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## Teachers' Confidence and Pedagogical Perspectives on Social Media-Based Augmented Reality in Malaysian Early Education

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### Abstract

Augmented Reality (AR) is increasingly discussed as a contemporary approach to enriching teaching and learning practices. However, its integration in early childhood and primary education remains underexplored, particularly from teachers' perspectives. This study investigates teachers' familiarity, confidence, conceptual understanding, and pedagogical perspectives regarding the integration of AR in classroom contexts following structured exposure to AR content creation using social media-based AR platform. A mixed-methods approach was adopted involving kindergarten and primary school teachers purposively selected due to their direct pedagogical roles in foundational education and their relevance to the study's focus on early learner contexts. Pre- and post-test surveys were administered to examine changes in teachers' familiarity, confidence, and knowledge related to AR integration. Paired-sample t-tests and McNemar analyses revealed statistically significant improvements across most perception and knowledge measures. Semi-structured interviews further explored teachers' instructional intentions, perceived pedagogical value, and implementation challenges. Findings indicate increased instructional confidence, improved conceptual understanding, and recognition of AR's potential to enhance learner engagement, visualisation of abstract concepts, and differentiated learner support. Time constraints and technical limitations were identified as key considerations for sustainable integration. The study highlights the potential of social media-based AR as an accessible instructional innovation

and underscores the importance of scaffolded hands-on professional development, peer-supported learning, and curriculum-linked lesson design activities to support sustainable AR integration in early education settings.

**Keywords:** Augmented Reality (AR); Social Media-Based AR; Early childhood; Primary education; Instructional innovation

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## Introduction

In today's educational landscape, teachers face several challenges including keeping learners engaged and focused on class. Young children typically have shorter attention spans and Generation Alpha has grown up immersed in visual media and digital technologies, shaping their learning preferences (Amelia & Cintya, 2023)

Augmented Reality (AR) is increasingly recognised as a promising educational technology that overlays digital information onto the physical environment, offering interactive and immersive experiences in real-world contexts (K. Li et al., 2024; Mansyur, 2020; Mohd Noor et al., 2025). AR is particularly valuable for supporting the visualisation of concepts that may be difficult to convey through verbal explanation alone, thereby enabling clearer and more concrete understanding among young learners (Yuniawatika et al., 2023).

Recent work by Mohd Noor et al. (2025) further demonstrates how AR-based instructional prototypes can improve accessibility for specific learner groups, particularly through stronger visual animation cues that support comprehension among deaf learners. These findings suggest broader pedagogical potential for AR as a differentiated visual support tool, especially for learners who benefit from multimodal scaffolds, vocabulary contextualisation, or reduced dependence on text-heavy explanations.

From a pedagogical perspective, AR is particularly relevant to early childhood and primary education because young learners respond strongly to visual, interactive, and experience-based learning environments, which support early concept formation and sustained attention. This is consistent with recent study in early childhood digital pedagogy, which highlights play-based, project-based, and collaborative pedagogical approaches as central to effective technology integration in foundational settings (H. Li et al., 2024).

In this regard, AR offers a distinct instructional advantage by overlaying manipulable visual elements onto real-world learning materials, allowing abstract or hard-to-visualise concepts to become more concrete and accessible. This is particularly relevant for spatial and visually dependent topics, as recent research in early childhood geometry learning also emphasises the pedagogical value of digital tools for supporting concrete spatial exploration and concept formation (Zhao & Roberts, 2025).

These pedagogical affordances strengthen guided discovery and support developmentally appropriate classroom practices for foundational learners, thereby reinforcing the sustainability of AR as an instructional approach in early education contexts (H. Li et al., 2024).

Building on these pedagogical foundations, recent research demonstrates that AR technologies are being explored widely across diverse learning environments, ranging from subject-specific instruction to collaborative learning scenarios, suggesting sustained scholarly interest in their pedagogical potential (Kazlaris et al., 2025).

Much of existing literature on AR in education focuses on the effects of AR on student engagement, motivation, and learning performance. Systematic reviews show that AR tools have been widely employed to support institutional goals and enhance classroom across subjects (Zekeik et al., 2025). However, most of these studies revolve around purpose-built AR applications or experimental learning settings.

There is comparatively less scholarly attention directed towards understanding how AR is interpreted, adopted, and implemented by teachers themselves. Despite the growing body of work on AR's impact for learners, fewer studies investigate teachers' beliefs, confidence, and challenges when incorporating AR into everyday instructional practice.

Research on teachers' readiness and perspectives is emerging, but remains underrepresented, especially in early childhood and primary school contexts, where pedagogical demands differ from those at higher educational levels. A recent study examining teachers' readiness for innovative AR media in primary schools highlights the need to better understand teachers' perceptions and support needs when adopting AR-based learning tools (Diyaurrahman et al., 2025).

This gap is significant as the successful technology integration depends not only on technical availability but also teachers' confidence, perceived competence, and pedagogical alignment. Professional development initiatives that strengthen teachers' familiarity with AR tools and enhance their instructional confidence therefore represent an important, yet underexplored, area of research.

In addition to traditional AR systems, social media-based AR platforms provide accessible environments for creating AR content without requiring advanced programming skills. These platforms broaden opportunities for teachers to design interactive AR experiences using familiar digital ecosystems. Yet, research on educational potential of social media-based AR tools remains limited compared to conventional AR systems. Reviews of AR research in education reveal that although interactive and collaborative uses of AR are increasingly discussed, the integration of AR accessible through everyday digital platforms is not routinely examined in empirical studies (Kazlaris et al., 2025).

Responding to these gaps, this study examines teachers' familiarity, confidence, conceptual understanding, and pedagogical perspectives regarding the integration of augmented reality (AR) in early educational contexts. Specifically, the study aims to:

1. Examine changes in teachers' familiarity, instructional confidence, and AR-related conceptual knowledge following structured exposure to social media-based AR platform.
2. Explore teachers' pedagogical perspectives and instructional intentions regarding the integration of AR into classroom practice.
3. Identify perceived challenges and practical considerations for sustainable implementation of AR in early childhood and primary education.

By foregrounding teachers' experiences, this study contributes to an emerging body of research on how teachers interpret, adopt, and strategically integrate accessible AR technologies as instructional innovations.

## **Methodology**

### ***Research Design***

This study adopted a mixed-methods research design, as this approach is well suited to educational technology research where both measurable learning outcomes and contextual participant experiences are equally important. Mixed methods enable researchers to integrate quantitative evidence of change with qualitative insights that explain how and why those changes occur, thereby providing a more comprehensive understanding of complex pedagogical phenomena (Creswell & Plano Clark, 2017).

In the context of augmented reality (AR) as an instructional innovation, this design was considered appropriate for capturing both teachers' observable shifts in confidence and their reflective interpretations of classroom applicability.

A pre-test and post-test survey design was employed to assess changes in teachers' understanding, confidence, and perceived competence before and after participation in the AR training workshop. Pre-post measurement is widely recommended in intervention-based educational studies because it allows direct examination of changes attributable to the learning experience across the same participant group (Fraenkel et al., 2022). This approach was particularly relevant for determining whether short-term professional development exposure could influence teachers' readiness to adopt AR-support teaching practices.

To complement the quantitative findings, semi-structured interviews were conducted to obtain richer explanations of how teachers interpreted the workshop experience and envisioned the integration of AR within their own classroom settings. Semi-structured interviews are especially useful when exploring participants' perceptions, reasoning processes, and context-specific pedagogical decisions, as they allow both consistency across key themes and flexibility for emergent insights (Kallio et al., 2016)

The integration of both methods strengthened the study through methodological triangulation, allowing numerical patterns from the pre-post-tests to be interpreted alongside teachers' narratives, concerns, and creative considerations. Such triangulation enhances the credibility and interpretive depth of findings by linking measurable changes with lived experiences that shape technology adoption in educational contexts (Denzin, 2012).

### ***Participants and Sampling***

Participants comprised 97 kindergarten and primary school teachers from educational institutions located within the Klang Valley region of Malaysia. Participating institutions included Falih Junior International Academic, Ana Muslim Preschool, CIC Preschool, Abedeen Islamic International School, KinderHive Preschool, and Naluri Bestari Preschool. These institutions represent a mix of early childhood and primary educational settings, providing a relevant context for examining AR integration within foundational levels of schooling.

Participants ranged in age from 25 to 45 years and were actively engaged in classroom teaching at the time of the study. All teachers voluntarily enrolled in a structured professional development workshop focused on the development of educational AR content using TikTok Effect House.

A purposive sampling strategy was employed, as the workshop specifically targeted teachers interested in exploring digital innovation in teaching and learning. Recruitment was conducted through institutional invitations and professional networks within the Klang Valley.

### ***Intervention: AR Training Workshop***

The intervention took the form of a structured, hands-on workshop centred on the creation of educational AR content using TikTok AR filters developed through Effect House application. The workshop introduced participants to fundamental AR concepts before moving into practical development task. Teachers were guided through 3D assets creation, AR marker design, interaction logic, and principles of clarity and recognisability.

Rather than focusing solely on technical production, the workshop emphasised pedagogical alignment. Participants were encouraged to consider curriculum relevance, developmental appropriateness, and classroom feasibility when designing their AR content. Each teacher developed a prototype AR content intended for use within their respective educational context. The design process therefore combined creative exploration with instructional planning.

### ***Quantitative Data Collection***

Quantitative data were collected through structured pre-test and post-test questionnaires administered immediately before and after the workshop. The instrument comprised categorical and multiple-choice items designed to assess participants' familiarity with AR applications, prior experience in AR creation, confidence in integrating AR into teaching, and perceived competence in developing AR-based learning materials.

The questionnaire also measured teachers' conceptual knowledge of AR, including understanding of AR principles, distinctions between AR and virtual reality, identification of AR marker types, and the role of digital assets in interactive experiences. Several items assessed foundational knowledge related to 3D modelling concepts, AR markers, and basic design principles relevant to AR development.

Response options were presented in categorical formats, such as "very familiar", "somewhat familiar", "not familiar at all"; or knowledge-based multiple-choice answers. The pre-test established baseline levels of knowledge, familiarity, and perceived confidence prior to workshop participation. The post-test captured changes in these areas following the intervention.

### ***Qualitative Data Collection***

A total of 15 participants, drawn from the 97 teachers who completed the survey component, were purposively selected for semi-structured interviews to gain deeper insights into their experiences with AR integration. The interview protocol explored teachers' reflections on using TikTok AR tools, their experiences during the design process and their perceptions of AR as a creative instructional approach.

Participants were also invited to discuss anticipated student engagement, potential implementation challenges, and contextual constraints within their schools. Interviews were audio-recorded with participants' consent and subsequently transcribed verbatim. This allowed for systematic and detailed analysis of teachers' responses.

## ***Data Analysis***

Quantitative data were analysed using Jamovi. Paired-sample t-tests were conducted to examine pre-post difference in ordinal items (Question 1-7 and 10). Knowledge-based items (Questions 11-20) were coded as correct (1) or incorrect (0). McNemar's test was conducted to examine changes in the proportion of correct responses between pre-test and post-test administrations. Researchers commonly use McNemar's test in before-after studies to assess changes in categorical outcomes (such as perceptions or correct responses) after an intervention (Lee et al., 2022).

Qualitative data were analysed using thematic analysis. Transcripts were read repeatedly to ensure familiarity before initial coding was conducted. Codes were generated inductively and later organised into broader themes that reflected recurring patterns related to pedagogical perspectives, creative practices, perceived benefits, and implementation challenges. Integration of quantitative and qualitative findings occurred during interpretation, allowing patterns identified in survey data to be contextualised through teachers' narrative.

## ***Ethical Considerations***

Ethical approval was obtained prior to the commencement of the study. Before participating in the research, all teachers were provided with an information sheet outlining the purpose of the study, research procedures, data usage, and their rights as participants. Those who agreed to participate were required to sign a written informed consent form.

Participation in the study was entirely voluntary and separate from workshop attendance requirements. Teachers were informed that they could withdraw from the research at any stage without penalty and could decline to answer any questions if they felt uncomfortable.

Although participating institutions were identified in this study, individual teachers were not identified in any report or publication. Survey responses and interview transcripts were anonymised through coded identifiers, and no personal data were disclosed during analysis or reporting. All findings are presented in aggregate form to ensure confidentiality.

All data were securely stored on password-protected devices accessible only to the research team. Audio recordings were deleted after transcription and verification. Data will be retained solely for research purposes in accordance with institutional guidelines.

## **Results**

### ***Quantitative Data Analysis***

A total of 97 teachers completed both the pre-test and post-test questionnaires. Matched responses were retained for all analyses. To examine changes following AR training workshop, paired-sample t-tests were conducted for ordinal perception items (Questions 1–7 and 10), while McNemar’s tests were conducted for knowledge-based items (Questions 11–20). The findings are presented in Tables 1 and 2.

### ***Changes in Familiarity, Confidence and Perceptions***

As shown in Table 1, statistically significant improvements were observed across all ordinal items after the workshop ( $p < .01$ ). Teachers reported higher levels of familiarity with AR platforms, greater understanding of AR integration, and increased confidence in incorporating AR into teaching practice.

The most substantial improvements were found in familiarity with AR development process,  $t(96) = -11.55$ ,  $p < .001$ , understanding of AR integration,  $t(96) = -11.01$ ,  $p < .001$ , and experience creating AR applications,  $t(96) = -10.80$ ,  $p < .001$ . These findings indicate a marked shift in teachers perceived technical competence following hands-on exposure to TikTok AR filters and Effect House.

Improvements were also observed in teachers’ likelihood of incorporating AR into future lessons,  $t(96) = -3.70$ ,  $p < .001$ , as well as in their perception of AR’s potential to enhance student engagement,  $t(96) = -5.22$ ,  $p < .001$ . Although baseline familiarity and experience levels were relatively low, post-tests scores demonstrate a consistent upward trend across all perceptual dimensions.

Table 1. Pre–post comparison of teachers’ responses (N = 97)

<b>Ordinal Items (Paired t-test)</b>				
<b>Question</b>	<b>Pre Mean</b>	<b>Post Mean</b>	<b>t-value</b>	<b>p-value</b>
<b>Q1. Used AR before</b>	2.28	2.71	-3.17	.002
<b>Q2. Experience creating AR</b>	1.38	2.70	-10.80	< .001
<b>Q3. Familiarity with AR tools</b>	1.38	2.68	-10.43	< .001
<b>Q4. Familiarity with development process</b>	1.46	2.79	-11.55	< .001
<b>Q5. Understanding AR integration</b>	2.09	3.37	-11.01	< .001
<b>Q6. Confidence integrating AR</b>	2.45	3.36	-7.62	< .001
<b>Q7. Likelihood of incorporating AR in class</b>	3.11	3.53	-3.70	< .001
<b>Q10. Perceived engagement potential</b>	2.84	3.45	-5.22	< .001
<b>Nominal Items (Frequency Distribution)</b>				
<b>Question</b>	<b>Most Common Pre Response</b>	<b>Most Common Post Response</b>	<b>Interpretation</b>	
<b>Q8. Anticipated challenges</b>	Technical difficulties	Time constraints	Shift from technical fear to practical concern	
<b>Q9. Primary motivation</b>	Innovating teaching methods	Enhancing student engagement	Shift towards student-centred motivation	

### ***Changes in Conceptual Knowledge***

In addition to perceptual changes, significant improvements were observed in teachers’ conceptual understanding of AR-related principles and tools. McNemar’s test (Table 2) revealed statistically significant increases in correct responses for eight of the ten knowledge items.

The largest gains were found in knowledge 3D modelling types,  $\chi^2(1, N = 97) = 41.60, p < .001$ , understanding of Effect House as an AR development platform,  $\chi^2 = 39.45, p < .001$ , and identification of relevant design principles such as contrast,  $\chi^2 = 31.74, p < .001$ . Substantial improvements were also observed in distinguishing Augmented Reality from Virtual Reality, understanding AR marker types and recognising the functional role of QR codes in AR systems (all  $p < .001$ ).

Two items, which are questions on definition of AR (Q11) and example of AR in education (Q12), did not show statistically change ( $p > .05$ ). Notably, however, baseline correct response rates for Q11 were already relatively high (72.2%), suggesting a possible ceiling effect.

Table 2. Pre–post comparison of knowledge items (McNemar Test,  $N = 97$ )

Question	% Correct (Pre)	% Correct (Post)	$\chi^2$	p-value
Q11. Definition of AR	72.2%	78.4%	0.66	.417
Q12. Example of AR in education	43.3%	52.6%	1.16	.281
Q13. AR vs VR difference	63.9%	93.8%	21.19	< .001
Q14. Definition of 3D modelling	49.5%	80.4%	15.02	< .001
Q15. Type of 3D modelling	28.2%	84.5%	41.60	< .001
Q16. What is Effect House	41.2%	90.7%	39.45	< .001
Q17. AR marker type	24.7%	70.1%	29.82	< .001
Q18. QR codes in AR	34.0%	72.2%	19.34	< .001
Q19. Importance of marker clarity	45.4%	78.4%	17.16	< .001
Q20. Design principle	16.5%	62.9%	31.74	< .001

### *Qualitative Data Analysis*

Thematic analysis generated a rich set of interconnected themes reflecting teachers’ experiences with AR tools, perceived pedagogical value, challenges, confidence development, and future instructional planning. Codes were derived from inductively from recurring patterns in participants’ responses and organised into high-order themes aligned with five guiding interview questions. The findings reveal both enthusiasm and practical constraints in adopting AR as an instructional innovation.

### *AR Tool Experience and Learning Process*

Table 3 presents themes and codes related to teachers’ experiences of learning to use AR authoring tools during the workshop, focusing on their perceptions of usability, the barriers encountered during early adoption, and the process through which understanding gradually developed. Across the data, participants described varying levels of ease with tools such as TikTok Effect House, Spline, and Canva, alongside initial struggles with technical steps and cognitive demands. However, these early challenges gradually shifted into clearer conceptual understanding through repeated practice, facilitator guidance, and peer-assisted support, highlighting a learning journey from initial difficulty to scaffolded adaptation.

Table 3. AR tool experience and learning process

Theme	Codes	Verbatim Excerpts
<b>Perceived usability and accessibility</b>	TikTok easiest tool; 3D modelling difficulty; ready-made model reliance; Canva familiarity; ease through practice	“Creating 3D models was a bit hard for me.” “However, when it came to the second part, where we could just search for ready-made models, it became easier and more helpful.” “But I think if I practice more, I’ll be able to do it like others.”
<b>Initial Barriers and Cognitive Overload</b>	unfamiliar workflow; repeated manual reference; baby-step learning; time-consuming preparation; new tool unfamiliarity	“It’s actually quite hard in the beginning.” “I kept referring to the manual repeatedly, even at home, to follow the steps.” “It’s also time-consuming, especially since teachers already have a lot on their plate...”
<b>Conceptual Breakthrough and Scaffolded Adaptation</b>	concept clicked; basic concept mastery; peer support; facilitator scaffolding; gradual adaptation	“...it’s actually quite easy if you get the concept.” “...actually I did not know how to do but my friend come to help...” “...after the teaching and guidance from the facilitator, it became easy.” “But I believe once I get used to it, it will be fine, Insyallah.”

### *Perceived Pedagogical Value for Learners*

Table 4 focuses on how teachers perceived the pedagogical value benefits of AR for learner learning experience. Participants consistently emphasised AR’s ability to create enjoyable and interactive classroom experiences, while also supporting deeper conceptual understanding through visualisation and simulation. Beyond general engagement, the data also revealed the inclusive potential of AR in supporting learners with different proficiency levels, including remedial students, struggling readers and language learners. Together, these themes position AR as a motivational and instructional tool that enhances content understanding while broadening access for diverse learners.

Table 4. Perceived pedagogical value for students

Theme	Codes	Verbatim Excerpts
<b>Engagement and Excitement</b>	fun learning; pop-up novelty; beyond textbooks; interactive excitement; teacher enthusiasm	“I think AR is a good tool for kids. It’s very fun, and students love doing fun things in class.” “With these tools, classes become more engaging because it’s not just about books anymore.” “For me, it is able to help teachers to be more enthusiastic in teaching their students...”
<b>Conceptual Understanding and Visualisation</b>	visible processes; AR simulation; more memorable lessons; multi-angle viewing; abstract concept support	“With AR, when I scan the textbook, the 3D duck will appear.” “AR helps them visualise better, and I believe it will make the lesson more memorable for them.” “With AR, they can rotate the 3D object and count the vertices themselves.”
<b>Inclusivity and Learner Support</b>	remedial learner engagement; struggling reader support; vocabulary learning support; learner focus support; lower-level learner inclusion	“AR can help these students engage more, especially since they’re already accustomed to technology.” “...pelajar yang berprofesyen rendah, pelajar yang berprofesyen intermedian, akan dapat fokus dalam kelas...”

### *Teacher Growth, Confidence, and Classroom Application*

Table 5 reflects teachers’ professional development outcomes after the workshop, particularly their growing confidence, readiness to integrate AR into teaching, and intentions for future classroom use. Participants described increased confidence in creating and implementing AR materials, stronger beliefs in its pedagogical effectiveness, and greater readiness to apply AR independently in lesson planning. The data further showed that teachers approached future use strategically, selecting visually suitable topics and envisioning gradual, sustainable adoption as part of more contemporary 21st-century teaching approach.

Table 5. Teacher growth, confidence, and classroom application

Theme	Codes	Verbatim Excerpts
<b>Confidence and Professional Readiness</b>	increased confidence; attention-based confidence; independent implementation; AR self-efficacy; pedagogical renewal	“I feel more confident using AR in teaching after attending this workshop.” “With AR, I find it more effective in capturing students’ attention compared to using textbooks.”
<b>Curriculum Integration Planning</b>	visual-topic suitability; subject-specific integration; topic-dependent planning; exam lesson limitation	“I plan to use AR in certain subjects that are more visual, like Science.” “For subjects like Global Studies, World Maps, or Science, AR is very helpful.” “There are no limitations based on the level, but it really depends on the topic.” “...for senior secondary students, it may not be as useful since their focus is more on writing and answering exam questions.”
<b>Sustainable Future Adoption</b>	trial intention; gradual scaling; self-challenge; 21st-century teaching	“I want to challenge myself and at least try to implement AR-integrated classroom lessons. At least once.” “...this is style pengajaran baru bagi saya... untuk mengajar kelas 21st century.”

## Discussion

### *Confidence and Conceptual Readiness Improved through Scaffolded AR Learning*

The quantitative findings demonstrated statistically significant improvement in teachers’ familiarity with AR tools, understanding of the development process, confidence in integrating AR, and likelihood of future classroom use after the workshop (Table 1). These improvements were further reinforced by significant gains in AR-related conceptual knowledge, particularly in 3D modelling, Effect House functions, AR marker types, and design principles (Table 2).

The qualitative findings help explain how and why these gains occurred. Teachers described an initial phase of cognitive load and unfamiliar workflow, followed by conceptual turning point once they “got the concept”, supported by facilitator scaffolding, repeated practices, and peer assistance. This convergence suggests that confidence growth was not merely attitudinal but emerged through guided conceptual mastery and supported practice.

This pattern supports earlier findings by Diyaurrehman et al. (2025), who emphasised that teacher readiness for AR adoption is closely linked to training support and pedagogical guidance. It also aligns with systematic review evidence that perceived ease of use and structured onboarding strongly shape AR adoption in education (Kazlaris et al., 2025; Zekeik et al., 2025).

### *Pedagogical Value of AR Was Reflected in Learner Engagement, Conceptual Understanding, and Inclusive Support*

Quantitatively, teachers showed a significant increase in their perception of AR’s learner engagement potential (Q10), with post-test scores rising significantly after the intervention. This shift is strongly corroborated by the qualitative themes under Perceived Pedagogical Value for Learners, where

participants consistently described AR as fun, visually engaging, and useful for making abstract concepts easier to understand.

The qualitative data add important nuance by showing that AR was not only viewed as motivating, but also as a tool for visualisation, simulation, and inclusive support, particularly for remedial learners, struggling readers, and vocabulary learning. This extends earlier work by K. Li et al. (2024) and Yuniawatika et al. (2023), which reported AR's role in enhancing concept visualisation and learner engagement, while further supporting Mohd Noor et al. (2025) on the accessibility benefits of visual AR learning for specific learner groups. Mohd Noor et al. (2025) research on AR-based instructional prototype for deaf learners improved accessibility through stronger visual animation cues.

The findings also resonate with Amelia and Cintya (2023) study, who highlighted how younger learners increasingly respond to visually rich digital environments. This suggests that AR may function not only as an engagement tool, but as an inclusive pedagogical aid aligned with contemporary learner preferences and differentiated classroom needs.

### ***Practical Constraints Shifted from Technical Anxiety to Instructional Workload***

An important insight emerges from the quantitative nominal findings. Before the workshop, the most common anticipated challenge was technical difficulties, whereas after the workshop this shifted to time constraints (Table 1).

The qualitative findings directly explain this shift. Once teachers became more confident with the tools, their concerns moved beyond technical fear toward the practical workload of lesson preparation and the time-consuming nature of creating classroom-ready AR materials.

This is a strong triangulated finding because the quantitative change captures the what, while the interviews explain the why. This corroborates Zekeik et al. (2025), who noted that preparation demands and classroom feasibility remain major barriers to sustainable AR integration despite positive pedagogical attitudes. Similarly, Kazlaris et al. (2025) argued that long-term AR adoption depends on how well the technology aligns with authentic teacher workflow conditions.

### ***Future Classroom Adoption Reflected Strategic Pedagogical Planning***

The significant increase in teachers' likelihood of future AR use (Q7) suggests stronger post-workshop readiness for classroom application. However, the qualitative themes Curriculum Integration Planning and Sustainable Future Adoption show that this intention was not indiscriminate. Teachers identified

visually suitable subjects, topic-dependent implementation, and even exam-oriented limitations, demonstrating selective pedagogical reasoning.

This supports Mansyur (2020) who argued that AR integration is most effective when aligned with contextual teaching needs and subject suitability. The intention to gradually apply AR part of a “21st-century teaching” approach further suggests that teachers were not merely motivated by novelty but were developing a more strategic and sustainable mindset toward digital instructional innovation.

## **Conclusion**

This study demonstrates that structured exposure to social media-based AR content creation can significantly strengthen teachers’ familiarity, confidence, conceptual understanding, and pedagogical readiness for classroom integration in early childhood and primary education. The quantitative findings confirmed significant improvements across key perception and knowledge measures, while the qualitative findings provided deeper insights into how teachers progressed from initial unfamiliarity and technical hesitation toward clearer instructional reasoning, stronger confidence, and more strategic intentions for classroom use.

Importantly, the findings highlight that teachers perceived AR not only as an engaging instructional medium, but also as a pedagogically valuable tool for visualisation, conceptual clarification, and inclusive learner support, particularly for visually dependent and spatially demanding topics. At the same time, sustainable adoption remains influenced by practical concerns, especially preparation time, technical limitations, and curriculum fit.

Taken together, the study contributes to the growing body of study on teacher-centred AR integration by showing that accessible platforms such as TikTok Effect House can serve as practical entry points for pedagogical innovation, especially when professional development combines technical scaffolding with curriculum-linked design tasks. This strengthens the value of social media-based AR as a feasible instructional innovation in foundational education settings.

From a practical standpoint, the study recommends that future teacher professional development programmes place greater emphasis on scaffolded hands-on workshops, peer-supported learning, and lesson-planning activities linked to specific curriculum topics. Institutions should also consider providing adequate technical infrastructure, shared asset repositories, and time-efficient design templates to reduce preparation burden and support sustainable classroom implementation. For future research, longer-term classroom-based studies are recommended to examine how teachers’ post-workshop intentions translate into actual instructional practice and learner outcomes over time.

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