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Culturally Responsive Teaching-Based Interactive Learning Application for Strengthening Polite Behaviour in Madrasah Tsanawiyah Students

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ABSTRACT

The rapid development of digital technology in education requires learning innovations that support both academic achievement and character development. This study aimed to develop an interactive web-based learning application grounded in Culturally Responsive Teaching (CRT) to strengthen students' polite behaviour in Akidah Akhlak (Islamic Creed and Ethics) learning, and to evaluate its feasibility, practicality, and effectiveness. This Research and Development (R&D) study adopted the ADDIE model integrated with Kapp's gamification concept at Madrasah Tsanawiyah Attaqwa Putra Bekasi. Using simple random sampling from 156 eighth-grade students, different students took part in the one-to-one (n=3), small-group (n=10), field-trial (n=20), and one-group pretest–posttest (n=57) stages, alongside 12 expert validators. Data were collected through observations, interviews, questionnaires, expert validation, and pre-test and post-test measurements. The application, named RAVID, integrates learning materials, instructional videos, character-based games, interactive quizzes, reflection activities, and teacher-managed content features. Expert validation yielded an average feasibility score of 91.50%, while practicality evaluations ranged from 90.60% to 92.80%, indicating highly feasible and practical criteria. In the one-group pretest–posttest trial, students' self-reported polite behaviour scores increased from 72.30 to 93.75, with an N-gain score of 0.772 (77.23%) and a significant difference between pre-test and post-test results ($t(56)=37.443$, $p<0.001$). The findings indicate that RAVID RAVID can support character education in Akidah Akhlak by linking Islamic adab (respect, courteous speech, salam, empathy), madrasah practices (shaking hands, asking permission), and daily interactions with teachers, peers, and online. However, the study was limited to one madrasah and a one-group pretest–posttest design. Future research should involve broader contexts and longitudinal approaches to examine the sustainability of character development.

Abstrak

Perkembangan pesat teknologi digital dalam pendidikan menuntut inovasi pembelajaran yang mendukung capaian akademik sekaligus pengembangan karakter. Penelitian ini

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Kata kunci:
Culturally Responsive Teaching; aplikasi pembelajaran interaktif; pendidikan karakter; kesantunan; Akidah Akhlak

bertujuan mengembangkan aplikasi pembelajaran interaktif berbasis web yang didasarkan pada Culturally Responsive Teaching (CRT) untuk memperkuat perilaku santun siswa dalam pembelajaran Akidah Akhlak, serta mengevaluasi kelayakan, kepraktisan, dan efektivitasnya. Penelitian Research and Development (R&D) ini mengadopsi model ADDIE yang diintegrasikan dengan konsep gamifikasi Kapp di Madrasah Tsanawiyah Attaqwa Putra Bekasi. Dengan simple random sampling dari 156 siswa kelas VIII, siswa yang berbeda terlibat pada tahap evaluasi satu-satu (n = 3), kelompok kecil (n = 10), uji lapangan (n = 20), dan one-group pretest–posttest (n = 57), ditambah 12 validator ahli. Data dikumpulkan melalui observasi, wawancara, kuesioner, validasi ahli, serta pengukuran pre-test dan post-test. Aplikasi yang dikembangkan, bernama RAVID, mengintegrasikan materi pembelajaran, video pembelajaran, permainan berbasis karakter, kuis interaktif, kegiatan refleksi, dan fitur pengelolaan konten oleh guru. Validasi ahli menghasilkan skor kelayakan rata-rata sebesar 91,50%, sedangkan evaluasi kepraktisan berkisar antara 90,60% hingga 92,80%, yang menunjukkan kriteria sangat layak dan sangat praktis. Pada uji coba one-group pretest–posttest, skor perilaku santun siswa yang dilaporkan sendiri (self-reported) meningkat dari 72,30 menjadi 93,75, dengan skor N-gain sebesar 0,772 (77,23%) dan perbedaan yang signifikan antara hasil pre-test dan post-test ($t(56) = 37,443$, $p < 0,001$). Temuan ini menunjukkan bahwa RAVID dapat mendukung pendidikan karakter pada mata pelajaran Akidah Akhlak dengan menghubungkan adab Islam (hormat, tutur kata sopan, salam, empati), praktik madrasah (bersalaman, meminta izin), serta interaksi keseharian dengan guru, teman sebaya, dan di ruang digital. Namun, penelitian ini terbatas pada satu madrasah dan menggunakan desain one-group pretest–posttest. Penelitian selanjutnya sebaiknya melibatkan konteks yang lebih luas dan pendekatan longitudinal untuk menelaah keberlanjutan pengembangan karakter.

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INTRODUCTION

Advancements in digital technology and the globalization of information have accelerated changes in how learners study, communicate, and interact. This situation places increasing demands on 21st-century education to produce learners who are not only academically excellent but also possess good character,

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courtesy, empathy, and ethical awareness[1]. The OECD emphasizes that today's learners need to possess critical thinking skills, creativity, collaboration, and communication abilities, as well as social-emotional competencies, in order to participate responsibly in a knowledge-based society [2]. In line with this, UNESCO emphasizes that technological advancement and the digitalization of education must be balanced with the strengthening of human values, social responsibility, and ethical awareness [3]. Thus, the use of technology in education should not be directed solely at enhancing academic competence and digital skills; it also needs to support the character development of learners.

At the national level, the intensity of digital technology usage among Indonesian students continues to rise. Data from Statistics Indonesia (BPS) indicates that internet usage among students remains predominantly driven by entertainment (66.51%) and social media (58.19%), whereas its utilization for online learning activities stands at only 50.54% [4]. The data reveals a gap between students' high level of access to digital technology and its utilization for productive educational activities. While technology is increasingly integrated into students' lives, its use has not yet been fully directed toward fostering ethics, empathy, responsibility, and courtesy in interactions [5]. This situation presents a challenge for educational institutions to design digital learning experiences that are not only engaging and interactive but also capable of internalizing character values.

This challenge is particularly relevant in the context of Madrasah Tsanawiyah (Islamic junior high schools), as this form of education focuses not only on developing intellectual aptitude but also on shaping students' character and etiquette. One key aspect of character that requires strengthening is politeness—manifested through habits such as respecting teachers, offering greetings, exchanging pleasantries, shaking hands, and communicating respectfully. Preliminary observations at Madrasah Tsanawiyah Attaqwa Putra in Bekasi revealed that students showed a very high level of interest in technology-based learning, with an average rate of 91.80%. However, interviews with teachers and guidance counselors indicated ongoing issues regarding the practice of a culture of politeness; specifically, there was a lack of habits such as greeting

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teachers, offering salutations, shaking hands, and communicating respectfully. These findings demonstrate that the students' high level of interest in technology has not yet directly translated into a strengthening of polite character traits in their daily lives.

The findings indicate that the primary issue is not a lack of student interest in learning innovations, but rather the suboptimal design of digital learning specifically aimed at internalizing the character trait of politeness. While technology is integral to students' lives and holds strong appeal within the learning process, its application has not yet been fully directed toward fostering ethical awareness, empathy, respect, and proper conduct in daily interactions [6]. This situation has the potential to undermine the function of madrasah as spaces for character formation, particularly if instruction in Akidah Akhlak (Islamic creed and ethics) continues to be delivered primarily in a normative and textual manner, with insufficient connection to the students' socio-cultural experiences [7].

One cutting-edge approach relevant to addressing these challenges is Culturally Responsive Teaching (CRT). CRT is an instructional approach that utilizes students' cultural backgrounds, social experiences, languages, values, and life contexts as meaningful learning resources [8]. Ladson-Billigs (2021)[9]emphasizes that culturally responsive teaching needs to foster students' academic success, cultural competence, and critical consciousness. Gay (2018)[10] This view is reinforced by defining CRT as the use of learners' cultural knowledge, prior experiences, and frames of reference to make learning more effective, contextual, and relevant. In the context of character education, CRT holds significant potential, as values such as politeness can be internalized through cultural

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experiences, social practices, everyday language, and behavioral examples that resonate with the learners' own lives [11].

CRT can be understood by asking what it is, how it is enacted, and what it is for. Ladson-Billigs (2021)[12] describes culturally relevant pedagogy as an approach that lets students maintain their cultural integrity while succeeding academically, built on three commitments: academic success, cultural competence, and critical consciousness. Gay (2018)[13] defines CRT as using the cultural knowledge, prior experiences, frames of reference, and performance styles of students to make learning encounters more relevant to and effective for them. In terms of enactment, recent conceptual work treats CRT as a multidimensional construct rather than a synonym for good teaching. Bostwick et al. (2025)[14] identify five dimensions (understanding the community, curriculum work, reflexive discussions, collaborative teaching practices, and learning through cultural mentorship), while Ghaemi & Boroushaki (2025)[15] organize CRT competence into cultural awareness, responsive pedagogical knowledge, and reflective classroom practice. In classrooms, these ideas appear as curricula, examples, tasks, and discussions that draw on students' communities and lived experiences. The purpose of CRT is to make learning meaningful and academically successful without requiring students to give up their cultural identities, and studies associate it with stronger engagement and sense of belonging [16], socio-emotional skills and learning motivation [17], and empathy and inclusive social relations [18].

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Most of this literature documents the use and benefits of CRT for engagement, motivation, or achievement; much less is reported on how CRT can be translated step by step into the design of a digital learning product, particularly for ethical character such as politeness (adab). In this study, CRT is therefore treated as a design principle. The socio-cultural experiences of madrasah students (greeting teachers, shaking hands, asking permission, and speaking respectfully) and the Islamic ethical teachings that underpin them (the Qur'an and hadith) are used as learning resources, and the needs analysis determines which of these experiences are brought into the materials, videos, game missions, and quizzes of the application.

Previous studies indicate that the CRT approach and interactive learning media have a positive impact on students' learning engagement, motivation, socio-emotional skills, and learning outcomes. Redmond et al. (2025)[19] demonstrates that CRT-based interactive learning media can enhance students' socio-emotional skills and learning motivation. Abacioglu et al. (2023)[20] found that integrating cultural values into instruction can enhance student engagement and strengthen the sense of belonging to the learning environment. Peña-Acuña et al. (2025)[21] also shows that the implementation of CRT contributes to strengthening inclusive social relations and increasing student empathy. Fauzi et al. (2026)[22] reported that CRT-based interactive media was able to generate high student interest in learning, while Chuang et al. (2020)[23] indicates that CRT-based learning media possess a good level of validity according to subject matter experts and media experts.

However, previous research still has limitations. First, the majority of CRT studies have focused more on improving learning outcomes, motivation, or general social skills, rather than specifically examining the strengthening of the character trait of politeness [24]. Secondly, research on the development of CRT-

[19] Redmond et al., "Unveiling Potential: Culturally Responsive Teaching Practices to Catalyze Social-Emotional Success in Black Youth."

[20] Abacioglu et al., "Effects of Multicultural Education on Student Engagement in Low- and High-Concentration Classrooms: The Mediating Role of Student Relationships."

[21] Peña-Acuña, Toscano-Fuentes, and Flor-Arasil, "Cultural Openness and Desire to Learn in Relation to Ethnocultural Empathy among University Students in Multilingual Contexts."

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based interactive media is still largely conducted within the context of primary education or general subjects; it has not yet been widely directed toward Akidah Akhlak (Islamic Creed and Ethics) instruction in Madrasah Tsanawiyah [25]. Third, the integration of interactive web-based learning applications, CRT, and the reinforcement of students' adab (proper conduct) within the context of Islamic education has not yet been systematically developed. This gap forms the basis for the necessity of this research [26].

Based on the issues and limitations of previous studies, this research aims to develop an interactive web-based learning application grounded in Culturally Responsive Teaching (CRT) for the Akidah Akhlak (Islamic Creed and Ethics) subject; to analyze the application's feasibility and practicality; and to test its effectiveness in strengthening the polite behavior of students at Madrasah Tsanawiyah Attaqwa Putra Bekasi. The study specifically seeks to produce a learning application that integrates cultural contexts, social experiences, Islamic values, and the students' daily life situations into the Akidah Akhlak learning process. In light of these research objectives, the problem statements for this study are as follows:

First, CRT-based digital media have rarely been designed for Akidah Akhlak at the Madrasah Tsanawiyah level; this study therefore designs and describes the characteristics of an interactive web-based learning application grounded in CRT that translates students' socio-cultural and Islamic experiences, identified through a needs analysis, into learning content and features at Madrasah Tsanawiyah Attaqwa Putra Bekasi; second, Evidence on the quality of CRT-based interactive applications for strengthening adab in Islamic education is still limited; this study therefore examines the feasibility of the application based on expert validation and its practicality based on trials with student users; and third, Because CRT studies have mostly focused on engagement and achievement rather than politeness, this study explores the change in students' self-reported polite behavior scores after using the application in a one-group pretest–posttest design, as preliminary evidence that needs to be tested with comparison groups.

METHODS

This study employs a Research and Development (R&D) approach to produce an interactive web-based learning application grounded in Culturally Responsive Teaching (CRT) that is valid, practical, and effective in strengthening

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students' character regarding politeness [27]. The development process adapts the ADDIE model, which consists of the analysis, design, development, implementation, and evaluation stages [28]. During the development phase, the ADDIE model is integrated with Kapp's gamification concept by determining game mechanics and incorporating game thinking[29]. The selection of this model is based on its systematic and flexible characteristics for the development of technology-based learning applications [30].

The research was conducted at Madrasah Tsanawiyah Attaqwa Putra—located in Bahagia Urban Village, Babelan District, Bekasi Regency—during the 2025/2026 academic year. The primary subjects of the study were eighth-grade students who utilized a web application for learning Akidah Akhlak (Islamic Creed and Ethics). Eighth-grade students were selected because they are at the early adolescent stage of development, a period characterized by identity formation and the strengthening of social character, including the trait of politeness [31]. The population comprised all 156 eighth-grade students of the madrasah. Participants were selected through simple random sampling, in which every student in the sampling frame had an equal chance of being chosen. The sampling frame consisted of classes at the middle level, namely neither the top-achieving class nor the lowest-performing class, so that participants did not come from either extreme of the achievement distribution. The sample of the pretest–posttest trial (n = 57) was 36.5% of the population and thus exceeded 20%, the minimum proportion used as the guideline for sample size [32]. For the one-to-one evaluation, three students were chosen to represent very good, moderate, and low levels of polite character. Students who took part in the one-to-one, small-group, field, and pretest–posttest stages were different individuals, so no student participated in more than one stage. Table 1 shows the participants in each stage of the ADDIE model.

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Table 1. Participants in Each Stage of the Study

ADDIE stage and activity	Participants	Number	Selection note
Analysis: needs analysis	Eighth-grade students (student-characteristics questionnaire); the Akidah Akhlak teacher and the Guidance and Counseling teacher (interviews)	20 students	Informants for the needs analysis
Development: expert validation	Media, instructional design, material, and gamification experts; two instrument experts	12 experts (3 per field); 2 instrument experts	Lecturers and practitioners with relevant expertise
Development: one-to-one evaluation	Eighth-grade students	3 students	Chosen to represent varied levels of polite character (very good, moderate, low)
Development: small-group evaluation	Eighth-grade students	10 students	Simple random sampling; different students from the other stages
Implementation: field trial	Eighth-grade students	20 students	Simple random sampling; different students from the other stages
Implementation: one-group pretest–posttest trial	Eighth-grade students	57 students	Simple random sampling; middle-level classes; 36.5% of the population

This research procedure uses the ADDIE model from Branch (2009) which is integrated with the Kapp gamification concept at the development stage. The integration of the ADDIE model and gamification concept in the research development stages is illustrated in Figure 1.

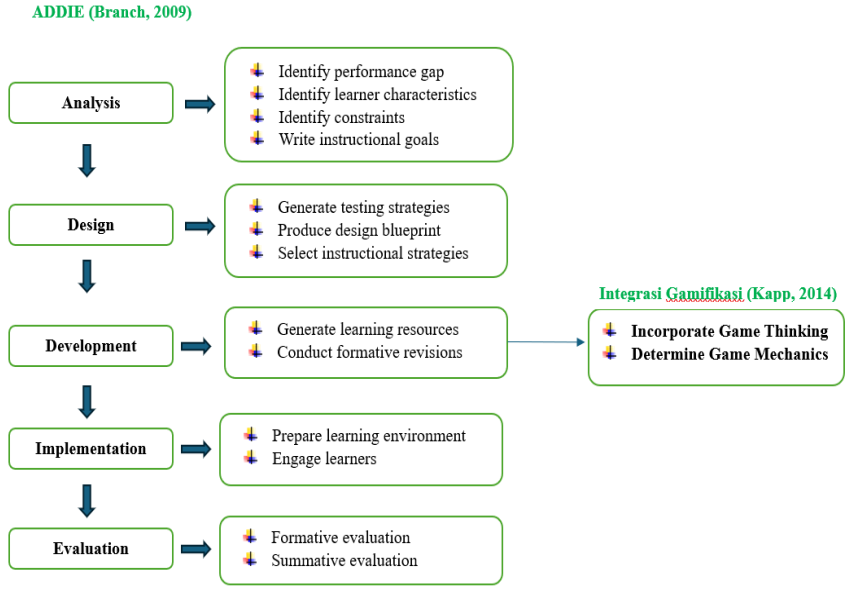


Figure 1. Integration of the ADDIE Model and Gamification Concept KAPP

First, Analysis. This stage identified the gap in students' polite behavior, learning needs, student characteristics, socio-cultural conditions, digital literacy, device availability, and madrasah support. Data were obtained through preliminary classroom observation; interviews with the Akidah Akhlak teacher and the Guidance and Counseling teacher (ten guiding questions each, covering the condition of students' politeness, forms of impolite behavior, current strategies and media, constraints, desired application features, the integration of local cultural values, and expectations for the application); a student-characteristics questionnaire (15 items, 20 students); and an analysis of the Akidah Akhlak learning outcomes on commendable morals together with the subject teacher. The socio-cultural characteristics of the students were identified from these sources. The interviews indicated that some students had not yet developed the habits of greeting teachers, saying salam, shaking hands, and communicating respectfully, whereas the questionnaire showed very high interest (91.80%) in digital media, videos, educational games, quizzes, and materials linked to everyday life and to examples of polite behavior. Constraints such as device availability, internet access, teachers' digital competence, and limited class time were also recorded. These findings determined the application's objectives, content, and features: each finding was translated into a design decision.

Second, Design. The needs-analysis findings were translated into design decisions. An assessment strategy was prepared first, namely a 20-item polite behavior questionnaire (5-point Likert scale) used as the pre-test and post-test. A design blueprint was then produced (learning flow, flowchart, storyboards, navigation, interfaces, and video scripts), with CRT as the main pedagogical framework, complemented by problem-based, reflective, and gamified learning. Because students' polite behavior toward teachers and peers was not yet optimal, the content drew on madrasah situations (greeting teachers, shaking hands, asking permission, and speaking respectfully) and included a light character game on politeness toward teachers. Because learning was still conventional and technology access and teachers' digital competence were limited, the material was delivered through a browser-based application with a teacher dashboard.

Third, Development. The design was developed into a web application using HTML, CSS, and JavaScript, Node.js with Express.js, and an SQLite database, deployed with Nginx and PM2. Students could access a light character game, material summaries, animated videos, a multiple-choice quiz, and a report page, while teachers could upload content, manage quiz items, and create student accounts through a dashboard. The ADDIE model was integrated with Kapp's gamification framework by incorporating "game thinking"—designing the learning process as a game-like experience—and establishing game mechanics such as points, badges, levels, challenges, progress tracking, rewards, and feedback. All gamification elements were tailored to the learning objectives, student characteristics, and the CRT cultural context. The product was then revised in stages: the instruments were validated first, followed by validation by

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12 experts (three each in media, instructional design, subject matter, and gamification) using five-point Likert instruments, and then by one-to-one (n = 3), small-group (n = 10), and field (n = 20) trials. Input from each stage was used to revise the product (examples are given in Table 4).

Fourth, Implementation. Before implementation, the teacher was trained to use the application, devices and internet access were prepared, and students were briefed on how to use the application and on the learning objectives. The teacher created student accounts through the dashboard. Each session followed the Akidah Akhlak chapter being taught, with about 50 minutes of application use and 20 minutes for remedial activities. The teacher acted as facilitator by guiding students and discussions, reinforcing values, linking the material to students' daily experiences, and giving feedback on their character during the game and remedial activities. The field trial (n = 20) examined practicality in real classroom conditions. A separate group of 57 students then completed the same 20-item questionnaire before and after using the application

Fifth, Evaluation. Formative evaluation ran throughout development, using expert validation and the one-to-one, small-group, and field trials with Likert-scale questionnaires. The scores were converted to percentages and categorized, and used to revise features and content before the next stage. Summative evaluation compared pre-test and post-test scores on the 20-item questionnaire, analyzed with N-gain and a paired-samples t-test. Feasibility and practicality were also judged from teachers' and students' responses.

Data were collected through observation, interviews, questionnaires, documentation, and measurements taken before and after the intervention. Observations were used to gather data on initial instructional conditions, polite behavior, student engagement, and the implementation of lessons using the application. Interviews were conducted with the Akidah Akhlak (Islamic Creed and Ethics) teacher and the Guidance and Counseling teacher to explore learning needs, the state of student character, instructional challenges, and the application's suitability for the madrasah environment. Questionnaires were used to obtain data on student needs, expert validation results, the application's practicality, teacher and student responses, and polite character traits. Documentation was used to record the processes of development, validation, revision, and instructional implementation.

Instruments

The expert validation and practicality instruments used five-point Likert scales, and the scores were converted into percentages. The main outcome instrument was the polite behavior scale administered as the pre-test and post-test.

Operational definition and theoretical basis. In this study, politeness (*kesantunan*) is defined as the internalization of Islamic ethical values (akhlak/adab) that is expressed in students' speech, conduct, respect for teachers, respect for peers, and ethical interaction in digital media. The definition draws on the conception

of adab as acting properly in a given situation, a refined etiquette that preserves unity and dignity [33]; on the view of politeness as the application of moral norms, cultivated in Islamic schools through religious habituation and teacher role modelling; on prophetic values as a foundation for politeness and character education[34]; and on the Prophet as the ideal model of conduct (QS. Al-Ahzab: 21). Operationally, politeness is the total score on a 20-item self-report scale, with possible scores from 20 to 100.

Indicators and items.

The scale consists of five aspects with four items each: polite speech, polite conduct, respect for teachers, respect for peers, and media ethics (digital interaction and CRT). Respondents rated how often they performed each behavior (always = 5, often = 4, sometimes = 3, rarely = 2, never = 1). Table 2 presents the indicators and example items. The same scale was used in the pre-test and post-test, and the complete items are provided in the appendix of the underlying study.

Table 2. Aspects, Indicators, and Example Items of the Polite Behavior Scale

Aspect (items)	Indicators	Example item
Polite speech (1–4)	Uses polite language to teachers, avoids harsh words toward peers, asks permission before speaking, says "please", "sorry", and "thank you"	"I speak to my teacher in polite language." (item 1)
Polite conduct (5–8)	Greets teachers, stays calm during explanations, does not interrupt others, shows respectful body language	"I greet my teacher with salam when we meet." (item 5)
Respect for teachers (9–12)	Listens attentively, does assignments seriously, expresses opinions politely, respects differing opinions	"I express my opinion to my teacher politely." (item 11)
Respect for peers (13–16)	Does not mock or belittle peers, helps peers in difficulty, respects peers' opinions, treats peers fairly	"I do not mock or belittle my friends." (item 13)
Media ethics: digital and CRT (17–20)	Writes polite comments, does not spread hurtful information, uses good language in the learning application, respects cultural differences in digital interaction	"I write polite comments on social media or the class group." (item 17)

[33] Wisam Kh. Abdul-Jabbar, "The Ethics of Disagreement (Adab Al-Ikhtilaf): Religious Education for Intercultural Competence in Arabo-Islamic Pedagogy," *British Journal of Religious Education* 48, no. 3 (2026): 344–59, https://doi.org/10.1080/01416200.2026.2619036.

[34] Sugeng Riyanto et al., "The Application of Moderate Politeness into School Practices of an Urban Muhammadiyah Primary Students in the Era of Global Communication," *International Journal of Language Education* 7, no. 4 (2023): 729–47, https://doi.org/10.26858/ijole.v7i4.58985.

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*Validity and reliability***.**

The research instruments, including the polite behavior scale, were first reviewed by two instrument experts using a rubric that covered content, construct, usability, and language aspects. The experts gave scores of 91% and 92%, both in the "very feasible" category. The scale was then tried out on 10 students who did not take part in the main study. Item validity was tested using Pearson product-moment correlation, and no item was dropped. Reliability, estimated with Cronbach's alpha, was 0.85, indicating good internal consistency.

Observation. Observation played a supporting, descriptive role. Preliminary classroom observation and direct observation of learning conditions supported the needs analysis, and during implementation the teacher monitored students while they used the application. These observations were not scored and are not used as outcome evidence.

Intervention Procedure and Research Design

The change in polite behavior scores was examined using a one-group pretest–posttest design (O1 × O2) without a comparison group. The pre-test (polite behavior scale) was first administered to the 57 students. Students then used RAVID in every Akidah Akhlak meeting, following the sequence of chapters of the subject material [once a week for 10 weeks]. In each meeting, RAVID was used for 50 minutes, beginning with the character-based game as apperception, followed by the material summary, the instructional video, and the quiz; the remaining 20 minutes were allocated to remedial activities. The teacher supervised and guided students while they used the application and gave feedback on students' character during the game and the remedial activities, whereas the application delivered the content and the quiz feedback. After all meetings had been completed, the post-test was administered using the same scale.

The data were analyzed using qualitative and quantitative descriptive techniques. Qualitative data consisting of interview results, observation notes, validator comments, and user feedback were analyzed through categorization, simplification, interpretation, and conclusion-drawing to serve as a basis for application improvements. Quantitative data from expert validation and practicality questionnaires were analyzed using score percentages calculated via the formula $P = \frac{Obtained\ Score}{Maximum\ Score} \times 100$. The effectiveness of the application was analyzed by comparing pretest and posttest scores and calculating the N-gain using the formula $g = \frac{Post\ test\ Score - Pre\ test\ Score}{Maximum\ Score - Pret\ est\ Score}$.

Prior to hypothesis testing, a normality test was conducted. Normally distributed data were analyzed using the paired-samples t-test, whereas non-normally distributed data were analyzed using the Wilcoxon signed-rank test at a significance level of $p < 0.05$. Effect sizes were also calculated to determine the magnitude of the application's impact, and the quantitative results were subsequently interpreted alongside observations of student behavior.

RESULT

Design and Characteristics of a CRT-Based Interactive Learning Web Application

This research successfully produced an interactive learning application named RAVID, which was specifically developed to support Akidah Akhlak (Islamic Creed and Ethics) instruction for eighth-grade students at Madrasah Tsanawiyah Attaqwa Putra Bekasi. RAVID is a web-based learning application designed to provide students with a more interactive, accessible, and engaging learning experience. The application was developed using HTML, CSS, and JavaScript for the frontend, Node.js with the Express.js framework for the backend, and SQLite for database management. It was deployed on an online server using Nginx and PM2 to ensure stable performance, continuous accessibility, and reliable system operation.

The RAVID application provides two types of access, namely student access and teacher access. The student interface consists of a welcome screen, user authentication, character-based gameplay, a main dashboard, material summaries, instructional videos, multiple-choice quizzes, and learning outcome reports. These features are designed to provide students with an interactive learning experience and support the development of polite and respectful behaviour, as shown in Figure 2.

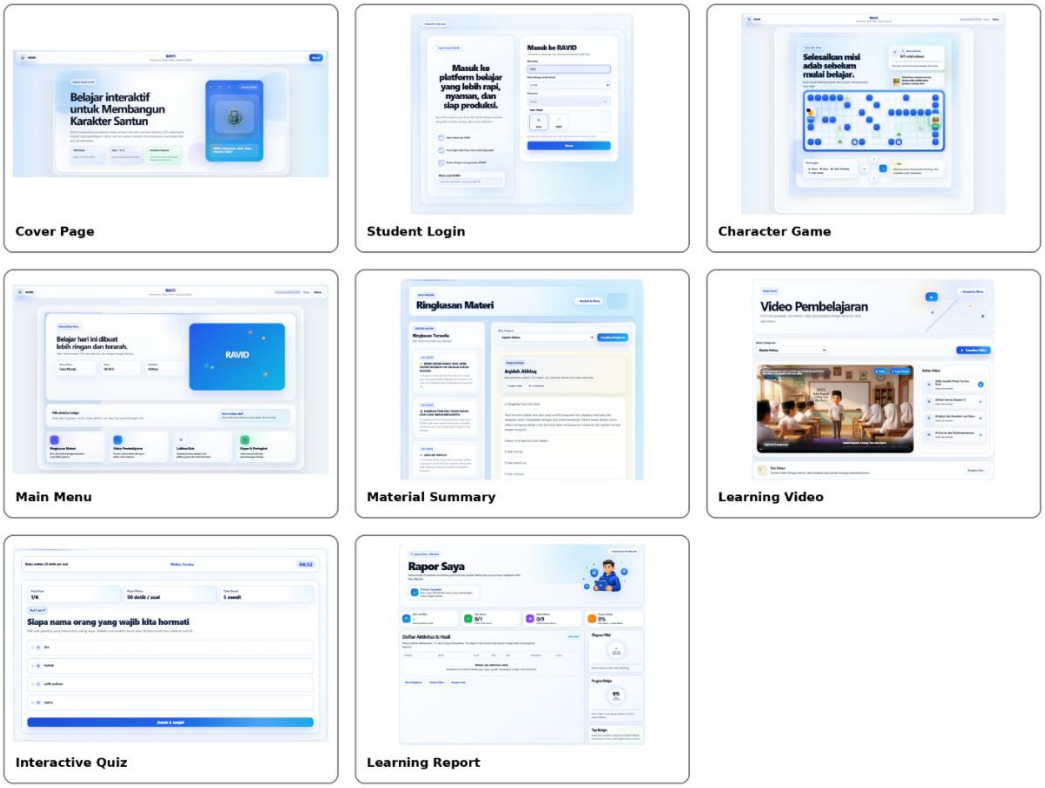


Figure 2. Student Interface od RAPID Application

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The teacher interface provides functions for managing learning materials, instructional videos, quiz questions, and student accounts, as well as monitoring learning activities. This structure enables teachers to update and manage learning content independently without modifying the core system of the application, as presented in Figure 3.

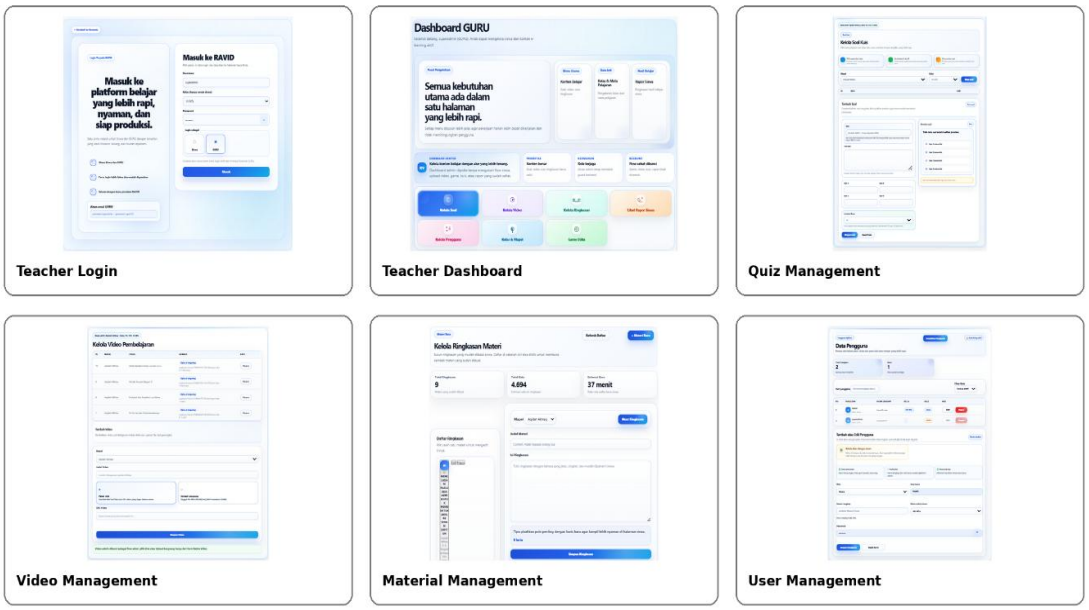


Figure 3. Teacher Interface od RAPID Application

Culturally Responsive Teaching (CRT) is integrated by linking Akidah Akhlak (Islamic creed and ethics)

CRT was integrated into RAVID through a traceable chain from the needs analysis to design decisions. The needs analysis showed that (i) some students had not developed the habits of greeting teachers, saying salam, shaking hands, and communicating respectfully; (ii) students were highly interested (91.80%) in digital media, videos, educational games, quizzes, and materials linked to daily life and to examples of polite behavior; and (iii) Akidah Akhlak instruction was still delivered mainly in a normative and textual manner. These findings were translated into the components summarized in Table 3. The madrasah practices of greeting and showing respect to teachers became the content of the three missions of the character-based game; the Islamic ethical sources of politeness (Qur'anic verses and hadith, displayed after material-expert input) became the normative basis of the material summaries; and everyday situations with teachers, parents, and the surrounding environment became the contexts of the videos and quiz items. Because RAVID was not compared with a version without CRT, these results show how CRT was implemented, not how much CRT itself contributed to the outcomes.

Table 3. Needs-Analysis Findings and Their Translation into RAVID Design Decisions

Component	Needs-analysis evidence	Design decision and CRT integration
Character-based game	Teachers and the counselor reported that some students had not developed the habits of greeting teachers, saying salam, and shaking hands; students were highly interested in educational games.	Three missions on proper conduct before learning and respectful behavior toward teachers (greetings, respect, learning etiquette); obstacles were added after gamification-expert input.
Material summary	Students were highly interested in material linked to daily life; Akidah Akhlak instruction was still delivered mainly in a normative and textual manner.	Summaries of commendable morals aligned with the Akidah Akhlak textbook and linked to politeness toward teachers, parents, and the surrounding environment; Qur'anic verses and hadith displayed after material-expert input.
Instructional videos	Students were highly interested in video-based learning and in examples of polite behavior presented through video or animation.	Cartoon-animation videos matched to each material summary, showing courteous behavior in everyday situations.
Interactive quiz and learning outcome report	Students were highly interested in quizzes and interactive challenges.	Ten multiple-choice items on social situations, based on the summary and the video; results are shown in a learning outcome report (raport).
Teacher dashboard	Constraints identified: teachers' digital competence, device and internet availability, and limited class time; the interviews explored the features teachers needed and the integration of local cultural values.	Teachers upload and manage materials, videos, and quizzes and create student accounts, so that content can be adapted to students' needs and cultural context.

Feasibility and Practicality of the RAVID Application

Before the product was evaluated, the validation instrument was reviewed by two instrument experts. The first validator assigned a feasibility score of 91%, while the second assigned a score of 92%. Both scores fell into the "highly feasible" category; therefore, the instrument was deemed suitable for evaluating the product.

The feasibility of the application was then assessed by 12 validators consisting of three media experts, three learning design experts, three material experts, and three gamification experts. Validation results are presented below.

Tabel 4. Feasibility Validation Results of the RAVID Application

Validation Aspect	Number of Validators	Average Score (%)	Category
Media	3	90.67	Highly Feasible
Learning Design	3	92.67	Highly Feasible
Material	3	91.33	Highly Feasible
Gamification	3	91.33	Highly Feasible
Overall Average	**12**	**91.50**	**Highly Feasible**

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The highest score was achieved in the instructional design aspect, at 92.67%. This result indicates that the application's objectives, flow, activities, media, and evaluation are perceived to be well-integrated. Media validation received a score of 90.67%, while content validation and gamification validation each scored 91.33%. Overall, the average rating of 91.50% indicates that the application meets the criteria for being highly suitable in terms of content, media, instructional design, and gamification.

Beyond the scores, the validators gave qualitative input that was used to revise the product before the user trials. Table 5 presents examples of this input and the corresponding revisions.

Table 5. Examples of Expert Input and Corresponding Revisions of RAVID

Validator	Input	Revision
Material validator	Display evidence from the Qur'an and hadith in the material.	Qur'anic verses and hadith are displayed in the material summaries.
Media validator	Provide explanations (descriptions) for the items in the RAVID application.	Explanatory notes were added to the application items.
Gamification validator	Create obstacles (challenges) in the light game.	Obstacles were added to the character-based game.

Following expert validation, the practicality of the application was evaluated in stages through one-on-one evaluations, small-group sessions, and field tests. The results are presented in Table 3.

Table 6. User Practicality Evaluation Results

Evaluation Stage	Number of Students	Average Score (%)	Category
One-to-one Evaluation	3	90.60	Highly Practical
Small-group Evaluation	10	91.20	Highly Practical
Field Trial	20	92.80	Highly Practical

In the one-on-one evaluation, three students with varying ability levels gave an average rating of 90.60%. The small-group evaluation yielded a score of 91.20%, while the field test resulted in a score of 92.80%. Practicality ratings were therefore consistently high across the three stages. Because each stage involved different students, the small differences between the stages cannot be attributed to product refinements; the interpretation is limited to the finding that RAVID received consistently high practicality ratings from students. The revisions documented in this study are those based on expert input (Table 5).

Thus, the research findings answer the second research question, demonstrating that the RAVID application possesses a very high level of feasibility and exhibits consistent perceived practicality across the one-on-one evaluation, small-group, and field test stages.

Changes in Students' Self-Reported Polite Behavior Scores

The change in polite behavior scores was examined in a one-group pretest–posttest design with 57 eighth-grade students (Table 1) and no comparison group. Politeness was measured with the 20-item self-report scale described in the Methods (five-point frequency scale, maximum score 100). The scale captures how often students report practicing polite conduct; it does not directly measure observed behavior in daily interactions, and no structured observation data were analyzed. The results therefore describe changes in self-reported polite behavior scores. The descriptive results are presented in Table 7.

Table 7. Descriptive Statistics of Students' Self-Reported Polite Behaviour Scores

Measurement	N	Mean	Standard Deviation	Category
Before using the application	57	72.30	3.68	Good
After using the application	57	93.75	2.92	Very Good
Improvement	57	21.45	4.33	Increased by 21.45 points

The average score prior to using the application was 72.30, falling into the "good" category. After students participated in instruction using RAVID, the average score rose to 93.75, placing it in the "very good" category. All students achieved post-intervention scores higher than their initial scores, with individual increases ranging from 10 to 29 points. The data indicate an average increase of 21.45 points.

The relative change in scores was analyzed using N-gain.. The analysis results show an average N-gain of 0.772 (or 77.23%), with a minimum score of 0.54 and a maximum of 0.93. Based on N-gain classification, this value falls into the high category. A total of 41 students (71.93%) achieved an N-gain in the high category, while 16 students (28.07%) fell into the medium category. No students obtained a low N-gain. The summary of the effectiveness test results is presented in Table 8.

Tabel 8. Summary of the RAVID Application Effectiveness Test Results

Indicator	Result
Mean before treatment	72.30
Mean after treatment	93.75
Mean improvement	21.45
95% confidence interval of improvement	20.31–22.60
Mean N-gain	0.772
N-gain percentage	77.23%
t-value	37.443
Degrees of freedom	56
p-value	<0.001
Cohen's *dz* effect size	4.96

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A paired-samples t-test revealed a significant difference between scores before and after using the application, $t(56) = 37.443$, $p < 0.001$. The 95% confidence interval indicates that the mean increase is estimated to be between 20.31 and 22.60 points. The effect size (Cohen's dz = 4.96) indicates a very large effect on politeness scores.

Based on these results, the null hypothesis stating that there was no significant improvement in students' politeness after using the RAVID application was rejected. Conversely, the research hypothesis stating that the use of the CRT-based interactive web learning application significantly strengthened students' politeness was accepted.

DISCUSSION

This study resulted in the development of RAVID, an interactive web-based learning application grounded in CRT principles. Experts rated it highly feasible (91.50%), student users rated it highly practical (90.60%–92.80%), and students' self-reported polite behavior scores were higher after its use (72.30 to 93.75; N-gain = 0.772). Rather than restating these figures, this section interprets what they may mean. Three features of the development process offer plausible explanations for the high ratings. First, the design decisions were derived from a needs analysis (Table 3), so that content and features matched students' stated interests and the problems reported by teachers. Second, the application was validated by four groups of experts (media, instructional design, material, and gamification), all of whom rated it above 90%, and their input (Table 4) was used to refine the product, for example by adding Qur'anic verses and hadith to the material, explanatory notes to application items, and obstacles to the game. Third, the application is web-based and teacher-managed, and the practicality questionnaires, which addressed ease of use, display, the opening game, and understanding of the material, were answered consistently highly by students. These explanations interpret the development process and were not tested empirically in this study.

The literature offers theoretical explanations for the high ratings and the higher scores observed in this study; these explanations are interpretive and were not tested empirically here. Previous research suggests that the value of web-based learning does not depend solely on the technology [35]. T One possible explanation is that using students' cultural contexts as part of the learning process may increase relevance and engagement [36]. Integrating Akidah Akhlak (Islamic Creed and Ethics) content with interactive activities may enables Islamic values to be

[35] Samantha Viano and Jennifer Darling-Aduana, "Culturally Relevant Pedagogy in K-12 Online Learning: A Systematic Review," *Review of Educational Research* 96, no. 3 (March 18, 2026): 724–60, https://doi.org/10.3102/00346543251320355.

[36] Ialuna, Civitillo, and Jugert, "Culturally Responsive Teaching, Teacher-Student Relationship and School Belongingness: A Multi-Informant Study in Ethnically Diverse Classrooms."

learned in a more contextual and meaningful way [37]. In addition, gamification elements may increasing student engagement [38], Meanwhile, teacher assistance is considered necessary to provide direction, feedback, and support during web-based learning [39]. The material on manners is presented through experiences relevant to students' daily lives, such as exchanging greetings, greeting teachers, asking for permission, communicating with peers, and showing respect for others [40]. This presentation may help students connect the concept of Aqidah Akhlak with the social situations they experience. This interpretation is in line with [41], which shows that culturally responsive education can produce positive outcomes when students' cultural knowledge and experiences are used in learning. A Systematic review by Viano & Darling-Aduana (2026)[42] of 42 studies also indicates that the principles of academic excellence, cultural competence, and critical consciousness can be integrated into online learning whether synchronous, asynchronous, or blended.

The use of videos, illustrations, case studies, role-playing, and situational quizzes provides students with opportunities to observe behavior, assess situations, consider consequences, and determine appropriate responses [43]. This process may help ensure that character education does not stop at mastering the

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[37] Ayse Demirel Ucan and Andrew Wright, "Improving the Pedagogy of Islamic Religious Education Through an Application of Critical Religious Education, Variation Theory and the Learning Study Model," *British Journal of Religious Education* 41, no. 2 (2019): 202–17, https://doi.org/10.1080/01416200.2018.1484695; Johar et al., "Enhancing Mathematical Communication and Islamic Values in Islamic and Regular Schools through Interactive Worksheets."

[38] Kapp, *The Gamification of Learning and Instruction: Game-Based Methods and Strategies for Training and Education*; Judy Julieth Ramírez Ruiz, Ana Dolores Vargas Sanchez, and Oscar Rafael Boude Figueredo, "Impact of Gamification on School Engagement: A Systematic Review," *Frontiers in Education* 9 (2024): 1466926, https://doi.org/10.3389/feduc.2024.1466926.

[39] Jinze He, Qiang Wang, and Hanjin Lee, "Enhancing Online Learning Engagement: Teacher Support, Psychological Needs Satisfaction and Interaction," *BMC Psychology* 13 (2025): 696, https://doi.org/10.1186/s40359-025-03016-0; Daniel Kangwa et al., "Enhancing Student Engagement in Online Education: The Role of Self-Regulation and Teacher Support in Zambia," *Discover Education* 3 (2024): 156, https://doi.org/10.1007/s44217-024-00216-5.

[40] Kathleen McCallops et al., "Incorporating Culturally Responsive Pedagogy within Social-Emotional Learning Interventions in Urban Schools: An International Systematic Review," *International Journal of Educational Research* 94 (2019): 11–28, https://doi.org/https://doi.org/10.1016/j.ijer.2019.02.007.

[41] Aronson and Laughter, "The Theory and Practice of Culturally Relevant Education: A Synthesis of Research Across Content Areas."

[42] Viano and Darling-Aduana, "Culturally Relevant Pedagogy in K-12 Online Learning: A Systematic Review."

[43] Hiba Zarglayoun et al., "Assessing and Optimizing Socio-Moral Reasoning Skills: Findings from the MorALERT Serious Video Game," *Frontiers in Psychology* 12 (2022): 767596, https://doi.org/10.3389/fpsyg.2021.767596; Tessa van der Leij et al., "Designing a Module for Supporting Secondary Biology Students' Morality Through Socioscientific Issues in the Human-Nature Context," *Journal of Biological Education* 58, no. 5 (2024): 1186–1203, https://doi.org/10.1080/00219266.2023.2174160.

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definition of politeness but extends to activities involving reflection and moral decision-making [44]. Finding by Sakti et al. (2024)[45] demonstrates that integrating local wisdom through an ethnopedagogical approach can enhance cultural awareness while simultaneously supporting character development. Meanwhile, Sarkadi et al. (2022)[46] demonstrates that learning involving reflection, engagement, collaboration, and elaboration can help students understand and internalize character values.

Gamification elements such as missions, challenges, points, rewards, feedback, and learning progress may help explain the high level of acceptance and the improvement in student scores [47]. This element provides clear objectives, information on achievements, and opportunities to repeat learning activities [48]. Research by Sailer & Homner (2020)[49] shows that gamification has a significant influence on cognitive, motivational, and behavioral learning outcomes, although the magnitude of the influence is influenced by the context and design of the gamification. These results are supported by Huang et al. (2020)[50], who found that gamification has a positive impact on learning outcomes, with effect sizes ranging from small to moderate. The magnitude of this impact varies depending on the gamification elements, the learners' educational level, and the subject area involved. Khaldi et al. (2023)[51] further explains that goals, rewards, challenges, feedback, and progress indicators are essential elements that can clarify learning achievements, provide recognition, and support learner motivation.

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[44] Baruch B Schwarz, Michael Baker, and Nili Brandel, "Seeds for Democracy: Understanding European Values in Educational Dialogues," *Frontiers in Education* 10 (2025): 1662663, https://doi.org/10.3389/feduc.2025.1662663; Tessa van der Leij et al., "Supporting Secondary Students' Morality Development in Science Education," *Studies in Science Education* 58, no. 2 (2022): 141–81, https://doi.org/10.1080/03057267.2021.1944716.

[45] Syahria Anggita Sakti, Suwardi Endraswara, and Arif Rohman, "Revitalizing Local Wisdom within Character Education through Ethnopedagogy Apporach: A Case Study on a Preschool in Yogyakarta," *Heliyon* 10, no. 10 (May 30, 2024), https://doi.org/10.1016/j.heliyon.2024.e31370.

[46] Sarkadi et al., "Integrating Character Education Into the RECE Learning Model Through Pancasila and Citizenship Education Subjects," *Frontiers in Education* Volume 7- (2022), https://doi.org/10.3389/feduc.2022.841037.

[47] Shurui Bai, Khe Foon Hew, and Biyun Huang, "Does Gamification Improve Student Learning Outcome? Evidence from a Meta-Analysis and Synthesis of Qualitative Data in Educational Contexts," *Educational Research Review* 30 (2020): 100322, https://doi.org/https://doi.org/10.1016/j.edurev.2020.100322.

[48] Amina Khaldi, Rokia Bouzidi, and Fahima Nader, "Gamification of E-Learning in Higher Education: A Systematic Literature Review," *Smart Learning Environments* 10, no. 1 (2023): 10, https://doi.org/10.1186/s40561-023-00227-z.

[49] Michael Sailer and Lisa Homner, "The Gamification of Learning: A Meta-Analysis," *Educational Psychology Review* 32, no. 1 (2020): 77–112, https://doi.org/10.1007/s10648-019-09498-w.

[50] Rui Huang et al., "The Impact of Gamification in Educational Settings on Student Learning Outcomes: A Meta-Analysis," *Educational Technology Research and Development* 68, no. 4 (2020): 1875–1901, https://doi.org/10.1007/s11423-020-09807-z.

[51] Khaldi, Bouzidi, and Nader, "Gamification of E-Learning in Higher Education: A Systematic Literature Review."

The findings of this study are consistent with previous research showing that CRT and gamification can support engagement and learning outcomes [52]. However, this study differs in terms of context, target audience, and the form of integration. Previous research has largely applied culturally responsive teaching to science, mathematics, language, multicultural education, or academic achievement [53], Differences in subject, educational level, and media format alone, however, do not constitute a conceptual contribution. What distinguishes this study is how CRT was adapted. First, the cultural resources used were the Islamic ethical teachings on adab (Qur'anic verses and hadith, as required by the content experts) and the etiquette practices of the madrasah, such as greeting teachers, shaking hands, and asking permission, rather than ethnic or linguistic diversity. Second, the targeted outcome was politeness as an ethical disposition rather than academic achievement. Third, the chain from the needs analysis to the design decisions is documented (Table 3), and teacher-managed content allows teachers to adapt the cultural context of the materials. We therefore position the contribution as a contextual adaptation of CRT from academically oriented instruction to character-based learning in Islamic education, which still needs to be tested with stronger designs. A synthesis by Aronson & Laughter (2016)[54] demonstrates that the implementation of culturally responsive education has been carried out across various fields of study, whereas recent studies by Viano & Darling-Aduana (2026)[55] emphasizing the need for more comprehensive integration within the digital learning environment.

Theoretically, the development process suggests that religious and cultural values can be integrated into a digital learning application through contextual learning experiences, although the present data do not show that this integration caused the change in scores. Culture serves not merely as a backdrop for learning but as a resource for understanding the forms, rationales, and consequences of polite behavior. Practically, RAVID can serve as a supporting tool for Akidah Akhlak (Islamic Creed and Ethics) instruction, enabling teachers to update materials, videos, case studies, and questions to suit students' needs. However, the application is not intended to replace the teacher's role; teachers remain essential for modeling behavior, guiding reflection, reinforcing values, and

[52] Minzi Li, Siyu Ma, and Yuyang Shi, "Examining the Effectiveness of Gamification as a Tool Promoting Teaching and Learning in Educational Settings: A Meta-Analysis," *Frontiers in Psychology* Volume 14 (2023), https://doi.org/10.3389/fpsyg.2023.1253549.

[53] Daniel Gbormittah et al., "Culturally Responsive Pedagogy Model Integration in Mathematics Education: Perceptions and Practices among Ghanaian Teachers," *Social Sciences & Humanities Open* 12 (2025): 102036, https://doi.org/https://doi.org/10.1016/j.ssaho.2025.102036; Jeremy Bernier et al., "Exploring Culturally Responsive Teaching Practices in Computational Thinking + Science Lesson Planning," *Discover Education* 4, no. 1 (2025): 465, https://doi.org/10.1007/s44217-025-00897-6.

[54] Aronson and Laughter, "The Theory and Practice of Culturally Relevant Education: A Synthesis of Research Across Content Areas."

[55] Viano and Darling-Aduana, "Culturally Relevant Pedagogy in K-12 Online Learning: A Systematic Review."

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fostering the habit of politeness in real-world interactions. Findings by Sarkadi, (2022) [56] and Sakti, (2024)[57] also demonstrates that character building requires the active involvement of educators, as well as a connection between learning, culture, and the students' social environment.

The findings of this study are best interpreted within the scope of a development study, which examined the feasibility, practicality, and initial effectiveness of RAVID through a one-group pretest-posttest design with eighth-grade students at one Madrasah Tsanawiyah (Islamic junior high school). Accordingly, the improvement in politeness scores is understood as a change that emerged within an integrated learning ecosystem of the application, teacher facilitation, classroom interaction, and students' active participation. These initial findings leave room for further strengthening, particularly in clarifying the specific contribution of RAVID within this broader ecosystem. The evidence can also be extended to wider contexts and enriched with complementary sources of data to give a more comprehensive picture of students' character development.

Future research should employ experimental or quasi-experimental designs with comparison groups, involve madrasah from diverse sociocultural backgrounds, and conduct follow-up measurements after the intervention concludes. Character assessment should also integrate student questionnaires, structured observations, teacher and peer evaluations, behavioral records, and in-app activity data. Subsequent studies could separately examine the contributions of cultural context, videos, reflection, case studies, and specific gamification mechanisms to identify which components most significantly influence the character trait of politeness. Such analysis is crucial, as meta-analyses of gamification indicate that its effectiveness is shaped by design, context, duration, social interaction, and the alignment of game elements with learning objectives.

CONCLUSION

This study concludes that the RAVID interactive web-based learning application, grounded in Culturally Responsive Teaching (CRT), was successfully developed as a learning medium for Akidah Akhlak (Islamic Creed and Ethics). It integrates course materials, videos, quizzes, character-based games, and reflection activities, alongside teacher-managed content, and connects Islamic values of adab and madrasah etiquette to students' daily interactions. Expert validation (averaging 91.50%) and student user trials (90.60% to 92.80%) indicate that the application is highly feasible and practical in terms of content, media, instructional design, gamification, and ease of use. After using the application, students' self-reported polite behavior scores were higher (72.30 to 93.75; N-gain = 0.772, categorized as high; $t(56) = 37.443$, $p < 0.001$). Because the study used

[56] Sarkadi et al., "Integrating Character Education Into the RECE Learning Model Through Pancasila and Citizenship Education Subjects."

[57] Sakti, Endraswara, and Rohman, "Revitalizing Local Wisdom within Character Education through Ethnopedagogy Apporach: A Case Study on a Preschool in Yogyakarta."

a one-group pretest–posttest design with a self-report scale, this increase is an encouraging preliminary indication. RAVID can therefore serve as a supporting medium for Akidah Akhlak instruction in Madrasah Tsanawiyah (Islamic junior high schools), with teachers continuing to model and reinforce polite behavior. Further research is needed with control groups, broader school coverage, behavioral observation and other data sources, and longitudinal measurements; ongoing development focuses on refining reflection features and student progress monitoring.

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AUTHOR CONTRIBUTIONS

F.M.: Conceptualization, methodology, application development, data collection, data analysis, and writing original draft. H.R.: Supervision, validation, writing review and editing, and final manuscript review. Y.W.: Supervision, validation, and writing review and editing.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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