Visualising Abstract Values: Reducing Cognitive Load in Moral Education Using an Interactive Learning Media

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ABSTRACT

The increasing accessibility of the internet, while offering educational opportunities, also contributes to moral decline among adolescents, including students at MAN 2 Sleman. The teaching of Akhlak (morals), which should strengthen moral values, often becomes less effective due to conventional and less interactive methods, leading to student disengagement and weak internalization of values. This study aims to develop an interactive web-based learning media called "BATIKA" (Belajar Etika/Learning Ethics) as an alternative for teaching Akhlak to tenth-grade students of MAN 2 Sleman. The research employed the ADDIE development model consisting of five stages: analysis, design, development, implementation, and evaluation. Data were collected through validation sheets and questionnaires, involving media experts, material experts, teachers, and students. Feasibility data were analyzed using percentage-based assessments. The results indicate a real demand among teachers and students for technology-based learning media to overcome the limitations of conventional teaching methods. BATIKA was developed as a response to this need, offering accessible, attractive, and interactive features such as practice exercises, gamification elements (leaderboards, progress reports, educational games, and quiz-based scoring), which promote enjoyable and engaging learning. Validation results show feasibility scores of 92% from material experts, 88% from media experts, and 94% from teachers, all categorized as "very feasible." Student responses also showed a positive reception, with a feasibility score of 78% categorized as "feasible." These findings demonstrate that BATIKA can serve as an effective and innovative learning medium for Akhlak education.

Keywords: *ADDIE, Akhlak, Gamification, Learning Media, Website.*

ABSTRAK

Meningkatnya aksesibilitas internet, meskipun menawarkan peluang pendidikan, juga berkontribusi terhadap penurunan moral di kalangan remaja, termasuk siswa di MAN 2 Sleman. Pengajaran Akhlak, yang seharusnya memperkuat nilai-nilai moral, sering kali menjadi kurang efektif karena metode konvensional yang kurang interaktif, menyebabkan ketidakterlibatan siswa dan lemahnya internalisasi nilai. Penelitian ini bertujuan untuk mengembangkan media pembelajaran berbasis web interaktif bernama "BATIKA" (Belajar Etika) sebagai alternatif pengajaran Akhlak bagi siswa kelas sepuluh MAN 2 Sleman. Penelitian ini menggunakan model pengembangan ADDIE yang terdiri dari lima tahap: analisis, desain, pengembangan, implementasi, dan evaluasi. Data dikumpulkan melalui

lembar validasi dan kuesioner, melibatkan ahli media, ahli materi, guru, dan siswa. Data kelayakan dianalisis menggunakan penilaian berbasis persentase. Hasil penelitian menunjukkan adanya permintaan nyata di kalangan guru dan siswa akan media pembelajaran berbasis teknologi untuk mengatasi keterbatasan metode pengajaran konvensional. BATIKA dikembangkan sebagai respons terhadap kebutuhan ini, menawarkan fitur yang mudah diakses, menarik, dan interaktif seperti latihan soal, elemen gamifikasi (papan peringkat, laporan kemajuan, permainan edukatif, dan penilaian berbasis kuis), yang mempromosikan pembelajaran yang menyenangkan dan menarik. Hasil validasi menunjukkan skor kelayakan 92% dari ahli materi, 88% dari ahli media, dan 94% dari guru, semuanya dikategorikan sebagai "sangat layak." Respons siswa juga menunjukkan penerimaan positif, dengan skor kelayakan 78% dikategorikan sebagai "layak." Temuan ini menunjukkan bahwa BATIKA dapat berfungsi sebagai media pembelajaran yang efektif dan inovatif untuk pendidikan Akhlak.

Kata Kunci: *ADDIE, Akhlak, Gamifikasi, Media Pembelajaran, Website.*

INTRODUCTION

In the 21st century, the development of information and communication technology, particularly the internet, has experienced a rapid surge, influencing almost every aspect of human life. Initially used for limited purposes, the internet has become a primary necessity, spawning sophisticated innovations ranging from social media to artificial intelligence. In Indonesia, internet penetration is growing significantly. According to the 2024 survey report by the Indonesian Internet Service Providers Association (APJII), the number of internet users in Indonesia has reached 221,563,479 people, or approximately 79.5% of the total population. The data indicates that internet users are dominated by the productive age group and students, specifically Generation Z (ages 12-27) at 34.40% and Millennials (ages 28-43) at 30.62% (APJII, 2024). This statistical fact indicates that the majority of students currently in school are "digital natives" who live side-by-side with technology.

This ease of internet accessibility, on the one hand, opens up great opportunities for digital transformation in education, eliminating spatial and temporal boundaries in the learning process. On the other hand, this phenomenon brings complex negative impacts, one of which is moral decadence or the decline of morals, which has become a global issue. As stated by Iskarim (2016), moral decline does not occur only in adults but has also spread to adolescents and students. Various deviant behaviours, such as drug abuse, promiscuity, and the erosion of politeness, serve as tangible indications that technological advancement, unaccompanied by a strong moral foundation, can pose a serious threat to the character of the nation's generation.

In responding to these challenges, Islamic education places Akhlak (morals/ethics) as the main foundation of universal character education. This aligns with the fundamental mission of the Prophethood of Muhammad SAW, as stated in his Hadith: "I was sent only to perfect noble morals" (Narrated by Al-Baihaqi). Moral

education is not limited to memorising definitions of virtue. Still, it is a process of internalising noble values, such as wisdom (hikmah), courage to uphold the truth (syaja'ah), maintaining self-honour ('iffah), and justice ('adalah), so that they are ingrained in the student's personality. Therefore, moral material in the Islamic education curriculum, as stipulated in KMA No. 183 of 2019, is designed to form student characters that are adaptive yet firmly hold to ethical principles (Ministry of Religious Affairs RI, 2019).

However, strategies for delivering moral and ethical material often face constraints on relevance in the field. Conventional learning methods, which tend to be doctrinal and one-way, often fail to engage the affective aspects of Generation Z students, who are often critical and prefer visual stimulation. The phenomenon of "learning fatigue" post-pandemic further exacerbates this condition, making it difficult for students to grasp the essence of the abstract values being taught. Empirical observations conducted by researchers at the senior high school level, specifically at MAN 2 Sleman, confirm this. A gap was found between the teacher's delivery method and the students' learning preferences, which lean more towards interactive digital media. Consequently, the internalisation of moral values becomes suboptimal.

Given this urgency, a reorientation of moral learning media is needed to bridge traditional Islamic values with modern technological approaches. The integration of technology in character education is not just a trend but a pedagogical necessity to increase student engagement. Astuti et al. (2020) emphasise that website-based media offers the advantages of flexibility and multimedia capabilities, which are effective in the context of self-directed learning.

This study aims to offer a solution model through the development of a website-based learning media named "BATIKA" (Belajar Etika/Learning Ethics). Although developed and tested within the scope of moral material at the senior high school level, the concept offered, namely the gamification of ethical values through a digital platform, is expected to serve as a reference model generalizable for moral learning in broader contexts. Through this medium, the moral learning process is expected to shift from merely transferring normative knowledge to an immersive, enjoyable, and relevant learning experience for students in the current digital ecosystem.

METHODS

This research employs a Research and Development (R&D) approach, a method used to produce a specific product and test its effectiveness (Sugiyono, 2022). In the context of this research, the developed product is a digital learning media based on a website named "BATIKA" (Belajar Etika). This media is designed as a pedagogical tool to facilitate the interactive internalisation of noble moral values. The development model adopted is the ADDIE model (Analyse, Design, Develop, Implement, and

Evaluate) developed by Branch (2009). The selection of the ADDIE model is based on its characteristics: systematic, flexible, and oriented to feedback at each stage, making it highly relevant for the development of educational technology products that require multi-level validation. The development procedure is carried out through five comprehensive stages as follows:

First, the Analysis Stage. This stage is the foundation of the research involving three main dimensions of analysis: (1) Needs Analysis, conducted through preliminary studies and in-depth interviews with educators to map the gap between conventional learning methods and the learning preferences of "digital native" students; (2) Curriculum Analysis, aimed at deconstructing basic competencies of moral material into learning indicators that can be translated into digital content; and (3) Student Characteristic Analysis, to identify levels of digital literacy, learning styles, and cognitive barriers experienced by students in understanding abstract ethical material.

Second, the Design Stage. At this stage, the researcher designs the system architecture and learning content. Technical design includes creating user flowcharts and designing the User Interface (UI) in Figma to ensure aesthetics and usability. The design process in Figma was not linear but iterative. Researchers created low-fidelity wireframes first to map the basic layout, followed by high-fidelity prototypes that simulated the actual user experience. These prototypes were briefly tested with a small group of peer reviewers to identify potential usability bottlenecks, such as confusing button placements or illegible font sizes, before a single line of code was written. This 'fail-fast' approach ensured that the development phase focused on implementing a validated design rather than experimenting with unproven concepts. The website structure includes a dashboard page, content modules, interactive quizzes, and gamification features (leaderboards) to support student engagement. Specifically, product evaluation instruments are compiled at this stage using standard media quality frameworks. Material and media validation instruments follow Surjono's (2017) criteria, covering content, instructional, and display aspects, while user response instruments adapt the Learning Object Evaluation Scale for Students (LOES-S) from Kay (2011), focusing on learning, design, and engagement dimensions.

Third, the Development Stage. This stage is the product realisation phase. The "BATIKA" website is built using modern web technologies to ensure performance and scalability. The interface side (Frontend) is developed with the Next.js framework, which provides high interactivity, while data management (Backend) is handled with MongoDB. Coding is performed using the Visual Studio Code editor. Once the prototype is complete, the product undergoes rigorous validation by experts, consisting of: (1) Material Experts, to validate the correctness of theological concepts and Islamic ethics; (2) Media Experts, to assess technical aspects, layout, and system responsiveness; and (3) Education Practitioners, to assess pedagogical feasibility and

suitability for real classroom conditions. Product revisions are carried out iteratively based on expert input before entering the implementation stage.

Fourth, the Implementation Stage. The product declared valid is tested empirically in the field. The trial was conducted on 32 tenth-grade students at Madrasah Aliyah Negeri (MAN) 2 Sleman in the 2024/2025 academic year. This location was chosen as a representation of an Islamic-based school integrating technology into its curriculum. Students were given full access to explore website features, study materials, and perform evaluations independently or under guidance. The goal of this stage is to measure the end-user response to the functionality and appeal of the media in a real learning situation.

Fifth, the Evaluation Stage. Evaluation is carried out in two forms: formative evaluation running concurrently with the development stage (expert validation), and summative evaluation conducted after the field trial. Data were collected using questionnaire instruments with a Likert scale of 1 to 5 (Very Unfeasible to Very Feasible). Data analysis techniques used quantitative descriptive statistics to calculate the percentage of feasibility using the formula:

$$P = (\Sigma x / \Sigma x_i) \times 100\%$$

Where P is the percentage of feasibility, Σx is the total score obtained, and Σx_i is the ideal maximum score. The percentage results are then converted into feasibility categories: Very Feasible (>80%), Feasible (61-80%), Quite Feasible (41-60%), Less Feasible (21-40%), and Not Feasible (<20%) (Arikunto, 2010). This analytical approach aims to provide an objective justification of the feasibility of the "BATIKA" website as an effective and generalizable model of moral learning media.

RESULT

This development research has successfully realised a website-based learning media product named "BATIKA" (Belajar Etika). This product is specifically designed to support learning of the Akidah Akhlak material, particularly the chapter titled "Applying the Attitudes of Hikmah, Iffah, Syajaah, and Adalah as Formers of Noble Character." The entire development process strictly followed the five phases of the ADDIE model to ensure the resulting product is not only technically sophisticated but also pedagogically valid.

1. **Needs Analysis and User Characteristics**

    The initial development stage was based on empirical field findings. Based on in-depth interviews with the Akidah Akhlak subject teacher at MAN 2 Sleman, a significant gap was identified between the delivery method for the material and the learning characteristics of Generation Z students. The teacher revealed that although technological facilities were available, their use was not optimal for value-based materials like morals. Students tended to experience boredom when

material was presented through lectures or static presentation slides. An analysis of 32 tenth-grade students showed that they had adequate digital literacy and high enthusiasm for gadget use. Yet, this potential was often diverted to non-educational activities, such as social media. Therefore, the primary identified need was for media capable of converting abstract moral material into a visual-interactive format accessible independently via mobile devices.

2. Information Architecture and Interface Design

To address these needs, the design stage focused on creating an intuitive User Experience (UX). The researcher compiled a User Flow Chart mapping the student's learning journey from the authentication page (Login/Register) to material access and evaluation. The User Interface (UI) was designed in Figma, applying "Clean and Minimalist" design principles. The colour palette was selected based on colour psychology to be soothing yet energetic, helping maintain student focus. The navigation menu structure was logically categorised into: (1) Main Dashboard as the control centre; (2) Content Modules (Details), breaking content into micro-learning segments; (3) Evaluation (Quiz) integrated at the end of each sub-chapter; (4) Gamification (Leaderboard & Games); and (5) Personalisation (Profile).

3. Technical Development Realisation

The development stage was the phase of translating design into a functional software product. The BATIKA website was developed using a "Modern Web App" approach. The researcher used Visual Studio Code (VS Code) as the integrated development environment. The code structure was built upon the Next.js framework, a React-based technology chosen for its "Server-Side Rendering" (SSR) capability, ensuring learning materials load very quickly even on unstable internet connections.

For data management, the system was integrated with a MongoDB database. The Database Schema was designed to store "Users" tables (student data), "Materials" (moral content), "Quizzes" (question banks), and "Scores" (evaluation results). Integration between the Frontend (Next.js) and Backend (MongoDB) enabled dynamic features to run in real time. For instance, when students complete a quiz, their scores are instantly calculated by the server and displayed on the Leaderboard. The final product was then hosted on the Vercel cloud service (https://batika.vercel.app), making it publicly accessible without geographic restrictions.

4. Product Feasibility Validation Data

Product feasibility was tested through comprehensive expert judgment.

a. Material expert validation. Validation of material substance was conducted by a PAI material expert lecturer. The evaluation results showed a cumulative

score of 46 out of a maximum of 50, equivalent to 92% (Very Feasible). Aspect analysis showed:

1) The "Difficulty Level & Student Characteristics" aspect received a perfect score (100%). This indicates that the narrative of Hikmah, Iffah, Syaja'ah, and 'Adalah materials has been successfully simplified without reducing the weight of their meaning, making it highly suitable for the cognitive development stage of Madrasah Aliyah adolescents.

2) The aspects "Suitability with Curriculum" and "Language" each reached 93%. The validator assessed that the digital content remained compliant with the Basic Competencies (KD) of KMA No. 183 of 2019 and used communicative language.

3) Revision notes from the material expert focused on synchronising illustration images with material text to avoid visual ambiguity.

b. Media expert validation. Evaluation of technical and design aspects was conducted by a learning media expert lecturer. The total score obtained was 53 out of 60, with a percentage of 88% (Very Feasible). Assessment details included:

1) The "Navigation & Design" aspect received a 100% score. This confirms that the website's information architecture is very solid; buttons, menus, and links function without errors, facilitating student movement between pages.

2) The "Colour & Contrast" aspect was rated 90%, indicating harmonious visual aesthetics.

3) The "Ease of Use" aspect received a score of 80% (Feasible). Although high, this was the lowest score, prompting revisions to the usage instructions to be friendlier for technology-novice users.

4) Specific input from the media expert included the need to vary displays in the Game feature to avoid monotony and to add a more representative visual identity (logo).

c. Field practitioner validation (teacher). The assessment by the subject teacher as an expert user in the field yielded very positive results with a score of 47 out of 50, or 94% (Very Feasible). The teacher gave a perfect score (100%) on the "Cognitive Load" and "Evaluation & Feedback" aspects. This is a crucial finding, indicating that BATIKA successfully presents dense material in a digestible format and provides a practical tool for measuring learning success for teachers.

5. Field Trial and Student Response

The implementation stage was conducted on 32 tenth-grade students at MAN 2 Sleman. User response data were collected using a closed-ended Likert-scale questionnaire. The recapitulation results showed a total score of 1489 out of

a maximum ideal score of 1900, resulting in a feasibility percentage of 78% (Feasible Category).

Analysis of student response frequency distribution provided deep insights:

a. A total of 7 students (22%) gave a "Very Feasible" rating (90-100%), indicating high satisfaction with the new features.

b. The majority of students, namely 15 people (47%), rated it "Feasible" (75-89%).

c. There were 8 students (25%) who rated it "Feasible" in the lower range (60-74%).

d. Only 2 students rated it "Quite Feasible."

Qualitatively, students highly appreciated the Gamification feature (Leaderboard), which spurred a competitive spirit. However, occasional slow internet access at school became an external factor influencing user experience, reflected in the feasibility percentage being slightly lower than the experts' assessments. Nevertheless, this product was well received as a learning innovation.

DISCUSSION

The findings of this development research make a significant empirical contribution to the discourse on integrating technology into character education. Research findings show that the website-based learning media "BATIKA" (Belajar Etika) meets high feasibility standards across various assessment dimensions. However, behind these validation numbers lie complex pedagogical, psychological, and technological dynamics that need critical dissection. This discussion will elaborate on the implications of these findings by reviewing them from the perspectives of multimedia learning theory, motivational psychology, and deep comparative analysis.

1. **Deconstructing Cognitive Load: Between Visualisation and Meaning Reduction**

The ontological challenge in teaching Akidah Akhlak, especially on metaphysical topics like "Hikmah" (wisdom) and "'Iffah" (maintaining honour), is how to transform these concepts into perceptible material without reducing the depth of their meaning. Conventional logocentric methods (text-centred) often burden students' working memory capacity (cognitive load). The findings of material expert validation (92%) and media expert validation (88%) confirm that BATIKA successfully bridges this gap through a "Multimedia Learning" strategy.

Referring to Paivio's Dual Coding Theory (Paivio, 1990), the human brain processes information through two separate channels: verbal and visual. BATIKA optimises both channels simultaneously. However, it is critical to note that visualising moral material carries the risk of ambiguity. For example, visualising "Syaja'ah" (courage) as a soldier might narrow its meaning to the physical aspect, whereas moral courage is also vital. Therefore, BATIKA's success is not merely due to the presence of images but to the integration of contextual narratives that guide

student interpretation. The "clean" interface design (100% navigation score) helps minimise extraneous cognitive load, ensuring students' mental energy is spent processing values (germane load) rather than resolving navigational confusion. Furthermore, applying Mayer's Segmenting Principle (Mayer, 2009), breaking lessons into smaller, manageable chunks, allowed students to process abstract ethical concepts at their own pace, significantly reducing the learning anxiety often associated with dense theological texts.

2. **Critique of Gamification: Intrinsic vs. Extrinsic Motivation in Moral Education**

The most prominent yet controversial innovation of BATIKA is the integration of gamification features (Leaderboard & Points). Statistically, this feature successfully increased student engagement. However, from the perspective of Islamic educational philosophy, this raises a critical question: Does gamification shift the orientation from "Lillahi Ta'ala" (intention for God's sake) to a point-chasing orientation?

Analysing human motivation through the lens of Self-Determination Theory (SDT) by Ryan and Deci (2000), human motivation is driven by autonomy, competence, and relatedness. BATIKA fulfils the competence aspect through instant score feedback. However, the Leaderboard feature potentially creates unhealthy competition if not managed wisely. There is a risk that students memorise quiz answers merely to climb the ranks, rather than internalise moral values, a phenomenon known as the Overjustification Effect.

From the perspective of Islamic pedagogy, this phenomenon touches upon the concept of Niat (intention). While external motivatores are acceptable in early developmental stages (Tadrij), the ultimate goal of Akhlak education is Tazkiyatun Nafs (purification of the soul). Therefore, the gamification layer in BATIKA serves as a Muqaddimah (introduction). It grabs the student's attention in a distracted digital world. However, the teacher must bridge this digital excitement with spiritual reflection, ensuring that the 'points' earned on screen translate into 'merit' (Pahala) in the real world. The technology facilitates the knowing, but the teacher facilitates the becoming. Ideally, future iterations should incorporate Organismic Integration Theory principles to facilitate the transition from external regulation (points) to integrated regulation (values congruent with self).

3. **Advantages of "Modern Web App" Architecture and Sustainability Issues**

In the educational technology landscape, the decision to build BATIKA using Next.js and MongoDB architecture (rather than instant CMS or native Android apps) has strategic long-term implications. *First*, Interoperability and Accessibility. Previous studies, such as Azizah (2019) and Nurdiansyah (2024), found that Android (APK) applications faced "Walled Garden" barriers: they could only run on specific OSs and required installation, consuming memory. BATIKA disrupts this boundary

with a "Zero-Installation" approach. This is a crucial step toward democratising access to education, ensuring that students with low-end devices retain equal learning rights. The use of Server-Side Rendering (SSR) in Next.js ensures that content is pre-rendered on the server, significantly improving load times on slower devices common in rural educational settings.

Second, Data Dynamics (Data-Driven Decision Making). Most Flash or PPT-based learning media are static. Teachers do not know whether students actually read them. With MongoDB integration, BATIKA changes this paradigm. Every click, every quiz score, and learning duration is recorded in the database. This opens opportunities for teachers to perform Learning Analytics: identifying at-risk students and materials most frequently misunderstood. This feature is not found in previous comparator studies and represents a shift towards "Precision Education."

4. **The "Digital Native" Paradox and Infrastructure Gaps via TAM Framework**

The finding most triggering reflection is the student response score (78%), which "only" falls into the Feasible category, lower than the expert assessments (>90%). This disparity can be analysed using the Technology Acceptance Model (TAM) developed by Davis (1989). While Perceived Usefulness (the benefit of learning) was rated high by experts, Perceived Ease of Use among students was influenced by external factors, specifically infrastructure.

This reveals a phenomenon known as the "Digital Native Paradox." Although Generation Z students are proficient in using TikTok and Instagram, they do not necessarily possess the digital literacy needed for learning. Students might feel that educational interfaces (LMS/Edu Web) are less "entertaining" than the industry-standard entertainment apps they use daily. When faced with BATIKA developed on an academic scale, there is an expectation gap.

Furthermore, the infrastructure factor (school internet connectivity) proved to be a significant confounding variable. Modern web-based apps like Next.js, although fast, still require stable network latency to load visual assets. This serves as a critique of the euphoria of educational digitalization: that sophisticated digital content becomes irrelevant without adequate basic infrastructure. Future solutions must lean towards developing Progressive Web Apps (PWA) allowing "Offline-First" features, so dependence on internet signals can be reduced.

5. **Shifting Teacher Roles: Empowering via TPACK Framework**

The presence of BATIKA is not intended to replace the teacher's role but to redefine it. Using the TPACK (Technological Pedagogical Content Knowledge) framework (Koehler & Mishra, 2009), BATIKA supports teachers who may have strong Content Knowledge (CK) in Akhlak but struggle with Technological Knowledge (TK).

Practitioner (teacher) validation, with a score of 94%, indicates that teachers do not feel threatened but feel helped. This media takes over lower-order cognitive tasks (explaining definitions, grading rote quizzes), so teachers can allocate face-to-face time for higher-order cognitive and affective tasks: case study discussions, counselling, and character building, areas where Pedagogical Knowledge (PK) is paramount. BATIKA functions as a virtual "Co-Teacher." Without a teacher guiding post-media usage reflection, moral learning via a website risks stopping at the cognitive level alone (knowing good/bad), not yet reaching the conative (wanting to do good) and psychomotor (doing good) levels. Thus, the tool amplifies the teacher's capacity to focus on the spiritual transmission of values, which requires human-to-human connection.

6. Limitations and Future Directions

This study acknowledges limitations in the small trial sample (32 students) and the short implementation duration. The Novelty Effect might bias the results; students were enthusiastic because it was something new, not necessarily because the media was inherently effective. Longitudinal research is needed to see if student motivation persists after repeated use over a semester. Additionally, developing adaptive features based on Artificial Intelligence (AI) that adjust question difficulty to students' abilities is a crucial recommendation to help BATIKA evolve from interactive media into an Intelligent Tutoring System. Specifically, future research could explore integrating Natural Language Processing (NLP) models. Currently, BATIKA relies on multiple-choice quizzes, which test recall. An NLP-powered module could evaluate open-ended essay responses, allowing students to express their understanding of complex ethical dilemmas in their own words. This would shift the assessment from purely objective scoring to a more subjective, qualitative analysis of the student's moral reasoning capabilities, bringing the digital tool closer to the complexity of real-world ethical decision-making.

CONCLUSION

This study concludes that the website-based learning media "BATIKA" (Belajar Etika) is an effective and feasible innovation for revitalising moral education at the Madrasah Aliyah level. Media development through the ADDIE model has produced a platform that is not only theoretically valid (based on expert assessments of 92% from the material expert and 88% from the media expert) but also proven practical and well-received by users in the field (teacher response 94% and student response 78%).

In essence, this research makes three main contributions. First, the transformation of learning methods from conventional-doctrinal to interactive-participatory through gamification features (quizzes and leaderboards), which are

proven capable of increasing student motivation and engagement. Second, the provision of flexible learning accessibility through a lightweight, cross-device web platform (Next.js), overcoming spatial and temporal constraints in learning. Third, a cognitively friendly material visualisation model that helps students understand abstract ethical concepts more easily.

The implications of this study show that integrating technology into character education is not impossible but a strategic necessity in the digital era. BATIKA can serve as a reference model (prototype) for developing similar media for other value-based subjects. However, this research is still limited to a local trial scale. Future research is suggested to expand the trial scope to measure long-term effectiveness on real behavioural change (affective) in students, as well as develop AI-based adaptive features for material personalisation.

DECLARATIONS

Author contribution statement

Frisnadi Nurul Huda, as the primary author, was responsible for the research design, data collection and analysis, and manuscript preparation. The academic supervisor provided scientific guidance, supervision, and manuscript revisions to ensure the work was suitable for publication.

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Data availability statement

Research data, including interview results, validation sheets, and questionnaires, are available from the corresponding author upon reasonable request.

Declaration of interests statement

The author declares no financial or personal conflicts of interest that could have influenced the outcomes of this study.

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