



## Augmented Reality in History Education: A Systematic Review and Blueprint for Islamic Civilization Learning

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| ARTICLE INFO                                                                                                                                                                                                                                                                             | ABSTRACT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| <p><b>Article History:</b><br/>Received: 25-Jun-2026<br/>Revised: 07-Aug-2026<br/>Accepted: 11-Sep-2026<br/>Available online: 30-Sep-2026</p> <p><b>Keywords:</b><br/>Augmented Reality; History of Islamic Civilization; Instructional Design; Cognitive Load; Learning Motivation.</p> | <p>Augmented Reality (AR) integration offers transformative potential in history education; however, practical implementation often prioritizes visual appeal over a solid pedagogical foundation. This study aims to synthesize instructional design trends and cognitive load mitigation strategies found in AR-based history education literature to formulate a media development blueprint specifically addressing the significant gap regarding religious-humanities narratives, such as the History of Islamic Civilization. Employing a Systematic Literature Review (SLR) method guided by the PRISMA 2020 protocol, this review analyzes 21 final empirical articles from the Scopus and ERIC databases published between 2022 and 2026. The synthesis reveals that AR's spatial interactivity significantly boosts students' intrinsic motivation and autonomy by satisfying basic psychological needs. Unfortunately, most current studies overlook the integration of scaffolding, thereby risking learner disorientation and cognitive overload. Furthermore, motivational evaluations are often skewed by the "novelty effect," while hardware limitations create accessibility issues. Consequently, future research on historical media development requires a holistic approach: adopting the ADDIE (Analyze, Design, Development, Implement, Evaluation) instructional model, optimizing visuals via the "Low-Poly" approach, and refining evaluation instruments through "Negative Anchoring Removal" to ensure precise and meaningful validation of affective outcomes. These findings provide a comprehensive overview of AR implementation in history education and offer a theoretical and instructional blueprint for developing AR-based learning environments for the History of Islamic Civilization environments capable of visualizing abstract historical narratives in a manner that is immersive, meaningful, and motivating for learners.</p> |

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## INTRODUCTION

Digital transformation in sector education has trigger shift paradigm from method learning passive going to ecosystem immersive pedagogical (Garg et al., 2025; Poupard et al., 2025a). In context education history and heritage culture, shift this become very crucial remember characteristics material that is often full of will abstract narrative of the past tall (Dordio et al., 2024; Innocente et al., 2023). During decade lastly, delivery material history dominated by two static texts dimensions often fail stimulate students' visual imagination, so that culminates in low involvement cognitive and motivational study in the room class (Hermansyah et al., 2025; Nordin et al., 2025).

As response to challenge instructional said, technology *Augmented Reality* (AR) is recognized globally as catalyst transformative that offers affordability spatial revolutionary (Garg et al., 2025; Krüger et al., 2019). Immersive features from technology reality added this own capacity unique for reconstruct past objects, artifacts culture, as well as landscape abstract historical become three visual entities real dimensions within room physique users (Dordio et al., 2024; Innocente et al., 2023). Manipulation object in a way instantly facilitate exploration active, changing position participant educate from observer passive become actor main one that navigates narrative history in a way direct (Dunleavy & Dede, 2014; Srdanović et al., 2025a).

Although offer promising visual sophistication, implementation AR technology in the world of education often trapped in A paradox technology (Mirza et al., 2025c; Sosa et al., 2021). Potential big affordability spatial AR often no balanced by the framework Work structured pedagogical (Pallavicini & Anesa, 2026). Neglect to utilization of design models systematic instructional, such as framework ADDIE (*Analyze, Design, Development, Implement, and Evaluation*) work, causing AR to simply functioning as tool props shallow vulnerable trigger mental fatigue or burden cognitive excessive (Buchner et al., 2022a; Ding & Toran, 2025). Absence foundation pedagogical this in a way slowly degrade mark educative technology and make it difficult alignment content with objective achievements learning (Mirza et al., 2025a; Nijhawan et al., 2025).

Absence design mature pedagogical this in a way direct trigger risk Serious in the form of excess burden cognitive *overload* (Buchner et al., 2022a; Gonnermann-Müller & Krüger, 2025a). Remembering AR interface brings very complex interactions, allowing student lay explore in a way random without scaffolding instructional *scaffolding* will distort processing information historical (Yoon et al., 2018; Zhu et al., 2026). Therefore that, integration design friendly instructional beginner is prerequisite absolute (Grecu et al., 2025).

Success mitigation burden cognitive in AR environments are highly dependent on the capabilities design instructional for trigger involvement psychologically described in *Self-Determination Theory* (SDT) (Cheng, 2017; Ryan & Deci, 2017). By theoretical, affordability spatial AR is capable of facilitate freedom exploration satisfying need autonomy student (Moyaki et al., 2026; Riding et al., 2025). More further, structured visual presentation help student navigate narrative complex history so that foster a sense of competence self (Maemunah et al., 2025; Yoon & Wang, 2014). Fulfillment

need base this, plus with interaction to inheritance past cultures that facilitate a sense of relatedness, acting as determinant crucial for stimulate motivation intrinsic in a way sustainable (Elford et al., 2022; Gilroy et al., 2026a).

Although urgency integration pedagogical in AR technology has recognized in a way theoretical, review literature academic moment this show gap very sharp empirical (Mirza et al., 2025a). The majority studies previously Still stuck in evaluation effect novelty technology term short and very vulnerable against measurement bias motivation consequence instrument evaluation that is not purified from assumptions beginning student (Poupard et al., 2025a; Prasetya et al., 2024). Besides that, global studies often ignore limitation capability device gadgets in the field that lead to failure operational consequence absence visual optimization (Mondal & Mondal, 2025; Shen et al., 2026).

Although urgency related integration pedagogical in AR technology has recognized, literature academic moment this show gap segmented empirical (Dogru et al., 2025). The least studies comprehensive special blend framework Work instructional ADDIE structured with theory motivational SDT to in A scheme design intact. Focus research previously Still stuck in analysis technical term short (Buchner et al., 2021). They ignore deepening critical about scaffolding burden cognitive for population student beginners. Besides that, global studies often escape explore adjustment AR design for subject of a nature humanities historical and religious in a way inclusive (McMonigle et al., 2024).

In landscape education history, a subject that is loaded inheritance religious such as the History of Islamic Civilization (SPI) presents challenge distant pedagogical more complex compared to narrative history general (Jennah et al., 2025; Paucar et al., 2025). SPI material is full of will need reconstruction landscape ancient architecture like the glory of Andalusia or the Abbasid era as well as artifacts historically which geographically very far and not can accessible in a way physical by the majority participant educate (Abd Elnaby & Soliman, 2025; Elamin, 2026). More far, learning history religious demand no only mastery cognitive, but also internalization spiritual values and bonds emotional (connectedness). (Fahma et al., 2025; Richards et al., 2023)Conventional media two dimensions proven fail bridge distance spatial and psychological the (Fitriani et al., 2024; Y. Xu, 2025). Therefore that, affordability spatial Augmented Reality (AR) becomes instrument very urgent essentials for demolish limitation geographical and reconstruct narrative Islamic civilization to in room class in a way immersive (Abd Elnaby & Soliman, 2025; Vashisht & Sharma, 2024).

More far again, synthesis literature reveal a emptiness absolute about framework design AR instructional that is specific adapted for discipline humanities worth religious, especially the History of Islamic Civilization or Islamic Religious Education. Responding gap massive literature said, review systematic this aim for synthesizing pedagogical and tactical strategies mitigation burden cognitive in literature education history use formulate A print blue (*blueprint*) design instructional that can made into runway theoretical and practical in development of Islamic Civilization History based learning media *Augmented Reality*, in particular for materials historical nature abstract, complex, and difficult accessible in a way directly by participants educate.

With thus, the review systematic this no only aim for synthesize findings empirical about use *Augmented Reality* in education history in a way general, but also for build runway conceptual and pedagogical that can used in development of Islamic Civilization History based learning media technology immersive in the future. In order to explore literature in a way transparent, comprehensive, and avoidable from selection bias, study this executed in a way strict based on PRISMA 2020 guidelines for answer three question study main:

- **RQ1:** How trend latest in design instructional and characteristics technology AR spatial implementation in education history and heritage culture?
- **RQ2:** How impact integration technology spatial the to mitigation burden cognitive and fulfillment need base psychologically stimulating motivation intrinsic learners?
- **RQ3:** What just constraint pedagogical and technical (limitations devices) that are at risk trigger excess burden cognitive in users early AR in literature moment this?

## LITERATURE REVIEW

### The Transformation of Augmented Reality in History Education

Digital transformation in the sector education has trigger shift from method learning passive going to ecosystem pedagogical in nature immersive (Garg et al., 2025; Poupard et al., 2025b). In education history, shift this become very crucial because material history often contains abstract narrative of the past tall (Dordio et al., 2024). Delivery material history use static text two dimensions often fail stimulate students' visual imagination, which results in low motivation Study (Bunari et al., 2025; Nordin et al., 2025). As the solution, technology *Augmented Reality* (AR) is recognized own capacity unique for reconstruct past objects, artifacts culture and landscape abstract historical become visual three real dimensions in space physique users (Srdanović et al., 2025a). Manipulation object spatial this facilitate exploration active, changing participant educate from observer passive become actor main navigation in a way direct (Chiang et al., 2023; Srdanović et al., 2025a).

### Instructional Design and Cognitive Load Mitigation

Although offer visual sophistication, implementation *Augmented Reality* (AR) is often trapped paradox because no balanced framework work pedagogical structured like the ADDIE model (Mirza et al., 2025b). Abandonment design instructional reduce AR to tool props shallow trigger risk excess burden cognitive (*cognitive overload*) in drastic (Buchner et al., 2022b). Remember AR interface brings interaction complex, let student lay explore without scaffolding instructional *scaffolding* will distort assimilation information historical (Gonnermann-Müller & Krüger, 2025). Therefore that, integration design systematic absolute needed for technology immersive no cause disorientation and mental fatigue (Bautista et al., 2025).

### Self-Determination Theory (SDT) in Environment Immersive

Success mitigate burden cognitive excessive in environment *Augmented Reality* (AR) is highly dependent on capacity design instructional trigger involvement psychological in a way comprehensive, as described in *Self-Determination Theory* (SDT) (Ryan & Deci, 2017). Affordance spatial AR proven facilitate freedom exploration, which has an impact directly to fulfillment need autonomy participant educate (Riding et al., 2025). Structured visual presentation participate help student navigate narrative complicated history, so that significant foster a sense of competence self (Zheng, 2025). Fulfillment autonomy and competence this, when combined interaction inheritance culture that facilitates relatedness affective (*relatedness*), acting as determinant crucial for stimulate motivation intrinsic in a way sustainable (Echavarria et al., 2022; Gilroy et al., 2026).

### **Characteristics and Needs of Media in the History of Islamic Civilization**

In realm education history, subject loaded religious such as the History of Islamic Civilization (SPI) presents challenge distant pedagogical more complex. SPI material really needs reconstruction landscape ancient architecture as well as artifacts historically which geographical distance far and impossible accessible in a way physical by the majority participant educate (Dordio et al., 2024). Besides that, education history religious no just demand mastery cognitive, but also internalization spiritual values as well as formation bond strong emotions (Echavarria et al., 2022; Q. Li et al., 2025). Considering conventional media two dimensions proven fail bridge distance spatial and psychological this, utilization *Augmented Reality* (AR) now become instrument essential. AR technology is proven in a way empirical capable demolish limitation geographical and reconstruct narrative civilization in a way immersive, transforming abstraction values religious become experience inspiring facts inside room class (Papakostas, 2025; Srdanović et al., 2025b).

## **METHOD**

Study this adopt approach *Guided Systematic Literature Review* (SLR). stick to standards *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) 2020. Uses PRISMA protocol positioned for ensure transparency reporting and minimizing selection bias (Page et al., 2021). Search literature executed in a way comprehensive in May 2026 through the academic databases Scopus and *Education Resources Information Center* (ERIC). executed using *Boolean* operators specific designed for netting studies empirical related: (*"augmented reality" OR "mobile AR"*) AND (*"history education" OR "cultural heritage" OR "historical narratives"*) AND (*"instructional design" OR "pedagogical" OR "ADDIE" OR "motivation" OR "cognitive load"*).

Selection literature controlled in a way precision through eligibility parameters. Included articles must is studies empirical from journal academic, language English, published in five years last (2022–2026), and focused on implementation *Integrated Augmented Reality* (AR) design pedagogical use evaluate motivation or mitigation burden cognitive in education history. On the other hand, the study excluded if in the form of article review, proceedings conference, or using pure AR for STEM (Science, Technology, Engineering, Mathematics) domains simulation medical and navigation

tourist the same commercial very no own framework instructional education in a way intact and direct excluded from review this.

Phase identification beginning produced 122 documents, consisting of on 113 Scopus documents and 9 ERIC documents. At stage filtering database automation, 71 documents excluded because no fulfil criteria language, limitations year publication, or type documents, so that leaving 51 articles. Stage filtering furthermore executed manually with evaluate title and abstract, where 20 documents excluded because studying AR outside realm education Humanities. A total of 31 documents remaining then evaluated comprehensive through reading text full. At the stage end this, 10 articles return excluded because no to describe framework design instructional in a way explicit. As a result, 21 final articles were declared fulfil condition inclusion. Screening and selection process article this in a way systematic served in the PRISMA flow diagram in Figure 1.

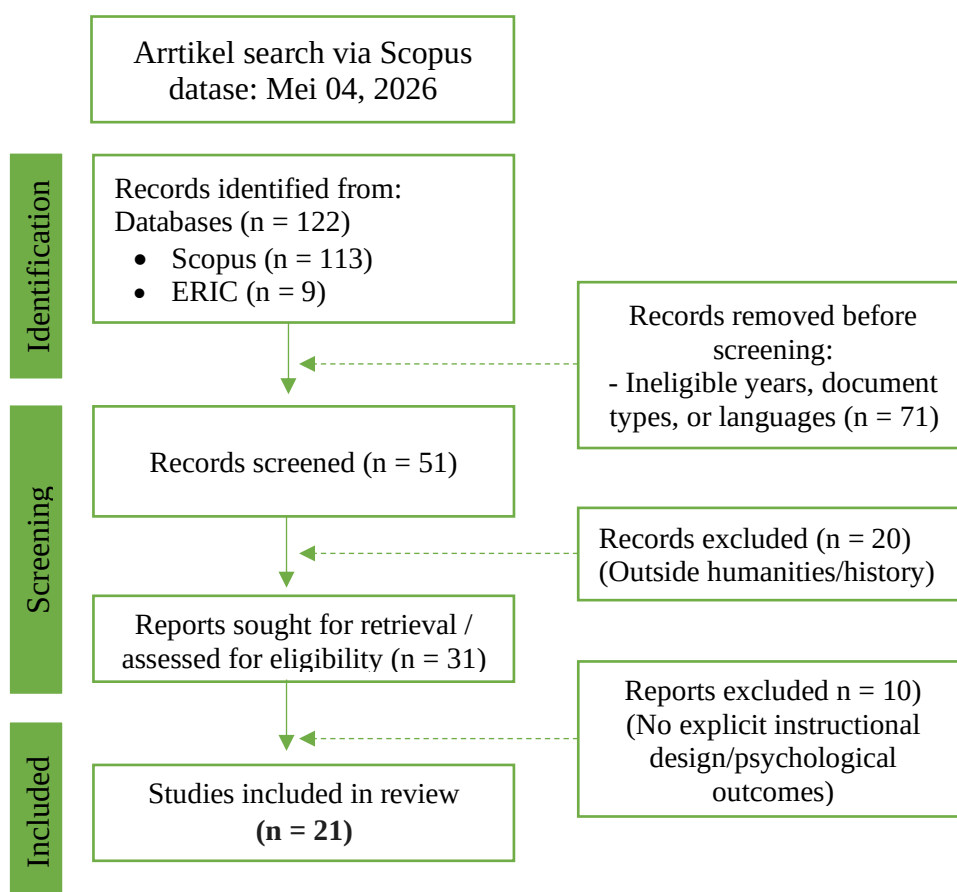


Figure 1. PRISMA 2000 *Flowchart*

Qualitative data extraction and synthesis thematic of the 21 final articles in a way strict guided by three question primary research (RQ). RQ1 examines trend latest in design instructional and characteristics AR technology implemented in education history as well as inheritance culture. RQ2 analyzes How integration technology spatial the impact on motivation intrinsic and engagement cognitive student moment learn draft abstract historical. While that, RQ3 in general critical evaluate various challenge pedagogical, problems burden cognitive beginners, as well as limitation

methodological in measure effectiveness AR intervention in literature education existing history moment this.

## FINDINGS

In the section results serve synthesis comprehensive of the 21 final articles that have been pass criteria inclusion strict. In order to facilitate holistic understanding, reporting findings reconstructed through two layer analysis main. Layer First is analysis level macro use keyword co-occurrence mapping for reveal trend thematic literature visually, as presented in figure 2. Layers second is analysis level micro through qualitative data extraction deep dissection specification technology spatial, architecture design instructional, as well as external motivational participant educate. Details extraction from all over literature the mapped in a way systematically in table 1. Approach analytic double this functioned as foundation solid empirical before answer third question study in a way specific.

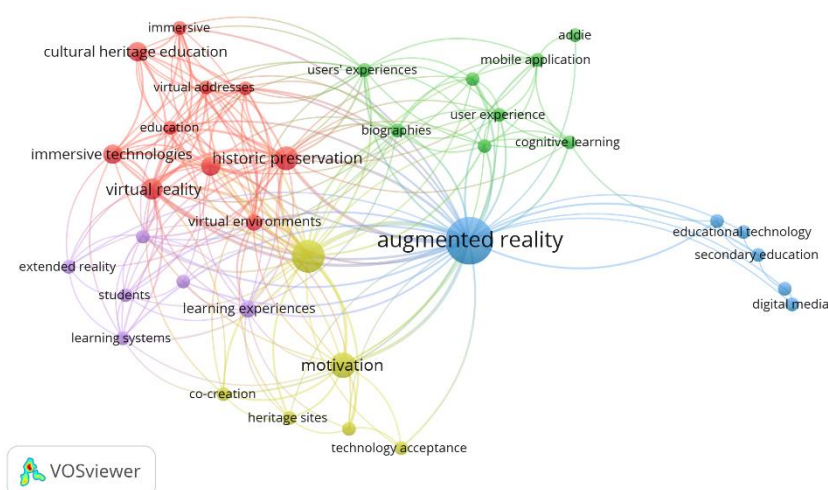


Figure 2. Keyword co-occurrence Literature

Visualization keyword co-occurrence mapping use VOSviewer (figure 2) confirms landscape thematic from reviewed literature. Analysis network this share focus research to in five clusters color. Cluster blue and red confirm centrality *augmented reality* as bridge connector main between *educational technology* with *historic preservation* as well as *cultural heritage education*. Dominance cluster red indicates that implementation technology immersive moment it is very focused on efforts visual reconstruction of virtual environments for preservation history. This map visually validate trend that AR has become instrument essential in transform room physique become an educational medium interactive history for participant educate.

More continue, cluster green and yellow give outlook crucial related dimensions psychological and pedagogical. Cluster yellow centered on the motivation that has bond strong with reception technology and co-creation, proving that adoption the device relies heavily on stimulation interactive. Interestingly, in the cluster green,

keywords ADDIE and learning cognitive appear close together with development application mobile. Position peripherals from ADDIE node in network this in a way empirical validate findings review: although evaluation burden cognitive start attention, adoption framework design instructional structured still very marginal. Position peripherals this is what confirms existence gap research massive for development of historical media to the necessary front dissected more deep.

In order to follow up gap research said, phase data synthesis in review systematic this focused on extraction deep against the 21 final articles that met the criteria criteria inclusion. Overall literature mapped in a way structured use reveal slices between characteristics technology spatial, framework design instructional, as well as the impact to external psychological participant didik. Extraction process operationalized with dissect element essential manuscript, including specification device hard, scaffolding strategy pedagogical, up to effectiveness motivational post-intervention. Comprehensive data matrix this functioning as instrument analytic main for serve description holistic regarding research status reality added moment this. Details profile literature and variables extraction served in a way detailed in table 1.

Table 1. Data Extraction (*Extraction Matrix*)

| Author & Year             | Context / Heritage Culture           | AR Specs & Affordability Spatial |             | Instructional Design & Scaffolding                                                                   | External Motivation & Cognitive                                                               |                  |
|---------------------------|--------------------------------------|----------------------------------|-------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------|
| (Zhou et al., 2025)       | Ruins Shimao China.                  | Mobile annotation objects.       | AR/VR, 3D   | Cognitive Load Theory (CLT), a 3-level annotation model progressive (basic, intermediate, advanced). | Retention memory length (72.3%), cognitive not relevant ( <i>extraneous load</i> ) decreases. | term up load not |
| (Ruiz-Muñoz et al., 2024) | Expression linguistics multilingual. | Mobile AR, Marker-based (RA+).   | Flashcards  | Universal Design for Learning (UDL) for education inclusive and multi-dimensional evaluation.        | Support learning active, inclusive, and perceptive positive psycho-pedagogical.               |                  |
| (Dahdal & Sayed, 2024)    | Oral history Palestine pre-1948.     | Volumetric AR, tracking.         | Video Image | Immersive storytelling, a mini-narrative production that                                             | Stimulating presence emotional <i>presence</i> and involvement generation young.              |                  |

|                                 |                                                  |                                                            |                  |                                                                                                            |                                                                                                                                  |
|---------------------------------|--------------------------------------------------|------------------------------------------------------------|------------------|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
|                                 |                                                  |                                                            |                  | involves young people in a direct.                                                                         |                                                                                                                                  |
| <b>(Nuanmeesri, 2024)</b>       | Essay flower traditional Thai.                   | <i>Mobile Marker/QR 3D models.</i>                         | <i>AR, Code,</i> | ARCS model ( <i>Attention, Relevance, Confidence, Satisfaction</i> ) .                                     | Motivation Study very high independence, stimulation of curiosity know, and improve satisfaction.                                |
| <b>(Chiang et al., 2023)</b>    | Daxi Ancient Street & Han Architecture (Taiwan). | <i>Mobile AR, Object &amp; Image Tracking.</i>             |                  | Comparative design ( <i>On-site vs Off-site</i> ), book gradual digital text.                              | Effectiveness, satisfaction, and motivation Study increase sharp (especially in groups) <i>on-site</i> .                         |
| <b>(Huang et al., 2025)</b>     | Artifact Sanxingdui Bronze.                      | <i>Extended Reality (XR), Visualization AR/VR hybrid.</i>  |                  | <i>Game-based learning, storytelling interactive (Storytelling )</i> .                                     | Involvement deep, improvement experience users, and interests strong situational.                                                |
| <b>(Lai &amp; Zhang, 2025)</b>  | Craft hand inheritance culture intangible.       | <i>Mobile AR, Games interactive AR.</i>                    |                  | Integration of <i>Technology Acceptance Model (TAM) &amp; Cognitive Load Theory (CLT)</i> .                | Power visual pull pressing burden cognitive, intention adoption / learning users increase rapidly.                               |
| <b>(Sam'ani et al., 2026)</b>   | Kuta Kaladan Fortress & Dayak History.           | <i>Mobile AR (Vuforia), Marker-based 3D.</i>               |                  | <i>Design-Based Research (DBR), Principles of Information Design (limitations text, visual hierarchy).</i> | Understanding material increased by 43.7%, motivation increased by 38.7%, and scores <i>Usability (SUS)</i> is very good (81.4). |
| <b>(Mohapatra et al., 2025)</b> | Story folk and                                   | <i>AR integration Generative AI &amp; Computer Vision.</i> |                  | <i>Dynamic Difficulty Adjustment</i>                                                                       | Retention knowledge culture increased,                                                                                           |

|                                |                                                       |                                                   |          |                                                                                                     |                                                                                                          |
|--------------------------------|-------------------------------------------------------|---------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
|                                | traditional motifs.                                   |                                                   |          | (DDA),<br><i>Reinforcement Learning</i> for narrative adaptive.                                     | bond emotional about tradition local strengthen.                                                         |
| <b>(Pazarli et al., 2022)</b>  | Historical map <i>Charta of Greece</i> (Cartography). | <i>Mobile Games (Virtual/Augmented)</i> .         | AR, 3D   | <i>Digital Storytelling</i> based history cartography ancient.                                      | Fertilize interaction active and attitude positive students to inheritance mapping history.              |
| <b>(Sijabat et al., 2025)</b>  | Traditional ULOS cloth (Batak culture).               | <i>Mobile (Vuforia), Interactive 3D.</i>          | AR       | <i>Project-Based Learning</i> (PjBL) uses the ADDIE instructional model.                            | Appreciation culture, attitude positive, and skills creative prospective teachers increase significant.  |
| <b>(Vargas et al., 2025)</b>   | Santa Clara Museum (Heritage) Culture & Nature).      | <i>Mobile Location-based Image tracking.</i>      | AR, &    | <i>Design-Based Research</i> (DBR), adaptation information for visitors no excess burden cognitive. | Co-creation motivation content high, tired cognitive down, acceptance positive (ARAM) technology.        |
| <b>(Yanar et al., 2026)</b>    | Toy historical at the Ankara Toy Museum.              | <i>Mobile AR, Visual &amp; Audio AR.</i>          | Visual   | <i>Participatory Design, CIPP Model</i> evaluation, curriculum based <i>storytelling</i> .          | Involvement active, experience deep participatory, and thinking creative.                                |
| <b>(Pattaufi et al., 2025)</b> | Wisdom Local 4 Ethnicities in South Sulawesi.         | <i>Mobile AR, 3D Visualization Virtual Tours.</i> | AR, 3D & | Quasi-Experimental Design with integration material direct to culture local.                        | Awareness and literacy culture rose drastically ( $p < 0.001$ ), triggering environment Study inclusive. |

|                                            |                                                     |                                                      |         |                                                                                                              |                                                                                                                  |
|--------------------------------------------|-----------------------------------------------------|------------------------------------------------------|---------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>(Q. Li et al., 2025)</b>                | Shenyang Museum Palace Artifacts.                   | <i>Mobile Narrative application.</i>                 | AR      | <i>Scaffolding</i> information logical (progressive linear narrative) vs Non-narrative.                      | Excitement emotional and motivational intrinsic increase, <i>extraneous cognitive load</i> decrease significant. |
| <b>(X.-Z. Li et al., 2022)</b>             | Lantern Festival (Heritage) Taiwan Intangibles).    | -based Exhibition.                                   | Lantern | Integration of <i>Generic Learning Outcomes</i> (GLO) with <i>Technology Acceptance Model</i> (TAM).         | Inspiration, creativity (EIC), and understanding trigger satisfaction high AR learning and adoption.             |
| <b>(Souropetsis &amp; Kyza, 2025)</b>      | Mosaic 6th century Church Byzantine Panagia.        | <i>Mobile</i> (CompARe), <i>Digital Hotspots.</i>    | AR      | <i>Inquiry-based learning</i> , Gamification, <i>Role-play</i> collaborative (playing a role) as historian). | Motivation intrinsic (competence, effort, interest) activated, acquisition experience authentic.                 |
| <b>(Wahid &amp; Ain, 2025)</b>             | Oral Literature Malay (The Story of Awang Batil).   | <i>Mobile</i> (Assemblrworld), <i>QR Markers.</i>    | AR      | ADDIE model, rubric testing utility use <i>Triple-E Framework.</i>                                           | 90.9% of students more focus, transformation from learners passive become learners social active.                |
| <b>(Evagelou et al., 2025)</b>             | Settlement Neolithic Dispilio.                      | <i>XR (AR, MR), Location-based AR</i> (GPS).         |         | ADDIE model, learning experiential based location, <i>role-play</i> interactive.                             | Feeling happy high (r=0.688), value cognitive meaningful, and intentional use strong repeat.                     |
| <b>(Ferreira-Santos &amp; Pombo, 2025)</b> | Architecture and landscape city <i>Art Nouveau.</i> | <i>Mobile AR Game</i> (MARG), <i>Location-based.</i> |         | <i>Progression flow</i> (complexity cognitive thematic                                                       | Involvement emotional/cognitive cross discipline and activation                                                  |

|                      |                                         |                                           |         |                                                                                                   |                                                                                                                                           |
|----------------------|-----------------------------------------|-------------------------------------------|---------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
|                      |                                         |                                           |         | gradual),<br>narrative<br>history<br>local.                                                       | capability<br><i>sustainability</i> .                                                                                                     |
| (N. Xu et al., 2024) | Artifact<br>Statue<br>Bronze<br>Museum. | Tangible<br>(CubeMuseum<br>Postcard), 3D. | AR<br>& | User-<br>Centered<br>Design,<br>Gamified<br>Tangible AR,<br>features<br>Timeline<br>Hall history. | Learning<br>performance<br>increase,<br>manipulation<br>physique object<br>( <i>tangible</i> )<br>triggers<br>motivation/<br>desire know. |

From data extraction of 21 literatures empirically focused on application technology *Augmented Reality* (AR) in context education history, preservation inheritance culture, and humanities. Based on demographics location research, literature this spread globally in various countries, including China, Indonesia, Spain, Greece, and Malaysia (Amorós-Poveda et al., 2026; Chiang et al., 2023; Sam 'ani et al., 2026). Subject participants in the literature is very varied, covering student level school elementary school middle school, students education high, up to public general history museum visitors (Pattaufi et al., 2025; Souropetsis & Kyza, 2025; Zhou et al., 2025). In a way overall, distribution this show height global interest in utilization of immersive digital media for preservation culture.

For give description comprehensive, all characteristics and metrics main from literature the has summarized to in A matrix. Qualitative data extraction of 21 pieces of literature that meet it criteria inclusion presented in Table 1, which maps characteristics technology, design pedagogical, and output motivational. Table the summarize element specific like the type of AR used, object visualized culture, framework applied instructional, as well as achievements learning in a way objective. Through extraction this, pattern utilization of AR in educate generation young about inheritance local and historical architecture can mapped in a way structured use answer question research that has been formulated previously in review this (Wahid & Ain, 2025).

Related trend technology, the majority from 21 studies implement *Mobile Augmented Reality* with specification diverse spatial. There are around four twelve studies that use technology based marker - *based* and tracking image, while seven studies other more choose tracking based location (*location-based*) using the device's GPS sensor (Amorós-Poveda et al., 2026; Chiang et al., 2023; Vargas et al., 2025). Object reconstructed visualizations vary widely, including architecture ruins ancient, artifact bronze museum, up to inheritance culture intangible like ULOS cloth and bouquets flower traditional (Huang et al., 2025; Nuanmeesri, 2024; Sijabat et al., 2025). Representation format dominated by the presentation of the three- model dimensions interactive.

In aspect design pedagogical, extraction process find that integration framework formal instruction still not yet implemented in a way evenly distributed. There are eleven studies that are explicit mention use framework Work structured, such as the ADDIE development model, *Project-Based Learning* (PjBL), *Universal Design for Learning*, and instructional design learning based invention (Sam 'ani et al., 2026; Sijabat et al., 2025; Wahid & Ain, 2025). On the other hand, ten studies the rest no use runway framework clear instructions, and tends to only focus on testing instrument technology pure. Approach scaffolding *also* varies, starting from from giving text information gradual, narrative digital storytelling, to adjustment level difficulty dynamic (Q. Li et al., 2025).

Extraction results matrix in a way objective show that intervention *Augmented Reality* bring impact significant positive in the domain affective and cognitive users. A total of 19 of the 21 studies report occurrence surge level participation active, interested learning and motivation intrinsic post-intervention compared to with method conventional (Pattaufi et al., 2025; N. Xu et al., 2024). User report that Power visual attraction of objects three dimensions success stimulate desire know and build bond more emotional strong to narrative inheritance culture local approach immersive digital storytelling this proven capable transform experience participants from just observer passive become explorer interactive history (Dahdal & Sayed, 2024).

More further, literature documenting achievement metric measurable cognitive blessing structured visual interface. Some studies take notes that design good information proven effective lower burden cognitive no relevant (*extraneous cognitive load*) at the moment users processing material complicated history (Lai & Zhang, 2025; Zhou et al., 2025). As example specific, AR intervention on one studies success increase retention memory and comprehension historical student by 43.7%, accompanied by score utility system (SUS) at the incoming number 81.4 very good category (Sam 'ani et al., 2026). Improvement autonomy, competence, and acquisition experience authentic participate reported as results direct from activity based role (Souropetsis & Kyza, 2025).

Although serve Lots benefit educational, data extraction also reveal a number of constraint technical frequent field experienced during AR implementation. Obstacles main reported covers issue compatibility device varying cellular, where some application felt heavy and slow respond because size size asset memory three dimensions (Amorós-Poveda et al., 2026; Souropetsis & Kyza, 2025). Another study identified problem failure camera sensor tracking (*tracking failure*) when used in conditions environment with too much lighting dim or too bright. Obstacles connectivity internet network in the museum area is also often hinder the loading process multimedia content, so that lower quality experience interactive users in a way overall.

In terms of pedagogical and experience users, literature also records a number of complaints that arise from participants, in particular those who have not used to with technology immersive. Some studies documenting that student beginner often feel dizzy, experiencing disorientation spatial, or confusion moment first time interaction with interface *Augmented Reality* (Zhou et al., 2025). This matter trigger occurrence

excess burden cognitive when instructions use application no served in a way gradually. If the text annotation history and visual elements intertwine stacked on the screen in a way simultaneously without management good information, focus users precisely will split, so that objective main learning history risky no achieved optimally. (Lai & Zhang, 2025)

## DISCUSSION

Success integration technology immersive in education history relies heavily on maturity design the underlying pedagogy. This study in a way firm show that utilization *Augmented Reality* no will give impact optimal cognitive function without framework solid instructional. Very worthy literature praised is studies that are explicit adopt a systematic model like ADDIE in design the application (Sijabat et al., 2025; Zulkarnain et al., 2025). Approach structured kind of this proven capable direct experience multisensory become A learning meaningful (Abas & Zaman, 2011). When visual elements are combined with stages clear instructional, technology changed from just tool props become facilitator powerful cognitive for transform understanding history in a way comprehensive.

On the other hand, the study this give criticism sharp to a number of studies that ignore usage design instructional in implementation *Augmented Reality*. Exploration without clear direction and loss guide structured or scaffolding instructional believed will trigger disorientation Study student (Chen et al., 2023). Without existence scaffolding cognitive, students only focused on charm novelty technology solely so that objective main learning history risky no achieved optimally. If implemented (Lai & Zhang, 2025) without guidelines pedagogical strict, innovative this precisely will change room class become merely a shallow, momentary visual entertainment arena. Technology as sophisticated as whatever is confirmed will lost all over mark education If left alone without direction meaningful pedagogical.

Through glasses *Self-Determination Theory*, fulfillment need autonomy become very crucial in grow motivation intrinsic term long (Ryan & Deci, 2000). Autonomy no means just independence physical, but rather birth will free or *volition* on harmonious action with personal (Ryan & Deci, 2017) values. Intervention *Augmented Reality* in a way empirical proven liberate student for control the learning process in a way independent without depending on the instructions stiff. This digital environment give freedom exclusive to participant educate for browse narrative culture in accordance rhythm they Alone (Souropetsis & Kyza, 2025). Autonomy supported by personal control of some kind this will trigger strong internal drive (Keller, 2010), so that transformation going to learners active optimally (Nuanmeesri, 2024). realized

Besides fulfillment autonomy, dimensions competence facilitated in a way brilliant through ability *Augmented Reality* in present visualization three dimensions from draft history that was previously very abstract. When faced with challenging material, students need effective multimedia design use push processing cognitive generative without burdensome memory Work (Mayer, 2014). With help proper visual guidance, complexity material succeed simplified, so that student in a way direct feel

more smart, confident self, and speak in a way intellectual (N. Xu et al., 2024). Feeling efficacy and mastery task this is what it is essence fulfillment competence (Ryan & Deci, 2017). Feeling capable the grow pride that drives student for Keep going explore inheritance culture with very high enthusiasm (Souropetsis & Kyza, 2025).

Complete aspect autonomy and competence, aspects fulfillment need relatedness or *relatedness* achieved in a way spectacular when *Augmented Reality* functioned as bridge sociocultural in space class. Needs will have a sense of belonging and connection interpersonal this truly vital in the internalization process mark culture become full motivation autonomous (Ryan & Deci, 2000). Technology advanced this proven success trigger collaboration between students moment they solve puzzles history in a way together, so that there is a sense of togetherness strengthen sharp (Dahdal & Sayed, 2024). More far, storytelling immersive in the application success build connection emotional deep between student personal identity with inheritance local (Mohapatra et al., 2025). Fulfillment attachment social this is what led to the birth motivation intrinsic futures long for generation young (Yanar et al., 2026).

Regardless from euphoria motivational said, integration *Augmented Reality* bring fatal risks in the form of excess burden cognitive If applied to students beginner in a way carelessly. Applications that are too complicated, have filled interface visual elements no essential, as well as absence guide scaffolding instructional will drain capacity memory Work student in a way vain (Triana-Vera & López-Vargas, 2026). As a result, instead of understand narrative history, participants precisely feel confusion, experiencing disorientation spatial, and fast feel frustration moment first time operating interface (Zhou et al., 2025). Phenomenon crisis burden cognitive extreme this in a way clear prove that excessive visual charm always can become boomerang destructive destructive smoothness processing information If design the same very ignored.

Findings review this reveal that constraint technical like instability sensor tracking and lag operational (*lagging*) not just problem device hard, but rather obstacle serious cognitive (Amorós-Poveda et al., 2026; Huang et al., 2025; Souropetsis & Kyza, 2025). When the AR system fails respond in a way *real-time* consequence size asset 3D memory, thing this trigger *extraneous cognitive load* that diverts focus student from material history going to frustration technical (Amorós-Poveda et al., 2026; Lai & Zhang, 2025). Therefore that, visual optimization through approach *Low-Poly* (polygon low) to mandate urgent pedagogical (Sam 'ani et al., 2026). With compressing complexity geometry without remove visual essence of the artifact history, burden processing on the device mobile can minimized, so that capacity cognitive student can fully allocated For understand narrative civilization (Dahdal & Sayed, 2024; Mayer, 2014; Sam 'ani et al., 2026).

Criticism sharp that appears from synthesis literature this is vulnerability instrument evaluation against effect bias novelty *effect* (Dahdal & Sayed, 2024; Q. Li et al., 2025; Siposova & Hlava, 2020). The majority studies report surge motivation very high intrinsic, but often fail differentiate whether enthusiasm the appear from quality design instructional or just a sense of amazement moment towards AR media (Q. Li et al., 2025; Sam 'ani et al., 2026; Siposova & Hlava, 2020). For overcome illusion success

this, future research must adopt technique purification instruments, one of which through approach *Negative Anchoring Removal*. With insert indicator capable control neutralize response bias automatic positive, validity external affective and retention knowledge history can validated in a way more precise and meaningful.

## CONCLUSION

Review systematic this conclude that effectiveness *Augmented Reality* (AR) in education history no solely relies not on the visual appeal of its technology, but rather on the fulfillment of need psychological base orchestrated students through scaffolding pedagogical. Interactivity spatial AR proven in a way significant jack up autonomy, competence, and relatedness socio-cultural participant educate. However, the potential transformative this reduced in a way critical by facts empirical that absence framework mature instructional precisely trigger disorientation and overload burden cognitive in users beginners, who in the end degrade the role of AR becomes just momentary visual entertainment.

The gap pedagogical this exacerbated by two fundamental weaknesses in literature moment this. First, the majority studies trapped in an illusion success consequence vulnerability instrument evaluation self-report against effect bias novelty (*novelty effect*). Second, there is massive neglect to limitation specification device hard in the field, where use asset three heavy dimensions trigger delays operational (*lagging*) which is direct donate *extraneous cognitive load* on students.

Responding gap literature said, the study this formulate print blue operational for research and development (R&D) of learning media history in the future, especially use fill in emptiness absolute in narrative historical worth religious and abstract tall such as the History of Islamic Civilization. Development of media to front demand orchestration holistic and mandatory to: (1) Adopt a design model instructional structured in a way intact, like ADDIE framework, for ensure validity pedagogical; (2) Implementing visual optimization level tall use design *Low-Poly* use minimize burden processing memory and guarantee accessibility inclusive on devices specifications low; and (3) Purifying instrument measurement external psychological through approach *Negative Anchoring Removal* use neutralize amazement bias moment from users. Through leap paradigm this, effectiveness understanding historical and motivational intrinsic student can evaluated in a way pure, precise, and sustainable.

More far, print blue instructional results from review this own strong relevance for Learning the History of Islamic Civilization. Characteristics material on the history of Islamic civilization that is full of with narrative historical, artifacts culture, figures and heritage difficult architecture accessible in a way direct making Augmented Reality a potential alternatives for bridge gap between draft abstract and experience concrete learning. Therefore that, the integration of Augmented Reality is designed based on principles strong pedagogical potential increase involvement learning, understanding historical, as well as motivation intrinsic participant educate in context Islamic education.

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