/schools as users of graduates. The PAI Study Program's distinction lies in the integration of religious

knowledge, pedagogy, and technology, although in practice, the technological aspect remains a major challenge.

The Head of the Islamic Religious Education (PAI) study program stated, "A PAI teacher must not only be able to teach Islamic religious knowledge, but is also expected to be able to adapt to developments in the era through technology." Interviews with the Head of the PAI Study Program indicate that the PAI curriculum is based on the vision of producing Islamic religious educators who not only master religious content but are also able to respond to the challenges of the times. The Dean added that PAI's distinction compared to other study programs lies in its strengthening of broad Islamic knowledge. Students interviewed acknowledged this advantage, but also revealed that the use of technology in lectures is still less dominant than the religious content.

b. Course Structure

The Islamic Religious Education curriculum consists of general courses, education, Islamic religious studies, Islamic Religious Education methodology, and field practicum courses. A distinctive feature of Islamic Religious Education is its strong emphasis on Islamic religious studies, ensuring students have a strong grasp of religious content. However, learning technology courses are still limited and not all are designed to support the implementation of TPACK (Integrated Learning) in the Islamic Religious Education context.

The Islamic Religious Education curriculum emphasizes a significant portion of religious knowledge (the Quran, Hadith, Fiqh, Aqidah, and Morals, etc.). Interviews with students revealed that some found it helpful because it strengthened their religious competencies, but others felt that integration with learning technology was still minimal. Classroom observations revealed that lecturers predominantly used lecture and discussion methods, while the use of digital platforms was still limited.

c. Semester Course Plan and Learning Syllabus

The Islamic Religious Education Study Program's (RPS) and syllabus are designed with an orientation toward mastery of Islamic religious material and teaching skills. Active learning strategies have begun to be adopted, but the use of digital technology as a learning medium or resource remains optional. Some lecturers have attempted to integrate digital platforms for discussions or assignments, but this has not yet become a consistent practice across all courses.

Based on document analysis, the Islamic Religious Education Study Program (RPS) includes learning outcomes related to mastery of Islamic material and teaching skills. However, interviews with lecturers indicate that technology integration into the RPS has not been consistently formulated. Some lecturers have begun using digital applications (e.g., Google Classroom and e-learning), but this still relies on personal awareness.

d. Teaching Materials and Evaluation

Based on interviews with the lecturers and students, and reinforced with observation in the class, PAI teaching materials still rely heavily on religious texts, reference books, and printed papers. Students stated that "for every assignment given by lecturers, almost all of them still want printed papers, and some lecturers even ask for papers to be written by hand." The use of technology-based media, such as digital Quran learning apps, Islamic preaching videos, or e-learning, is still limited to individual lecturers' initiatives. Evaluations place greater emphasis on students' cognitive and affective abilities, while technology-based assessments in learning are rarely systematically designed.

PAI teaching materials still focus on Islamic texts and reference books. Field observations show that some lecturers occasionally use digital media, such as Islamic preaching videos or Quran applications, but this is not structured into the curriculum. Evaluations still focus more on memorization tests, understanding of religious material, and written assignments. Students reported that they have not experienced practical assessments using learning technology.

Findings from the curriculum documents of the two study programs indicate that the curriculum of the PGMI and PAI study programs at the Faculty of Tarbiyah, Institut Asy-Syukriyyah, is structured based on the national regulatory framework, namely the KKNI (National Qualifications Framework), SN-DIKTI (National Higher Education Standards), and LAMDIK accreditation standards. Both study programs have comprehensive curriculum documents, encompassing the vision and mission, graduate learning outcomes (CPL), course structure, Semester Lecture Plan (RPS), learning syllabus, teaching materials, and evaluation instruments. Therefore, administratively, both curricula meet the formal requirements as guidelines for the implementation of higher education.

Structurally, PGMI emphasizes multidisciplinary competencies, with a relatively balanced portion of general subjects, basic sciences, education, and learning methodology in elementary schools. The PGMI curriculum distinguishes itself from the integration of pedagogy and content

across subject areas (mathematics, science, social studies, language arts, etc.), thus preparing graduates to be versatile classroom teachers. However, the integration of technology within the curriculum remains limited, generally appearing only in courses on instructional media or educational technology.

Meanwhile, the Islamic Religious Education (PAI) curriculum places greater emphasis on mastering religious content, which dominates the course structure. Courses in Islamic Religious Education (PAI) education and methodology are designed to balance the pedagogical aspects, ensuring graduates are equipped to become Islamic religious teachers with both depth of content and teaching skills. The distinction of the PAI curriculum lies in its strong and profound foundation in religious knowledge. However, as in PGMI (Indonesian Teachers' Association), technological aspects are not explicitly integrated into every course; rather, they are supplementary.

In terms of lesson plans (RPS), syllabi, teaching materials, and evaluation, both study programs emphasize active learning strategies, although variations in technology use still depend on the lecturer's initiative. PGMI's teaching materials are more oriented towards basic education textbooks and modules, while PAI still predominantly utilizes classical and contemporary Islamic books and literature. Evaluation in both programs focuses more on cognitive aspects, while integrative project-based assessment models (which connect content, pedagogy, and technology) are still rarely found in curriculum documents or classroom implementation.

Thus, the main distinction can be seen in the focus of the study areas: PGMI's multidisciplinary orientation with pedagogical reinforcement, while PAI's orientation focuses on mastery of Islamic religious content with an emphasis on educational competencies. Both have the potential to develop TPACK integration, but currently, it is still at a partial stage, not systematic and comprehensive.

Discussion

The findings indicate that both programs exhibit robust CK and adequate PK, yet TK and the integrative domains (TCK, TPK, TPACK) remain underdeveloped. In line with Shulman (1986) the notion of Pedagogical Content Knowledge and Thompson & Mishra (2008) the TPACK framework, curriculum design should move from an additive "technology-as-a-tool" to a designed co-evolution of content, pedagogy, and technology. Practically, this requires that curriculum maps, CPL/LOs, and RPS explicitly specify: (1) the content representation to be taught (CK), (2) the pedagogical model to be used (PK), and (3) the technology function that affords learning (TK) and, critically, how these

intersect (PCK/TCK/TPK) in authentic tasks.

Observational evidence in both programs, teaching dominated by projector-led slide delivery, minimal interactive platforms, and evaluation centered on written tests, signals a TPACK bottleneck: technology is present, but not pedagogically purposed nor content-specific. However, field observations and interviews revealed deeper, context-specific challenges hindering this integration. Students demonstrated limited digital literacy, limiting their ability to explore or adapt new tools beyond basic slide presentations. One reason for this is that students are not yet accustomed to integrating learning with technology. Student technology use still revolves around searching for references online, creating presentation slides, and using online (hybrid) learning models. Furthermore, a strong conventional teaching culture, characterized by lecture-dominated delivery and lecturer-centered learning expectations, creates subtle resistance to technology-enhanced pedagogy. These data suggest that barriers to TPACK are not only curricular but also socio-cultural and infrastructural challenges. Overcoming these barriers requires ongoing professional development, targeted digital literacy training for students, and collaborative efforts with multiple stakeholders to ensure adequate technology support and a gradual cultural shift toward technology-infused, interactive learning.

At the curriculum level, PGMI can scaffold TPACK by aligning elementary subject strands with signature technologies and pedagogies across semesters. For example, mathematics units can incorporate digital manipulatives for conceptual change; science units can use simple simulations to model phenomena; language units can integrate digital storytelling for multimodal literacy. Such integration resonates with Koh (2019) review, which emphasized that TPACK development requires content-embedded learning experiences rather than stand-alone ICT courses. Each RPS should therefore present a CK – PK – TK alignment table, making TCK and TPK visible and assessable. In PAI, TCK can be strengthened by systematically embedding digital Qur'an/ḥadīth resources, concordances, and audio-feedback tools within methods courses; PK then frames how these tools support inquiry, tafsir comparison, memorization with feedback, and discourse ethics, thereby forming content-faithful TPACK rather than generic ICT use.

Curriculum analysis of two study programs at Institut Asy-Syukriyyah, namely PGMI and PAI, shows that the Technological Pedagogical Content Knowledge (TPACK) framework can be a relevant analytical tool for measuring the integration between content, pedagogy, and technology in the teacher education process. The TPACK model was first introduced by Thompson & Mishra

(2008) emphasizing that the quality of prospective 21st-century teachers is not only determined by their mastery of content (Content Knowledge/CK) and pedagogy (Pedagogical Knowledge/PK), but also by their ability to integrate technology (Technological Knowledge/TK) in supporting meaningful learning.

Analysis of curriculum documents, interview results, and implementation observations in the PGMI and PAI study programs indicates an integration of Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK), albeit to varying degrees. In general, both study programs emphasize mastery of scientific content and pedagogy, while technology integration is still in its developmental stages.

This finding is consistent with a systematic review, which revealed that the implementation of TPACK in higher education, particularly in teacher education programs (Sofwan et al., 2024), often shows an imbalance: CK and PK tend to be strongly emphasized, whereas TK is treated as supplementary rather than as an integral component of curriculum design. Sofwan highlights that most studies in Indonesia report teachers and pre-service teachers using technology only at a basic level—mainly for presentation or administrative purposes—without a deeper pedagogical alignment. The same pattern was observed in PGMI and PAI, where the reliance on projectors dominates classroom practice, and more interactive or content-specific technologies remain underutilized.

Drawing on Sofwan's framework, this suggests that while the curricula have succeeded in embedding CK and PK structurally, TK requires more explicit and systematic integration. Without such emphasis, the full development of TPACK remains limited, resulting in pre-service teachers who are proficient in content and pedagogy but not fully prepared to employ technology as a transformative tool for learning.

First, in terms of Content Knowledge (CK). Both PGMI and PAI place significant emphasis on mastering core material. PGMI emphasizes mastery of multidisciplinary basic scientific content in elementary schools (SD/MI), while PAI emphasizes mastery of Islamic sciences (the Qur'an, hadith, fiqh, faith and morals, and the history of Islamic civilization). Both reflect what is stated by Shulman (1986) the mastery of content as the main requirement for prospective teachers to be able to convey material correctly and in depth.

Second, in the Pedagogical Knowledge (PK) aspect, both show relatively equal strengths. The PGMI curriculum emphasizes basic learning methodologies with a thematic and scientific approach tailored to the needs of elementary school-aged children, while PAI emphasizes pedagogical strategies oriented toward developing Islamic character and spiritual values. This is in accordance with the view of (Harris et al., 2009) that PK is the basis for determining the best approach to delivering content.

Third, in terms of Technological Knowledge (TK). Interview results indicate that both lecturers and students at PGMI and PAI are quite familiar with the use of learning technology, especially presentation applications, Learning Management Systems (LMS), and internet-based media. However, their use is still more dominant in the aspect of material delivery, not yet fully touching on interactive technology-based learning innovations. (Wang et al., 2018) emphasized that TK is not enough to just master the tools, but also requires an understanding of how technology can modify learning methods.

Fourth, in the integrative domain, such as Pedagogical Content Knowledge (PCK) and Technological Content Knowledge (TCK). The PGMI curriculum demonstrates stronger PCK, with its theme-based learning design and integration of various subjects. Meanwhile, Islamic Religious Education (PAI) emphasizes PCK, which is oriented toward building Islamic character through lectures, discussions, and worship practices. In TCK, both are still limited. For example, the use of digital interpretation applications in PAI or multimedia devices for science and mathematics learning in PGMI has not been systematically integrated into the curriculum.

Fifth, the Technological Pedagogical Knowledge (TPK) aspect. Both have begun to move toward utilizing technology to support learning methods. Classroom observations indicate the use of digital platforms such as Google Classroom and Zoom, but these have not yet been fully linked to specific pedagogical strategies. This aligns with findings (Hava & Babayiğit, 2024) that many educational institutions are still in a transitional stage in linking technology to teaching strategies.

Sixth, at the pinnacle of integration is TPACK. The PGMI and PAI curricula are already geared toward developing TPACK competencies, but they are not yet evenly distributed across all courses. Mastery of TPACK is more evident among lecturers who are adaptable to technology and among students who actively use digital applications in their coursework. However, institutionally, TPACK integration within the curriculum still needs to be strengthened to establish a consistent academic identity.

TPACK is the ultimate integration of the three domains in a teaching context. In both, TPACK is more visible in the implementation phase (PPL/PKL, specific lecturer classes) than in explicit curriculum design. PGMI demonstrates the embryo of TPACK through assignments/projects that integrate elementary school content, active strategies, and digital media in several courses. PAI is still limited: CK is strong and PK is adequate, but without a well-designed TK, TPACK integration is difficult to establish. Institutionally, there is no curricular orchestration (e.g., integrative courses, TPACK maps per family, TPACK assessment rubrics) that ensures a uniform TPACK experience across semesters.

Thus, it can be concluded that the depth of the TPACK content at the Institut Asy-Syukriyyah is still stronger in the CK and PK aspects, while TK and cross-domain integration (TCK, TPK, TPACK) still require further development. This also presents an opportunity for the institution to strengthen the integrative vision between pedagogy, content, and technology in order to produce adaptive teachers in the digital era.

CONCLUSION

This study concludes that the curriculum structure of the PGMI and PAI study programs at Institut Asy-Syukriyyah has been designed in accordance with national higher education standards, with integration between graduate profiles, learning outcomes, courses, and RPS (Lesson Plan) tools. In terms of substance, the curriculum emphasizes the strengths of Content Knowledge (CK) and Pedagogical Knowledge (PK). PGMI excels in multidisciplinary content and basic learning methodologies, while PAI focuses more on mastery of Islamic knowledge and teaching methodologies. However, the depth of Technological Knowledge (TK) content and the integration of TPACK (Technological Competency Assessment) remain limited. Technology aspects are predominantly presented in the form of presentation media and LMSs, not yet fully designed as core curriculum competencies. Integration at the PCK, TCK, TPK, and TPACK levels remains implicit and sporadic, dependent on lecturer initiative and field practice. This demonstrates the need for a more systematic strengthening of the TPACK-based curriculum so that graduates not only master content and pedagogy but also are able to effectively integrate technology into the learning process in the digital age.

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