TA'DIB JOURNAL, 28 (2), 2025, (July-December)

ISSN: 1410-8208 (*Print*) 2580-2771 (*Online*)
Available online at https://ejournal.uinmybatusangkar.ac.id/ojs/index.php/takdib

Teachers' Digital Competency Transformation through Sparkol Videoscribe: Technical, Pedagogical, and Identity Shifts in Madrasah Tsanawiyah

Received: 04-12-2025; Revised: 21-12-2025; Accepted: 22-12-2025

Hamdi Abdul Karim*)
Universitas Islam Negeri Sjech M. Djamil Djambek Bukittinggi, Indonesia
E-mail: hamdiabdulkarim@uinbukittinggi.ac.id

Helfi
Universitas Islam Negeri Sjech M. Djamil Djambek Bukittinggi, Indonesia
E-mail: helfi@uinbukittinggi.ac.id

Fadhil Hardiansyah
Institut Agama Islam Negeri Metro, Indonesia
E-mail: fadhil.hardiansyah@yahoo.co.id

Siska Oktavia
Nurul Fikri Academy, Jambi, Indonesia
E-mail: siskaoctavia17okt@gmail.com

Gusnia Darniati
Universitas Islam Negeri Sjech M. Djamil Djambek Bukittinggi, Indonesia
E-mail: gusniadarniati2000@gmail.com

Resa Afri Yuliandri
Universitas Islam Negeri Sjech M. Djamil Djambek Bukittinggi, Indonesia
E-mail: afriyuliandriresa120402@gmail.com

*) *Corresponding Author*

Abstract: The rapid development of digital technology necessitates new teacher competencies, yet how educators transform through specific tools in resource-limited contexts remains underexplored. Grounded in the DigComp framework and multimedia learning theory, this qualitative intrinsic case study examines the digital competency transformation of Madrasah Tsanawiyah (MTs) teachers using Sparkol Videoscribe animation media. Data from interviews, observations, and documentation involving six teachers in Agam Regency, West Sumatra were analyzed thematically. Findings reveal a significant three-dimensional transformation: (1) technical competence evolved from basic digital literacy to productive content creation; (2) pedagogical practice shifted from lecture-based instruction to interactive, multimodal, student-centered learning; and (3) professional identity was reshaped by a growth mindset, heightened self-efficacy, and proactive technology exploration. Despite challenges like limited devices and internet access, teachers developed adaptive strategies including peer collaboration and personal content banks. Theoretically, this study contributes to teacher professional development literature by demonstrating how experiential tool-based learning fosters holistic competency growth. Practically, it underscores the need for institutional policies that provide technological infrastructure, foster collaborative communities of practice, and integrate hands-on digital media training into sustainable professional development programs for madrasah teachers.

***Abstrak**: Perkembangan teknologi digital yang pesat memerlukan kompetensi baru guru, namun bagaimana pendidik bertransformasi melalui alat spesifik dalam konteks sumber daya terbatas masih jarang diteliti. Berdasarkan kerangka DigComp dan teori pembelajaran multimedia, studi kualitatif kasus intrinsik ini mengkaji transformasi kompetensi digital guru Madrasah Tsanawiyah (MTs) melalui penggunaan media animasi Sparkol Videoscribe. Data dari wawancara, observasi, dan dokumentasi yang melibatkan enam guru di Kabupaten Agam, Sumatera Barat dianalisis secara tematik. Temuan mengungkap transformasi signifikan dalam tiga dimensi: (1) kompetensi teknis berevolusi dari literasi digital dasar menjadi kreasi konten produktif; (2) praktik pedagogis bergeser dari pengajaran berbasis ceramah ke pembelajaran interaktif,*

multimodal, dan berpusat pada siswa; dan (3) identitas profesional dibentuk kembali oleh pola pikir bertumbuh, efikasi diri yang meningkat, dan eksplorasi teknologi yang proaktif. Meski menghadapi tantangan seperti perangkat dan akses internet terbatas, guru mengembangkan strategi adaptif termasuk kolaborasi sejawat dan bank konten pribadi. Secara teoretis, studi ini berkontribusi pada literatur pengembangan profesi guru dengan menunjukkan bagaimana pembelajaran eksperiensial berbasis alat mendorong pertumbuhan kompetensi secara holistik. Secara praktis, penelitian menegaskan pentingnya kebijakan kelembagaan yang menyediakan infrastruktur teknologi, memperkuat komunitas praktik kolaboratif, serta mengintegrasikan pelatihan media digital langsung ke dalam program pengembangan keprofesian berkelanjutan guru madrasah.

Keywords : teacher digital competence; Sparkol Videoscribe; animation media; learning innovation; Madrasah Tsanawiyah.

INTRODUCTION

The rapid advancement of digital technology over the past two decades has fundamentally reshaped the educational landscape, positioning technological proficiency not as an optional supplement but as a core competency essential for educators. The shift from lecture-dominated, conventional teaching toward more visual, interactive, and digitally enriched learning experiences has transformed the teacher's role from mere content deliverer to creative designer of learning experiences (Anggraeni & Triyono, 2023; Darling-Hammond et al., 2024; Kristiawan & Aminudin, 2021). Digital animation-based learning media such as Sparkol Videoscribe offer significant potential to present complex material in engaging, structured, and cognitively accessible ways that align with the learning preferences of digital-native students (Aryuntini et al., 2018; Assyifa et al., 2023; Dewi & Tyas, 2024). However, within the context of madrasah education—particularly in non-urban Madrasah Tsanawiyah (MTs) settings such as Agam Regency—technology integration faces a dual challenge: the pressure to innovate pedagogically coexists with constraints in infrastructure, access, and high teacher workloads.

Although previous studies have extensively examined the effectiveness of animation media on student learning outcomes (e.g., (Pradilasari et al., 2019; Sitepu & Siregar, 2023; Wahyudi & Amir Mz, 2022), attention to the transformation experienced by teachers as the primary agents of technology integration remains limited. Research involving teachers tends to focus on improving technical skills through training programs (Ilmudinulloh, 2021; Rosyita & Tsurayya, 2021; Salim et al., 2023), without exploring in depth how firsthand experience with a specific digital tool such as Videoscribe can alter not only technical ability but also pedagogical thinking and professional identity. Yet, teachers in madrasahs often operate in resource-constrained environments where technology adoption requires unique adaptation, creativity, and resilience (Firmansah & Firdaus, 2021). Thus, a significant gap exists in the literature concerning how madrasah teachers undergo holistic digital competency transformation—encompassing technical, pedagogical, and psychological dimensions—through their sustained use of specific tools like Sparkol Videoscribe within their authentic contexts.

To address this gap, this study is grounded in an integrated theoretical framework

combining TPACK (Technological Pedagogical Content Knowledge) and Growth Mindset Theory (Dweck, 2006). TPACK provides a lens to analyze how teachers connect and deepen their technological, pedagogical, and content knowledge through authentic practice. Meanwhile, Growth Mindset Theory helps explain the psychological and motivational shifts teachers undergo—from doubt to confidence, from risk aversion to exploration—as they gain mastery over a digital tool. Principles from Multimedia Learning Theory (Mayer, 2009) also inform the analysis of effective media design, while the DigComp framework serves as a reference for defining the dimensions of digital competence being transformed.

Based on this foundation, the study is designed to address three core research questions: First, how do MTs teachers' technical competencies transform through the process of creating and refining animated media using Sparkol Videoscribe? Second, how do their pedagogical competencies change following the integration of animation media into their instructional design, delivery, and assessment practices? Third, what shifts occur in teachers' mindsets and professional identities as a result of sustained Videoscribe use, particularly in response to various technical and non-technical constraints?

Through an in-depth qualitative intrinsic case study approach, this research aims not only to map the nature of this transformation but also to offer meaningful theoretical and practical contributions. Theoretically, the findings are expected to enrich understanding of the mechanisms behind teacher competency transformation within the TPACK and growth mindset frameworks, particularly in Islamic education and resource-limited settings. Practically, the study can inform policymakers, madrasah principals, and teacher training developers in designing context-sensitive, experiential, and collaboration-supportive digital competency development programs for madrasah teachers.

METHOD

This study adopted a qualitative research design with an intrinsic case study approach to achieve an in-depth, contextually embedded understanding of how Madrasah Tsanawiyah teachers experienced digital competency transformation through their use of Sparkol Videoscribe. The primary unit of analysis was the process of teacher transformation itself, observed through their changing practices, reflections, and interactions during the study period from July to September 2024. This three-month timeframe encompassed the phases of initial adoption, sustained use, and reflective integration of the animation tool, allowing for observation of competency development in real time. The case boundaries were deliberately defined around three madrasahs in Agam Regency, West Sumatra—settings characterized by limited technological infrastructure yet active engagement with digital media innovation—enabling a focused exploration of teacher experience within a specific sociocultural and institutional environment.

Participant selection was guided by purposive sampling, resulting in the involvement of six teachers across three schools. These individuals taught diverse subjects—Mathematics, Science, Social Studies, Arabic, Indonesian, and Fiqh—and each had already begun experimenting with Videoscribe prior to the study. The sample size was determined not by statistical representativeness, but by the principle of thematic saturation, whereby data collection continued until no new significant themes or insights emerged in relation to the research questions. One school principal also participated to provide an institutional perspective on teacher development and support systems. Fieldwork was conducted intensively over the three-month period (July–

September 2024), during which multiple forms of data were collected to enable methodological triangulation and enrich the depth of analysis.

Data gathering encompassed three complementary strands. First, two rounds of semi-structured in-depth interviews were held with each teacher, totaling twelve interview sessions, each lasting between 40 and 70 minutes. The initial round in early July focused on teachers' early encounters with Videoscribe, their learning processes, and perceived challenges, while the follow-up interviews in late September explored evolving competencies, pedagogical adaptations, and shifts in professional outlook after continued use. Second, classroom observations were conducted four times per teacher, amounting to twenty-four observed lessons throughout the study period, to document firsthand how animated media were integrated into instruction, how students responded, and how teachers adjusted their pedagogical strategies in real time. Third, a range of documents were collected for analysis, including teacher-created videos, lesson plans, reflective notes made during video production, and examples of student assessments linked to animation-based lessons.

Thematic analysis, following the structured six-phase framework outlined by Braun and Clarke (2006), served as the primary analytical method. The process began with deep immersion in the data—repeated reading of interview transcripts, observation notes, and documents—to foster familiarity. Initial coding followed, wherein meaningful segments of text were assigned descriptive and inferential labels (e.g., "navigating interface anxiety," "visual sequencing attempts," "student-led questioning post-video") using NVivo 12 software. These codes were then clustered into broader candidate themes such as technical skill development, pedagogical innovation, identity shift, and adaptive resilience. These themes were rigorously reviewed, refined, and clearly defined in relation to the dataset and research questions, ultimately forming the core structure of the findings.

To ensure the trustworthiness of the study, several validation strategies were employed. Triangulation was applied across data sources (teachers and principal) and methods (interviews, observations, documents) to cross-check consistency and comprehensiveness. Member checking was conducted by sharing preliminary interpretations with participants in September 2024 to confirm accuracy and resonance with their experiences. Peer debriefing was undertaken with two experienced qualitative researchers who reviewed the coding framework and thematic structure, helping to mitigate potential researcher bias. All research activities adhered to established ethical protocols, including informed consent, confidentiality, voluntary participation, and the secure handling of data. Through this methodologically rigorous and transparent approach, the study aimed to provide a credible, nuanced account of digital competency transformation among madrasah teachers in a non-urban Indonesian context over a defined and intensive period of engagement.

RESULTS AND DISCUSSION

Results

Introduction to Participants and Research Context

This study involved six teachers from three Madrasah Tsanawiyah (MTs) in Agam Regency, West Sumatra, a region characterized by semi-urban and rural settings with varying degrees of technological infrastructure. Participants were purposively selected based on their prior exposure to Sparkol Videoscribe and their willingness to engage in reflective inquiry. They represented a diverse range of subject specializations: Mathematics (T1), Science (T2), Social Studies (T3), Arabic (T4), Indonesian

Language (T5), and Fiqh (Islamic Jurisprudence, T6). One school principal also participated to provide institutional insights, though the primary data derive from teacher experiences. All participants had been using Videoscribe for at least three months prior to the study, which was conducted intensively from July to September 2024. Data collection continued until thematic saturation was reached—that is, until no new significant codes or insights emerged regarding the research questions after analyzing the twelfth interview and twenty-fourth classroom observation. The findings are structured around four core themes derived from a systematic thematic analysis, each representing a distinct dimension of the teachers' digital competency transformation. These themes, along with their constituent codes and illustrative data, are summarized in Table 1 below.

Table 1. Summary of Thematic Findings on Teacher Digital Competency Transformation.

Theme	**Description**	**Key Sub-categories**	**Illustrative Initial Codes**	**Data Sources**
1. Technical Competence Transformation	Evolution from basic digital literacy to skilled creation and editing of animated content.	Interface navigation, multimedia integration, editing proficiency, troubleshooting.	"icon confusion," "audio sync attempts," "export failures," "template reuse," "rendering time"	Interviews (T1–T6), video artifacts, observation notes.
2. Pedagogical Competence Transformation	Shift from teacher-centered lecturing to multimodal, interactive, and student-responsive teaching.	Video as pedagogical tool, concept visualization, assessment innovation, classroom interaction patterns.	"video opener," "3D visualization," "post-video quiz," "student questions increased," "lesson pacing change"	Classroom observations (24 sessions), lesson plans, teacher reflections.
3. Professional Mindset & Identity Shift	Psychological and motivational changes: from anxiety and avoidance to confidence, exploration, and self-identification as a digital-age educator.	Self-efficacy growth, exploratory behavior, professional self-concept shift, motivation for continuous learning.	"fear of clicking," "pride in first video," "trying Canva," "seeing myself as tech-capable," "evening tutorials"	Interview transcripts (especially second round), reflective journals.
4. Adaptive Strategies to	Context-sensitive,	Peer collaboration, content banking,	"sharing assets via WhatsApp,"	Interviews, WhatsApp

Theme	Description	Key Sub-categories	Illustrative Initial Codes	Data Sources
Overcome Challenges	collaborative, and resourceful practices developed to navigate technical, pedagogical, and logistical constraints.	time optimization, iterative refinement based on feedback.	"saving reusable images," "working after school," "revising after student confusion"	group logs, video version histories.

Theme 1: Transformation of Teachers' Technical Competence

Initial Technological Hesitance and Early Struggles

At the outset, all participants reported limited prior experience with animation software. Most were accustomed to using Microsoft Office applications for lesson preparation, but none had created animated video content before. Initial interviews revealed a consistent pattern of hesitance and technical confusion. T2 (Science) described the initial encounter: "*When I first opened Videoscribe, I saw so many panels, buttons, and timelines. I didn't know where to place images or how to make them move. I spent nearly an hour just trying to insert a text box.*" Similar sentiments were echoed by T5 (Indonesian), who noted: "*I was afraid I would delete something important or corrupt the software. I only dared to click on things I recognized, like 'Save' or 'Play.'*" Classroom observations in early July confirmed this early stage: teachers often used pre-made videos or very basic slideshows with minimal animation, and several were observed asking students for help with projector connections or audio playback.

Progressive Skill Acquisition through Trial, Error, and Sharing

As teachers engaged more consistently with the tool, their technical competencies evolved through iterative experimentation. The learning curve was steep but rewarding. T1 (Mathematics) explained his process: "*After failing to make a simple shape move, I watched a YouTube tutorial. The next day, I tried again and managed to animate a rectangle. It felt like a small victory*." Teachers gradually mastered core functions: inserting and resizing images, sequencing objects on a timeline, recording and synchronizing voice narration, adding background music, and adjusting playback speed. T4 (Arabic) illustrated this progression: "*My first video was just still images with text captions. A month later, I could make letters appear one by one as I spoke, add calligraphy animations, and even include a subtle background soundtrack*." Observations corroborated this growth: later videos (from August onward) showed more polished sequencing, clearer audio, intentional pacing, and thematic visual consistency.

Advanced Technical Maneuvers and Persistent Challenges

By September, several teachers were experimenting with more advanced features, such as creating custom illustrations using integrated drawing tools, layering multiple audio tracks, and using the "camera zoom" effect to highlight key content. T3 (Social

Studies) shared: "*I started using the 'hand drawing' effect to simulate a teacher writing on a whiteboard. Students loved it—it felt more personal.*" However, technical barriers persisted, primarily related to hardware limitations. T6 (Fiqh) reported: "*My laptop is very old. When I try to export a video in HD, it often crashes. I've learned to save after every step, but it's frustrating*." Internet instability also constrained access to online asset libraries, pushing teachers to develop offline repositories of reusable images and icons. Despite these hurdles, the overall trajectory was one of marked technical growth, moving from passive digital consumers to active, if still developing, digital creators.

Theme 2: Transformation of Pedagogical Competence

From Lecture-Centric to Multimodal Lesson Design

The most visible pedagogical shift was the integration of animated videos as central instructional components rather than supplementary aids. In 22 of the 24 observed lessons, teachers used Videoscribe content as a lesson opener. T5 explained the rationale: "*Starting with a video immediately grabs their attention. Before, I had to ask them to quiet down several times. Now, the video does that for me*." Teachers also began chunking content into shorter, thematically coherent video segments aligned with microlearning principles. T2 noted: "Instead of explaining photosynthesis in one long lecture, I now break it into three short videos: one for sunlight absorption, one for water uptake, and one for oxygen release. After each, we discuss."

Enhancing Conceptual Understanding through Visualization

Animation allowed teachers to convey abstract or invisible processes with newfound clarity. In a Mathematics lesson on geometry, T1 used a rotating 3D cube animation to explain faces, edges, and vertices. He reflected: "*Before, I drew static cubes on the board. Some students couldn't visualize the hidden sides. The animation made it tangible*." Similarly, T2 used animated diagrams to show blood circulation, while T4 used moving Arabic script to teach letter connections. T3 used historical timeline animations to help students grasp chronology, noting: "*Seeing events unfold in motion helps them remember sequence better than a static list*." These practices indicate a deliberate shift toward visual-spatial and multimodal teaching strategies.

Evolving Assessment and Classroom Interaction Patterns

Assessment methods diversified as teachers leveraged video content for formative evaluation. Common techniques included pause-and-predict prompts, post-video quizzes, and student-led explanations of animated sequences. T6 described: "*After showing a video on ritual purification (wudhu), I ask students to reorder the steps using flashcards. Their accuracy has improved.*" Classroom dynamics also shifted. In earlier observations, teacher talk dominated; later sessions showed increased student questioning, peer discussion, and hands-on activities following video stimuli. T5 observed: "*They now ask questions like, 'Can we see that part again?' or 'What if we changed this step?' It's more interactive.*"

Theme 3: Transformation of Professional Mindset and Identity

From Technophobia to Growing Self-Efficacy

Early interviews consistently revealed anxiety toward digital tools. T4 confessed: "*I used to think technology was for young teachers. I avoided it, worried I'd look incompetent*." The successful creation and classroom use of their first Videoscribe production served as a critical confidence-building milestone. T1 recalled: "*When my*

video played without glitches and students actually learned from it, I thought, 'Maybe I can do this.'" This growing self-efficacy encouraged further experimentation. By September, all teachers reported reduced fear of "breaking" software and increased willingness to explore unfamiliar features.

Emergence of an Exploratory and Innovative Disposition

As confidence grew, teachers began proactively seeking ways to enhance their digital media. T2 started using Canva to design custom thumbnails for his videos. T5 explored Powtoon as an alternative animation tool. T3 joined a Telegram group for educators sharing digital resources. This exploratory behavior was often self-directed and intrinsically motivated. T6 shared: "*I find myself browsing for educational graphics in my free time, thinking, 'This could go into my next video.' It's become a hobby, not a chore*."

Reconceptualizing Professional Identity

Teachers began to internalize digital competence as part of their professional identity. T3 articulated this shift: "*I used to see myself as a content expert who occasionally uses tech. Now I feel like a 'digital teacher'—someone who designs learning experiences with technology*." This renewed identity was coupled with a commitment to continuous learning. T5 noted: "*I now allocate time every weekend to learn something new—a new app, a new editing trick. It keeps me updated*." The transition from a fixed, avoidance-oriented mindset to a growth-oriented, integrative professional self-concept represents perhaps the most profound transformation documented in this study.

Theme 4: Adaptive Strategies to Overcome Challenges

Collaborative Knowledge Sharing and Support Networks

Teachers spontaneously formed informal support networks to mitigate technical and pedagogical challenges. WhatsApp groups became hubs for sharing resources, troubleshooting issues, and exchanging feedback. T2 explained: "*If someone found a free stock image site or solved an audio sync problem, they'd share it immediately. We became a mini learning community.*" In one observed instance, T3 and T4 worked together after school to co-create a video on Islamic history, blending T3's content knowledge with T4's growing technical skill.

Development of Personal and Collective Content Banks

To save time and ensure consistency, teachers began curating personal digital libraries of reusable assets: icons, background music tracks, voiceover snippets, and animation templates. T1 described his system: "*I have folders for Math symbols, geometric shapes, and diagram elements. When I need something, I don't search online—I use my bank.*" Some schools also initiated shared Google Drive folders where teachers uploaded commonly used assets, creating an institutional repository.

Strategic Time and Resource Management

Given heavy teaching loads and device limitations, teachers developed savvy time-management strategies. Many scheduled video creation during off-peak hours: early mornings, evenings, or weekends. T4 noted: "*I come to school an hour early to use the computer lab when no one else is there. The internet is faster, and I can concentrate*." Others used smartphones for initial storyboarding or audio recording, later transferring files to computers for editing.

Iterative Design Based on Classroom Feedback

Teachers adopted a reflective, iterative approach to video production. After using a video in class, they noted points of student

confusion, engagement drops, or technical issues, then revised accordingly. T5 shared an example: "*My first video on narrative structure was too fast. Students looked lost. I added pauses between scenes and inserted summary screens. The revised version worked much better*." This practice of cyclical refinement underscores a growing pedagogical intentionality and responsiveness to learner needs.

Verification and Trustworthiness Measures

To ensure the credibility of these findings, several verification steps were implemented. Member checking was conducted in late September 2024, where each teacher reviewed a summary of their interview data and preliminary thematic interpretations. All confirmed the accuracy and resonance of the representations. Peer debriefing was carried out with two independent qualitative researchers who examined the coding framework, thematic structure, and representative excerpts; their feedback led to refinements in theme definitions and labeling. Triangulation across data sources—teacher interviews, classroom observations, video artifacts, and lesson plans—provided convergent evidence for each theme. Finally, an audit trail documenting coding decisions, analytic memos, and theme evolution was maintained throughout the study.

The results presented here constitute the descriptive findings of the study. They reveal a multifaceted transformation in teachers' technical abilities, pedagogical practices, professional self-understanding, and adaptive resourcefulness. The interpretive significance of these findings, their theoretical implications, and their relation to existing literature will be elaborated in the Discussion section that follows.

Discussion

Situating the Findings in Theoretical and Empirical Context

The integration of digital technology in education has transcended its status as a mere trend to become a fundamental component of 21st-century teaching. However, the process through which teachers—particularly those in resource-constrained environments—transform their professional practice through sustained engagement with specific digital tools remains underexplored. This study sought to address this gap by investigating how Madrasah Tsanawiyah teachers in Agam-West Sumatra experienced digital competency transformation through their use of Sparkol Videoscribe animation software.

The findings reveal a complex, multi-layered process that extends beyond the acquisition of technical skills to encompass profound pedagogical and psychological shifts. This discussion interprets these findings through the integrated theoretical lenses of TPACK (Technological Pedagogical Content Knowledge) and Growth Mindset Theory, positions them in critical dialogue with existing literature—highlighting both convergence and divergence—and culminates in the proposal of a conceptual model that captures the dynamic, non-linear nature of teacher transformation. Ultimately, we argue that digital competency development in contexts of constraint is best understood as an experiential, socially scaffolded, and identity-reconstructing journey.

Interpreting Technical Transformation: From Digital Literacy to Digital Creativity and Problematizing the "Ease of Use" Narrative

The documented evolution of teachers from basic digital users to creators of animated content provides a vivid illustration of the "Digital Content Creation" competence within the DigComp framework. This framework posits that true digital competence involves not just consuming or communicating through

technology, but actively producing and editing digital artifacts (Sinaga et al., 2024). The findings strongly corroborate studies that highlight the user-friendly nature of Videoscribe and its potential for rapid skill acquisition by novices (Ilmudinulloh, 2021). Teachers, despite initial anxiety, were able to master core functions like sequencing, audio syncing, and basic editing through iterative practice—a process T2 described as "learning by clicking."

However, our study critically extends this literature by revealing the hidden labor and contextual friction behind this technical progression. While tools like Videoscribe are often marketed and researched as “intuitive,” our data show that mastery was neither immediate nor effortless (Punie & Redecker, 2017). It was achieved through significant investment of personal time, emotional resilience in the face of repeated failures (e.g., software crashes, lost work), and the development of workarounds for inadequate hardware. This finding contrasts with the somewhat sanitized narrative present in studies like Kristiawan and Aminudin (2021), which present tool adoption as a straightforward, linear progression. Our research suggests that in low-resource settings, technical transformation is a negotiated achievement, contingent on personal perseverance and informal support systems. This nuances our understanding of digital literacy, positioning it not just as a skill set, but as a form of digital resourcefulness—the ability to achieve creative goals despite systemic limitations.

Interpreting Pedagogical Transformation: TPACK-in-Action and the Critical Shift from Tool-Centric to Pedagogy-Centric Integration

The pedagogical shifts observed—using animation as a cognitive scaffold, restructuring lessons into multimodal segments, and diversifying assessment—demonstrate the practical enactment of TPACK. Teachers were not merely adding a technological layer to existing practice; they were reconceptualizing their pedagogical approach. The use of animation to visualize abstract processes in Science (T2) and Mathematics (T1) directly aligns with Mayer's (2009) Multimedia Learning Theory, particularly the segmenting and pre-training principles, which advocate for managing cognitive load by presenting information in learner-paced, multimodal chunks.

This finding reinforces a substantial body of research affirming the benefits of animation for student engagement and comprehension (Assyifa et al., 2023; Gofur et al., 2024). However, our study provides a crucial, and often missing, link: the teacher’s pedagogical reasoning process. We observed that effective integration required teachers to make deliberate design choices: How long should the video be? Which concept is most in need of visualization? What follow-up activity will cement understanding? This represents the active synthesis of Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK). This process stands in contrast to studies that primarily measure the outcome of using a tool (e.g., Wahyudi and Amir Mz, 2022, on improved test scores) without illuminating the process of pedagogical adaptation that teachers undertake. Our work shows that pedagogical transformation is an act of design and reflection, not a passive outcome of tool use. It underscores that the key variable for successful technology integration is not the tool itself, but the teacher’s ability to weave it meaningfully into their pedagogical framework—a core tenet of TPACK that is vividly demonstrated in our findings.

Interpreting Mindset and Identity Transformation: Growth Mindset as the Engine of Sustainable Change

Perhaps the most significant contribution of this study lies in its documentation of the profound psychological and identity shifts experienced by teachers. The journey from

technophobia ("*I was afraid to click anything*" – T5) to confident exploration ("*Now I feel like a 'digital teacher'*" – T3) is a textbook case of Growth Mindset in action (Dweck, 2006). Each successfully created and implemented video served as a "mastery experience," a powerful source of self-efficacy according to Bandura's (2001) social cognitive theory. This growing belief in their own capacity acted as a catalyst, transforming technology from a source of anxiety into a domain for professional curiosity and innovation.

This transformation of self-concept is a matter of professional identity. As Wenger (1999) argues, identity is shaped through participation in communities of practice. The informal collaborative networks that emerged—where teachers shared assets, solved problems, and celebrated successes—created a community that validated their new, digitally capable identities. This social dimension is critical. It moves the discussion beyond individual upskilling to consider the collective cultural shift within the madrasah. This focus on identity and mindset addresses a major gap in the literature on teacher technology professional development, which often focuses on skills and knowledge while neglecting the affective and psychological dimensions that ultimately determine long-term adoption and innovation (Akkerman & Meijer, 2011). While studies like Salim et al. (2023) document skills gained from training, they rarely explore whether teachers internalize these skills as part of their professional self. Our findings suggest that without this identity shift, technical skills remain superficial and vulnerable to abandonment.

Contrasting Perspectives, Tensions, and Articulating the Novelty of the Study

A robust discussion must engage with contrasting perspectives. While our findings align with the positive potential of digital tools, they also surface critical tensions. First, the time-cost of transformation is substantial. Teachers invested hours of unpaid personal time, a reality often absent from promotional literature or policy mandates that call for digital integration without providing corresponding time or resources. This creates a potential equity issue, where innovation becomes dependent on individual teacher sacrifice (Beauchamp & Thomas, 2009).

Second, we observed a tension between standardized curricula and creative pedagogy. Some teachers expressed concern that spending time on video production might detract from "covering the syllabus." This highlights a systemic constraint: education systems that prioritize content coverage over deep, engaging learning may inadvertently stifle pedagogical innovation, even when teachers are technically capable.

Novelty of this study arises from addressing these tensions within a specific, under-researched context and by adopting a holistic lens. Unlike much prior research that examines digital competence in isolation—focusing either on skills (Ilmudinulloh, 2021), student outcomes (Wahyudi & Amir Mz, 2022), or adoption challenges (Khuzaini et al., 2022)—this study traces the interconnected evolution of technical, pedagogical, and psychological domains (Mishra & Koehler, 2006). It's demonstrated that these dimensions are not separate tracks but are deeply entangled: pedagogical experimentation boosts technical skill, which in turn enhances self-efficacy, which then fuels further pedagogical creativity. This holistic, process-oriented perspective, grounded in the lived experiences of teachers in Indonesian madrasahs, fills a significant gap in the international literature on teacher digital competence.

A Proposed Conceptual Model: The Three-Level Transformation Spiral

Synthesizing these interpretations, we propose the "Three-Level Transformation Spiral" (Figure 1) as a conceptual model for understanding teacher digital transformation in contexts of constraint.

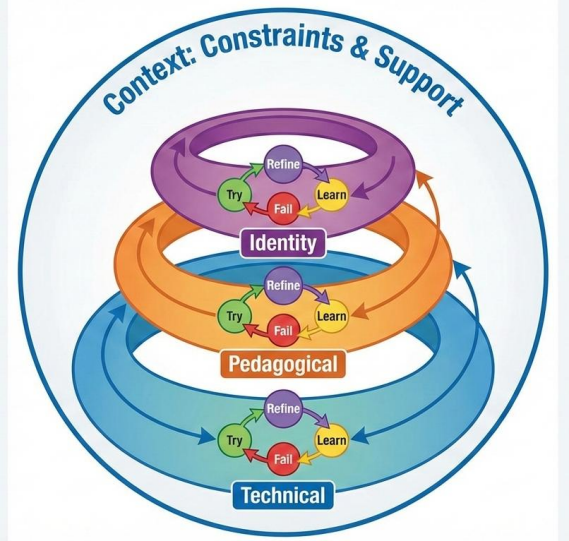

Figure 1: Three-Level Transformation Spiral Model

Description of the Model:

The model depicts transformation as an ascending spiral with three interconnected, permeable levels:

- Technical Skill Development (The "How"): The base level involves acquiring the functional ability to operate the tool, troubleshoot problems, and create digital artifacts.
- Pedagogical Integration (The "Why" and "When"): The middle level involves strategically embedding the technology into lesson design, assessment, and classroom interaction to enhance learning outcomes.
- Identity & Mindset Shift (The "Who"): The apex level involves internalizing digital competence into one's professional self-concept, characterized by confidence, a growth mindset, and a sense of agency.

Key Dynamics of the Spiral:

- Non-Linear & Iterative: Progress is not linear. Teachers may cycle within a level (e.g., try-fail-learn-refine on a technical skill) before ascending. Setbacks (e.g., a failed lesson) may cause temporary regression, but adaptive strategies facilitate recovery.
- Interdependence: Advancement at one level fuels and requires advancement at others. For example, a successful pedagogical application (Level 2) reinforces identity (Level 3), which motivates deeper technical exploration (Level 1).
- Contextual Embedding: The entire spiral operates within a ring representing the Contextual Ecosystem, which includes enablers (e.g., peer collaboration, institutional support) and constraints (e.g., poor infrastructure, heavy workload). The spiral's trajectory is shaped by this ecosystem.
- Driven by Experiential Learning: The engine of movement is reflective practice—the cycle of designing, implementing, observing outcomes, and refining approach.

This model integrates our theoretical frameworks: TPACK is operationalized across Levels 1 and 2, while Growth Mindset is the psychological driver essential for progressing to Level 3. It moves beyond descriptive lists of competencies to depict the dynamic, often messy, process of becoming a digitally proficient educator.

Theoretical and Practical Implications

Theoretical Implications

This study offers three primary theoretical contributions:

- Integration of Frameworks: It demonstrates the explanatory power of integrating TPACK with Growth Mindset Theory, providing a more complete picture of transformation that accounts for knowledge, practice, and psychology.
- Contextualization of Digital Transformation: It grounds the theory of teacher change in the under-studied context of non-urban Islamic education, highlighting how sociocultural and infrastructural factors are not merely background variables but active constituents of the transformation process.
- A Process-Oriented Model: The proposed Three-Level Transformation Spiral contributes a heuristic model that emphasizes the non-linear, iterative, and

interconnected nature of change, offering a valuable tool for future research on teacher professional development in diverse constrained environments.

Practical Implications

For educators, school leaders, and policymakers, the findings suggest several actionable pathways:

- Redesigning Professional Development (PD): Move from one-size-fits-all, tool-centric workshops to sustained, experiential, and collaborative PD models. PD should provide safe spaces for experimentation, dedicated time for creation and reflection, and foster professional learning communities.
- Providing Holistic Institutional Support: Support must go beyond hardware. Schools need to provide reliable technical infrastructure, but also recognize and reward the time and creativity involved in digital media production. This could involve adjusting workload models or creating innovation grants.
- Informing Supportive Policy: Curriculum and assessment policies should encourage pedagogical innovation. Metrics of teaching quality could include effective technology integration, shifting the focus from rote content delivery to the design of engaging learning experiences.
- Leveraging Teacher-Led Communities: Administrators should formally recognize and support the informal collaborative networks that teachers naturally form. Providing a platform for sharing resources and practices can institutionalize this powerful driver of change.

This discussion has woven together the threads of technical skill, pedagogical innovation, and psychological change to interpret the digital transformation of MTs teachers. By engaging critically with existing literature—both affirming the potential of tools like Videoscribe and challenging simplistic narratives of "ease of use"—it had been highlighted the complex, effortful, and deeply human nature of this change. The proposed Three-Level Transformation Spiral offers a conceptual lens to understand this complexity, emphasizing that sustainable transformation is a holistic process of becoming. It is not just about learning to use a new tool, but about teachers rebuilding their professional practice and identity in dialogue with technology, their students, their colleagues, and the constraints of their context. This study ultimately suggests that the future of digital education in settings like Indonesia's madrasahs depends not merely on distributing technology, but on nurturing the ecosystems that allow teachers to explore, create, and confidently claim their role as architects of meaningful digital learning.

CONCLUSION

This study set out to investigate the multi-dimensional process of digital competency transformation among Madrasah Tsanawiyah teachers in West Sumatra through their sustained use of Sparkol Videoscribe animation media. Employing a qualitative intrinsic case study design, the research revealed that teacher transformation is not a singular or linear event, but a holistic, iterative journey that unfolds across three interconnected domains: technical skills, pedagogical practice, and professional identity. Teachers progressed from initial hesitation to confident creation, from lecture-based instruction to multimodal pedagogy, and from a mindset of technological avoidance to one of exploration and integration. The findings were interpreted through the integrated lenses of TPACK and Growth Mindset Theory, culminating in the proposed Three-Level Transformation Spiral model, which captures the dynamic, context-dependent nature of this change.

The study offers distinct theoretical and practical contributions. Theoretically, it advances the literature on teacher digital competence by demonstrating the critical

interdependence of technical, pedagogical, and psychological dimensions—a holistic perspective often absent in tool-specific studies. The integration of TPACK with Growth Mindset Theory provides a more robust framework for understanding the affective and motivational drivers of technology adoption. The proposed Spiral Model contributes a novel heuristic for conceptualizing teacher transformation as a non-linear, experiential process deeply embedded within local ecosystems of support and constraint.

Practically, the findings yield actionable implications for multiple stakeholders. For school leaders and madrasah principals, the study underscores the need to foster collaborative professional learning communities, provide protected time for digital media development, and recognize innovation as part of teachers' professional workload. For policymakers—particularly within the Ministry of Religious Affairs (*Kementerian Agama*) and district education offices—the implications call for policies that allocate budgets for adequate technological infrastructure in madrasahs and support the design of long-term, experience-based professional development programs rather than one-off training. For teacher educators and professional development facilitators, the findings suggest a shift toward mentoring models that emphasize pedagogical design alongside technical skill, and that leverage teachers' own video creations as reflective artifacts for collective learning.

However, this study is not without limitations. Its qualitative, intrinsic case study design, while offering depth and richness, limits generalizability. The small sample size (six teachers) and confinement to one geographic region (Agam Regency) mean the findings are contextually specific. Furthermore, the study's focus on a single software tool (Videoscribe) and its relatively short timeframe (three months) may not capture longer-term sustainability or the transferability of competencies to other digital platforms.

These limitations naturally point to directions for future research. A longitudinal study tracking the same teachers over 1–2 years could reveal how transformation consolidates or evolves. Quantitative validation of the Three-Level Transformation Spiral model through survey instruments applied to larger, more diverse samples of madrasah teachers would enhance its robustness. Comparative studies between madrasahs and public junior high schools, or between urban and rural settings, could further elucidate the role of institutional and socio-geographical context. Finally, participatory action research involving teachers in the co-design of professional development programs based on this study's findings could bridge the gap between research and practice, ensuring that future interventions are truly by and for the teachers they aim to support.

In closing, this study reaffirms that meaningful digital transformation in education is less about the sophistication of the tool and more about the depth of the teacher's journey—a journey of skill, practice, and ultimately, professional self-renewal. By illuminating this journey within the unique context of the madrasah, we hope to inform efforts to build more supportive, sustainable, and teacher-centered pathways toward digital-age education.

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