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AI-Augmented Resilience Through Smart TV-Mediated Learning: A Qualitative Case Study of Academic Resilience, Psychological Well-Being, and Growth Mindset Among Senior High School Students

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Abstract

This study explores how the integration of artificial intelligence (AI) through Smart TV/Interactive Flat Panel (IFP) technology was perceived by students and teachers as a classroom-based psycho-pedagogical support mechanism for Grade X students at SMAN 1 Mentaya Hilir Selatan, East Kotawaringin, Indonesia. While AI in education is commonly examined as a cognitive tool for personalized instruction, less attention has been paid to its affective and communal roles in strengthening students' coping experiences, emotional safety, and willingness to revise mistakes. The study was conducted during one semester from October 2025 to February 2026 in Grade X learning activities involving English, history, coding, and informatics lessons. The AI tools used included ChatGPT, Gemini, Copilot, Perplexity, or school-approved AI assistant, which were accessed through teacher-led and student-assisted classroom routines and displayed on Smart TV/IFP screens. This study employed a descriptive qualitative case-study design involving 21 informants: 15 Grade X students and six supporting school informants consisting of the vice principal for curriculum affairs, counseling teacher, and subject teachers. Data were collected through in-depth interviews, classroom observation, digital documentation, and learning artifacts, and analyzed using the interactive model of Miles, Huberman, and Saldana. The findings reveal three central mechanisms. First, AI served as a non-judgmental dialogic partner that helped students break down difficult tasks, regulate frustration, and recover from academic setbacks. Second, the large-screen display created a Digital Mirroring Effect, in which the visible process of AI-supported trial, error, and revision normalized mistakes and encouraged a growth mindset. Third, teacher and counselor facilitation transformed AI-Smart TV integration into a safer classroom ecology that reduced academic anxiety and improved students' perceived psychological well-being. However, a negative case also indicated the risk of digital dependency when AI was used merely to copy answers. The study proposes AI-Augmented Resilience and Digital Mirroring Effect as interpretive, case-based psycho-pedagogical mechanisms,emphasizing that AI is most educationally productive when mediated by shared visualization, ethical guidance, and authentic assessment.

Keywords: Artificial intelligence; Academic resilience; Psychological well-being; Growth mindset; Smart TV; Digital mirroring effect

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INTRODUCTION

The rapid expansion of digital technology has transformed the ecology of schooling. Artificial intelligence (AI) is increasingly used to support personalized learning, generate feedback, assist information searching, and provide adaptive explanations (Fortuna et al., 2025; Hariyanto et al., 2025; Strielkowski et al., 2025). In many schools, AI is still treated mainly as

a cognitive instructional tool, while students' affective experiences in AI-supported learning receive less attention. This limitation is important because contemporary students face not only conceptual difficulty, but also academic anxiety, fear of failure, post-pandemic well-being loss, and pressure to perform in increasingly competitive curricula (Alotaibi, 2026; Fitas, 2025; Li & Awang, 2026; Ma et al., 2025; Marzuki et al., 2023).

Academic resilience has therefore become a strategic construct in twenty-first century learning. It refers to students' dynamic capacity to adapt, persist, and recover from academic difficulties. Resilience is not formed in isolation; it is linked to psychological well-being and growth mindset (Abdelrahman et al., 2025; Deakin Crick et al., 2015; Polat, 2024). Psychological well-being provides emotional stability and a sense of environmental mastery, whereas growth mindset encourages students to interpret mistakes as temporary and improvable rather than as evidence of fixed inability (Y. Meng et al., 2025; Qian & Qiu, 2026; Tao et al., 2022; Zeng et al., 2016). In this sense, resilience emerges from the interaction between personal resources and the learning ecology that surrounds students.

Previous research on AI in education has generally shown that AI can support cognition through adaptive feedback, automated explanation, learning analytics, writing assistance, and self-regulated learning support. In this stream, AI is commonly conceptualized as an individualized cognitive assistant that helps learners access information, reduce cognitive load, or receive immediate feedback. However, this line of research tends to pay less attention to what happens when AI interaction becomes visible to peers in a shared classroom space.

A second body of work on Smart TV, Interactive Flat Panel, and shared-screen learning emphasizes visibility, multimodal presentation, classroom interaction, collaboration, and teacher-led explanation. Shared-screen technologies can transform private learning material into a communal object of discussion. Nevertheless, this research usually treats the screen as a presentation or interaction medium, not as a mediator of students' emotional experience when confronting mistakes, uncertainty, and academic pressure.

The gap between these two research streams is important. AI studies explain how learners receive adaptive support, while Smart TV/IFP studies explain how classroom visibility can support interaction. What remains insufficiently understood is how AI-supported thinking changes when it is displayed publicly through a large classroom screen. In a personal-device setting, prompting, error, revision, and feedback remain mostly private. In a Smart TV/IFP-mediated setting, these processes can become visible, discussable, and collectively interpreted. This public visibility may influence how students experience mistakes, ask questions, and recover from confusion. Therefore, the scientific significance of this study is not simply that AI and Smart TV are combined, but that their combination may produce a distinct psycho-pedagogical mechanism related to coping, emotional safety, and growth-oriented revision.

The state of the art in AI in education indicates that AI can support feedback, learning analytics, adaptive scaffolding, and even psychosocial assistance. Prior studies have shown that AI-based chatbots, adaptive platforms, and learning analytics can improve engagement, motivation, and early detection of academic distress (Na Meng et al., 2025; Shahzad et al., 2024; Tang et al., 2026; Wu et al., 2025; Xiangming & Wei, 2026; Yang & Rui, 2025). Meanwhile, Smart TV and interactive display technologies can improve visibility, classroom interaction, and shared learning experiences (Dimitriadou & Lanitis, 2023, 2023; Haleem et al., 2022; Sharma et al., 2020; Stevenson et al., 2022). However, these two streams of research are often discussed separately: AI research commonly focuses on individual use through personal devices, while Smart TV research tends to emphasize multimedia presentation and classroom engagement.

This separation produces an important research gap. Limited studies have examined how AI becomes psychologically meaningful when it is projected through Smart TV/IFP as a communal classroom medium (Bill et al., 2022; Wahab et al., 2026). In a personal-device setting, AI interaction is private and individualized. In a large-screen setting, however, the

process of asking, receiving, revising, and evaluating AI responses becomes publicly visible (Chaudhry & Debi, 2024; Merwin et al., 2025; Register et al., 2025; Wahab et al., 2026). This configuration may shift AI from a private cognitive assistant into a collective psycho-pedagogical support mechanism that students and teachers perceive as emotionally safer and more collaborative. The present study addresses this gap by examining the AI-Smart TV integration at SMAN 1 Mentaya Hilir Selatan, a Sekolah Penggerak with 21 Smart TV/IFP units, 200 Mbps internet bandwidth, and 15 access points supporting digital classroom activities.

This study aims to explore students' subjective experiences in interacting with AI as a dialogic partner for mitigating academic pressure; to describe the implementation pattern of AI through Smart TV/IFP as a shared classroom support mechanism in the learning ecosystem; and to interpret the dynamic interconnection between psychological well-being, growth mindset, and academic resilience mediated by AI and Smart TV technology. The contribution of this study is twofold. Theoretically, it proposes the concept of AI-Augmented Resilience and Digital Mirroring Effect not as established universal theories, but as interpretive concepts generated from this case to extend discussion on academic resilience and growth mindset theory in digital classrooms. Practically, it offers a human-centered model for schools to use digital infrastructure not only for instruction, but also for psychological support, ethical AI literacy, and resilience-building.

METHOD

Design and rationale

This study used a descriptive qualitative case-study design. The design was selected because the research focused on the meaning-making process, subjective experience, and situated classroom practices surrounding AI integration through Smart TV/IFP. Rather than measuring the statistical effect of AI, this study investigated how students and teachers interpreted AI-assisted learning as part of an emerging psycho-pedagogical classroom support mechanism.

The case-study approach was appropriate because SMAN 1 Mentaya Hilir Selatan, East Kotawaringin, represents a distinctive school context: it combines Sekolah Penggerak status, large-scale Smart TV/IFP infrastructure, and teacher-counselor collaboration in digital learning. This case allowed the researchers to examine AI not as an isolated application, but as part of a socio-technical classroom ecology.

The case boundary was defined as the implementation of AI-supported learning displayed through Smart TV/IFP in one Grade X classroom context at SMAN 1 Mentaya Hilir Selatan during one semester from October 2025 to February 2026. Thus, the “case” in this study was not the entire school system, but the situated AI-Smart TV learning practice involving selected Grade X students, subject teachers, and counseling support. The unit of analysis was students’ perceived coping experience, emotional comfort, growth-oriented response to mistakes, and teacher-mediated ethical use of AI during classroom learning.

Participants and research context

The study was conducted at SMAN 1 Mentaya Hilir Selatan, Kotawaringin Timur, Central Kalimantan, Indonesia. The school is accredited A and serves 560 students in 17 classes, supported by 30 teachers and nine educational staff. The digital ecosystem includes 21 Smart TV/IFP units, 200 Mbps internet bandwidth, and 15 access points that enable real-time classroom use of AI-supported applications.

The informants consisted of 21 participants. The main participants were 15 Grade X students selected from a class of 30 students based on active interaction with AI and Smart TV during learning, diversity of academic achievement, and variation in resilience-related behavior observed during preliminary observation. Supporting informants consisted of six school personnel: the vice principal for curriculum affairs, a counseling teacher, and teachers of

English, history, coding, and informatics. The supporting informants were included to triangulate the cognitive, affective, and behavioral aspects of students' AI-supported learning experiences (see Table 1).

Active interaction with AI was operationally defined as students' visible participation in at least two of the following activities: proposing prompts, responding to AI-generated explanations, comparing AI answers with teacher explanations, revising prompts after receiving incomplete answers, or explaining AI-assisted outputs to peers. Resilience-related behavior was identified through preliminary classroom observation, including students' willingness to retry after mistakes, persistence in completing difficult tasks, help-seeking behavior, and emotional response when facing confusing material. To reduce selection bias, the selected students represented high, medium, and low academic achievement categories and included both students who appeared confident and students who showed hesitation, task frustration, or counseling-related concerns.

Table 1. Participants, data sources, and analytical contribution

Participant/data source	Number	Data collection	Selection basis	Analytical contribution
Grade X students	15	15 semi-structured interviews; classroom observation across two meetings; student learning artifacts	Active AI-Smart TV interaction; varied achievement levels; includes two students under counseling guidance	Primary narratives on academic anxiety, resilience, growth mindset, and well-being
Vice principal for curriculum affairs	1	1 interview; school policy documentation	Responsible for curriculum and school digital policy	Contextual validation of Smart TV infrastructure and learning policy
Counseling teacher	1	1 interview; counseling-related field notes without revealing confidential student records	Directly observes student psychosocial conditions	Validation of psychological well-being and academic resilience themes
Subject teachers	4	4 interviews; observation of AI-Smart TV use in English, history, coding, and informatics lessons	English, history, coding, and informatics teachers involved in classroom AI use	Triangulation of classroom behavior, ethical AI use, and authentic assessment practices
Documentation and artifacts	-	AI prompts, AI responses, revised prompts, student work, classroom photos, observation notes, and school media documentation	Classroom photos, learning artifacts, AI prompts, media publication, and observation notes	Evidence of Digital Mirroring Effect, trial-error processes, and classroom implementation patterns

AI Tool and Classroom Implementation

The AI platforms used in this study were ChatGPT, Gemini, Microsoft Copilot, Perplexity, or other school-approved AI applications. Students accessed AI through teacher account, student personal accounts, browser-based access, or school-managed device. The Smart TV/IFP was used to display teacher prompts, student prompts, AI-generated responses, student revisions, and teacher feedback. AI use was implemented in three classroom routines: (1) teacher-led prompting, in which the teacher demonstrated how to ask AI for explanations; (2) student-assisted prompting, in which students proposed or revised prompts that were displayed on the Smart TV/IFP; and (3) reflective discussion, in which teachers and students evaluated the accuracy, usefulness, and ethical limits of AI-generated responses.

The observed lessons involved English, history, coding, and informatics. The learning tasks included generating an outline, clarifying historical concepts, debugging simple code, comparing explanations, summarizing reading materials, or translating and revising sentences]. Each AI-Smart TV learning session lasted approximately 100 minutes and was observed across two classroom meetings. During these sessions, teachers emphasized that AI outputs should not be copied directly. Students were asked to paraphrase, verify, revise, and explain the reasoning behind the answers.

Examples of prompts collected as learning artifacts included: “Explain this concept in simpler steps,” “Give an example for Grade X students,” “Why is my answer incorrect?” “Revise this paragraph but keep my own idea,” and “Show the steps to solve this problem.” These prompt artifacts were analyzed not as technical AI performance data, but as evidence of how students used AI to seek clarification, manage confusion, and revise their work.

Data Collection and Ethics

Data were collected through in-depth semi-structured interviews, classroom observation, and documentation. Interviews explored students' experiences of using AI, perceived academic pressure, emotional responses, willingness to try again after mistakes, and the perceived role of Smart TV as a shared learning screen. Observation focused on student interaction with AI content displayed on the large screen, peer discussion, response to errors, and teacher facilitation. Documentation included digital artifacts, AI prompts, student work, classroom photographs, and publicly available media coverage related to the school's Smart TV implementation.

The interview protocol covered five domains: (1) students’ previous experience with difficult academic tasks; (2) their experience of using AI for explanation, revision, and task completion; (3) their emotional response when AI-supported processes were displayed on the Smart TV/IFP; (4) their perception of mistakes, revision, and confidence after AI-supported learning; and (5) their understanding of ethical AI use. Sample interview questions included: “What do you usually do when you do not understand a task?” “How did AI help or not help you when learning became difficult?” “How did you feel when AI answers or student revisions were shown on the Smart TV?” “Did seeing mistakes and revisions on the screen change how you viewed mistakes?” and “What rules did the teacher give about using AI responsibly?”

Classroom observation was guided by an observation sheet covering: student participation in prompting, emotional response to difficult tasks, peer interaction, teacher feedback, visible revision of AI outputs, and potential signs of dependency such as copying AI-generated answers without explanation. Field notes were written immediately after each observed lesson and compared with interview data and artifacts.

The researchers treated participants' identities confidentially by using codes such as S-01, S-04, S-13, SB-BK-02, G-SJ, and G-INF. Participation was based on informed consent involving the school, parents, and students. Participants were informed about the purpose and procedures of the study and were given the right to withdraw without academic consequences.

Before data collection, the researchers obtained institutional permission from SMAN 1 Mentaya Hilir Selatan. Because the participants were senior high school students, parental

consent and student assent were obtained. The researchers did not collect sensitive counseling records; counseling teacher input was used only to validate general classroom behavior and students' perceived emotional responses. All quotations were anonymized, and any identifying details were removed from transcripts, observation notes, and learning artifacts. Digital data were stored in password-protected files accessible only to the research team.

Data Analysis

The data were analyzed using the interactive model of Miles et al. (2019), consisting of data collection, data condensation, data display, and conclusion drawing/verification. In the first coding cycle, statements and observed behaviors were labeled according to academic resilience, psychological well-being, growth mindset, AI interaction, and Smart TV-mediated collaboration. In the second cycle, the codes were organized into broader themes: adaptive coping through AI, Digital Mirroring Effect, reduced academic anxiety, teacher-guided ethical use, and digital dependency risk. Credibility was strengthened through source triangulation, technique triangulation, member checking, peer debriefing, and comparison between interview data and classroom observation.

The coding process followed four stages. First, interview transcripts, observation notes, and artifacts were read repeatedly to identify meaning units related to academic difficulty, AI use, emotion, mistakes, revision, and teacher facilitation. Second, initial codes were assigned to these meaning units, such as "asking AI without fear," "breaking down task," "public revision," "mistake becomes normal," "copying AI answer," and "teacher asks for paraphrase." Third, similar codes were grouped into categories, including "dialogic coping," "visible revision," "emotional safety," "ethical mediation," and "dependency risk." Fourth, these categories were developed into themes through comparison across student, teacher, counseling teacher, observation, and artifact data. The proposed concepts of AI-Augmented Resilience and Digital Mirroring Effect were generated at this interpretive stage; therefore, they are presented as case-based conceptual mechanisms rather than statistically verified models.

Trustworthiness was maintained through triangulation, member checking, peer debriefing, and negative-case analysis. Member checking was conducted by confirming selected interpretations with several participants and teachers. Peer debriefing was conducted among the research team to examine whether the themes were sufficiently grounded in the data. The case of S-13 was deliberately retained as a negative case because it challenged an overly positive interpretation of AI-Smart TV integration.

RESULTS AND DISCUSSION

The results are presented and discussed thematically because the study sought to interpret the psycho-pedagogical mechanisms emerging from AI and Smart TV integration. Four main findings answer the research questions: AI was perceived as a dialogic coping scaffold, Smart TV/IFP appeared to create a Digital Mirroring Effect, students reported greater emotional comfort during difficult tasks, and teacher facilitation became a necessary boundary condition to prevent digital dependency (see Table 2).

Table 2. Taxonomy of psycho-pedagogical findings from AI-Smart TV integration

Theme	Core evidence	Interpretation	Related construct	Pedagogical implication
AI as non-judgmental coping scaffold	S-04 reported that AI broke difficult material into logical steps; SB-BK-02 felt safe asking without social judgment.	AI reduced frustration by providing immediate, private-to-communal feedback that helped students try again.	Academic resilience	Teachers can use AI prompts to scaffold coping strategies rather than merely generate answers.

Theme	Core evidence	Interpretation	Related construct	Pedagogical implication
Digital Mirroring Effect	AI-supported trial-error-revision processes were displayed through Smart TV/IFP and observed collectively.	Public visualization normalized mistakes and converted failure into shared learning iteration.	Growth mindset	Large-screen AI use should highlight revision processes, not only final answers.
Reduced academic anxiety	Students reported lighter exam preparation; counseling and media documentation confirmed interactive learning reduced anxiety.	The classroom became emotionally safer because AI provided supportive, non-threatening explanations.	Psychological well-being	AI-Smart TV integration can support digital well-being when guided by teacher empathy.
Teacher as digital ethics navigator	The negative case S-13 used AI as an answer-copying shortcut; teachers responded through oral quizzes and paraphrase tasks.	AI benefits depend on regulation, authentic assessment, and ethical literacy.	Boundary condition	Schools need an AI Honor Code and assessment practices that reward reasoning and reflection.

AI as A Mediator of Adaptive Coping and Academic Resilience

The first finding shows that AI mediated students' adaptive coping when they encountered difficult learning tasks. Students did not only use AI to obtain answers; they used it to decompose complex material, ask repeated questions, compare explanations, and reduce the emotional burden of not understanding. This finding answers the first research question by showing that students interpreted AI as a dialogic partner that helped them manage academic pressure as perceived in their learning experience.

For example, S-04 described AI as useful because it could explain difficult material in smaller steps: “When the teacher explained the material, I sometimes understood only the general idea. But when I asked AI, it gave the explanation step by step, from the easiest part first. I felt less confused because I could ask again without being afraid of disturbing my friends or being laughed at.” This statement was supported by observation notes showing that students often asked AI to simplify concepts before teachers invited them to compare the AI response with classroom material.

In one observed session in the informatics lesson, students were asked to identify the logic of a simple programming problem. Several students initially had difficulty explaining why the program did not produce the expected output. The teacher then invited one student to type the prompt on the AI platform displayed through the Smart TV/IFP: “Explain this coding error in simple steps for Grade X students.” The AI response first provided a general explanation, but the teacher asked students whether the answer was specific enough. After several students said that the explanation was still too broad, the prompt was revised into: “Explain why this code does not run correctly, identify the possible error, and give a corrected version with a simple explanation.” The revised AI response was more structured and showed the error, the corrected code, and the reasoning behind the correction. Students then compared

the AI explanation with the teacher's explanation and were asked to paraphrase the solution in their own words. Observation notes recorded that students who were initially silent began to ask follow-up questions, and one student commented that seeing the mistake corrected on the screen made the task feel "not as difficult as before." This sequence shows that AI was not always used as a final-answer provider; in several episodes, it functioned as a scaffold for clarification and re-engagement.

The experience of S-04 indicates that AI changed difficult material into a sequence of manageable steps, thereby preventing frustration and helplessness. The experience of SB-BK-02 further shows that AI created a safe space for asking questions without fear of negative peer judgment. "Some students are actually afraid to ask questions directly in class because they worry that their friends will think the question is too simple. When AI is used, they can first ask for an explanation in simpler language. After that, they become more confident to discuss the answer with the teacher or friends." This evidence suggests that some students perceived AI as less judgmental than direct public questioning. However, the finding should be interpreted as perceived support, not as measured psychological change.

Scientifically, this mechanism can be interpreted as a shift from avoidance coping to problem-focused coping. In conventional classrooms, students who fear being judged may remain silent, postpone tasks, or depend on classmates. AI, when projected and discussed appropriately, provides an immediate explanation while allowing students to test alternative prompts. This finding is consistent with academic resilience theory, which emphasizes persistence, self-regulation, and recovery after difficulty. It also extends the theory by showing that resilience can be scaffolded by responsive technology when students experience AI as non-judgmental feedback rather than as evaluative authority (Manning et al., 2026; Polydoros et al., 2026; Sun et al., 2025).

The finding also relates to established knowledge on academic buoyancy. Everyday academic pressures, such as confusing tasks, deadlines, or low scores, do not always require major psychological intervention; often they require timely support that prevents small difficulties from becoming persistent anxiety (Majerová & Sokolová, 2025; Mastrokoukou et al., 2025; Rad et al., 2025; Salguero-Pazos & Reyes-de-Cózar, 2023). In this case, AI provided such timely support. However, the support became educationally meaningful only when students were guided to ask better questions, revise prompts, and reflect on the explanation (Almutairi et al., 2026; Lin & Chen, 2024; Pavone, 2025; Walter, 2024; Xia & Guo, 2025). Thus, AI appeared to support resilience-related learning behavior not by removing academic challenge, but by helping students remain engaged with the challenge (Jallali et al., 2026; Singh et al., 2026; Zhao, 2025).

Digital Mirroring Effect and Growth Mindset Formation

The second finding concerns the Digital Mirroring Effect, which emerged when AI interaction was displayed on Smart TV/IFP and observed collectively by the class. This effect refers to a classroom condition in which students can see the process of asking, receiving an imperfect answer, revising a prompt, and improving the result in real time. The finding answers the second research question by explaining how AI-Smart TV implementation became a shared psycho-pedagogical process rather than merely a media presentation strategy.

In the observed AI-Smart TV sessions, the teacher did not only show final AI answers. The teacher also displayed the process of revising prompts when AI responses were incomplete, too general, or inaccurate. For instance, in an informatics lesson on basic programming logic, the initial prompt was "Explain why this code does not work." The AI response was considered insufficient because it only provided a general explanation about syntax errors without identifying the specific logical problem in the student's code. The teacher then invited students to revise the prompt into "Explain why this Grade X student's code does not produce the expected output, identify the possible error, and give a corrected version with a simple step-by-step explanation." Students watched how the improved prompt produced a

clearer response, after which they discussed which parts could be used, revised, or rejected. This classroom episode became the empirical basis for the Digital Mirroring Effect.

This mechanism is important because growth mindset is not built only through motivational statements; it is formed when students repeatedly experience that mistakes can be revised and ability can grow through strategy. The statement from S-01, that wrong answers could be corrected by AI and therefore mistakes felt less embarrassing, illustrates how public visualization lowered the stigma of error. S-01 stated "When my answer was wrong and shown on the Smart TV, I was embarrassed at first. But after the teacher asked AI to correct it and we revised the prompt together, I realized that mistakes could be improved. It made me feel that being wrong was not the end, because we could still fix the answer step by step." The class did not see error as individual failure; it saw error as a visible step in an iterative process. Smart TV therefore changed AI from a private helper into a shared mirror of thinking (see Figure 1).

The term Digital Mirroring Effect is used in this study as an interpretive label for this observed classroom phenomenon. It is not claimed as a universal psychological effect. In this case, "mirroring" refers to how the Smart TV/IFP made the usually hidden process of thinking, error, feedback, and revision visible to the whole class. The visibility allowed students to compare their own confusion with the displayed revision process and to reinterpret mistakes as part of learning.

This finding is consistent with growth mindset theory, which emphasizes process-oriented feedback, effort, strategy, and revision. However, it also modifies the existing theory by introducing a socio-technical pathway: the mindset message becomes stronger when the revision process is made visible to peers through a large communal screen (Ba et al., 2025; Kapasi & Pei, 2022; Morris et al., 2023; Platte et al., 2025; Yeager et al., 2019). In other words, growth mindset is not only internalized through teacher language, but also through technological visualization of improvability. This is a possible theoretical contribution suggested by this case (Luo et al., 2026; Yeager & Dweck, 2020).

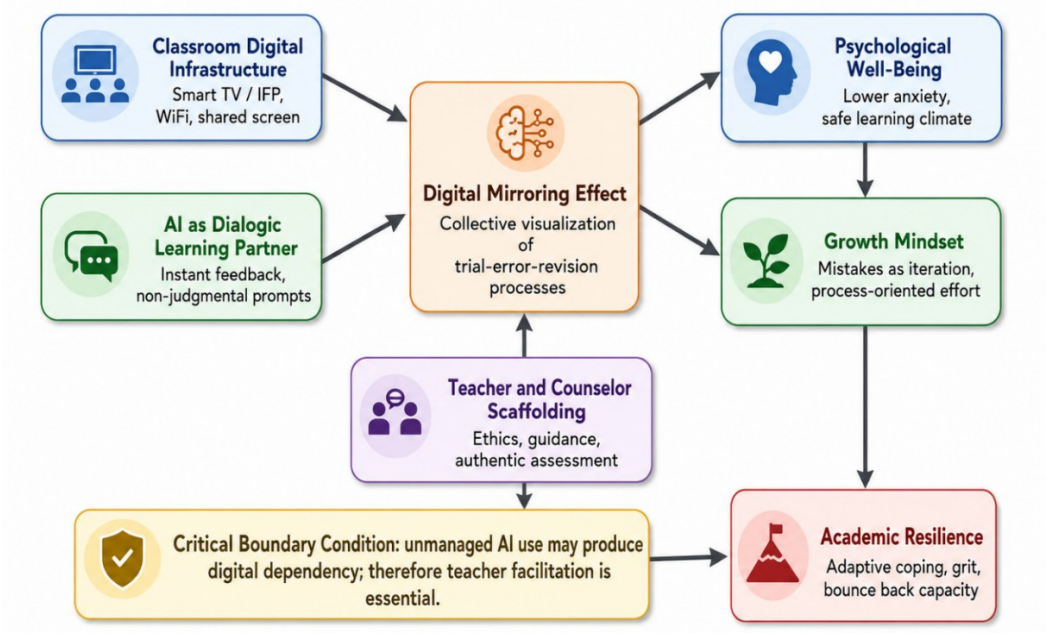

Figure 1. AI-Augmented Resilience model generated from the qualitative findings

Psychological Well-Being in A Digitally Supported Learning Ecology

The third finding shows that AI-Smart TV integration was perceived by several students as creating a more comfortable and less threatening classroom atmosphere when they encountered difficult tasks. Students perceived learning as lighter, more interactive, and less threatening when AI explanations could be accessed and discussed collectively. This finding answers the third research question by suggesting that perceived emotional safety and growth-

oriented revision interacted with resilience-related behavior: students were more willing to try, ask, and revise when mistakes were treated as discussable learning material.

It is important to distinguish psychological well-being from academic comfort or reduced task frustration. This study did not use a validated psychological well-being scale, did not measure anxiety before and after AI-Smart TV implementation, and did not conduct longitudinal follow-up. Therefore, the data do not support a causal claim that psychological well-being improved. What the data support is that students and school informants perceived the AI-Smart TV classroom routine as emotionally supportive. For example, S-07 stated: "I felt more comfortable when the explanation was shown on the Smart TV because I could read it together with my friends. If I did not understand, I could follow the teacher's explanation from the AI answer first. I was less afraid to ask because the discussion was not only about my mistake, but about improving the answer together." The counseling teacher also noted: "Several students who were usually passive seemed more willing to pay attention and respond when the teacher used AI through the Smart TV. They did not always ask questions directly, but they became more willing to follow the discussion, compare answers, and try to revise their work."

This interpretation aligns with the broaden-and-build perspective, which argues that positive emotions expand students' thought-action repertoires and help build lasting personal resources (Fredrickson, 2001, 2004). In this study, the positive emotion was not merely enjoyment from using technology; it was the relief of having a supportive learning environment. Smart TV created a shared visual field, AI provided responsive feedback, peers observed similar struggles, and teachers facilitated interpretation (Clemente-Suárez et al., 2024; Ng et al., 2023; Tan et al., 2025). Together, these elements produced a classroom ecology in which students reported feeling less alone when facing academic difficulty.

The well-being implication is particularly relevant in post-pandemic education, where learning loss has often been accompanied by well-being loss. The case shows that school digitalization should not stop at device procurement. Devices become meaningful when they are embedded in a pedagogical routine that protects emotional safety, enables asking questions, and promotes reflection. Thus, AI-Smart TV integration may function as a supportive classroom routine for perceived emotional safety when implemented with human-centered guidance.

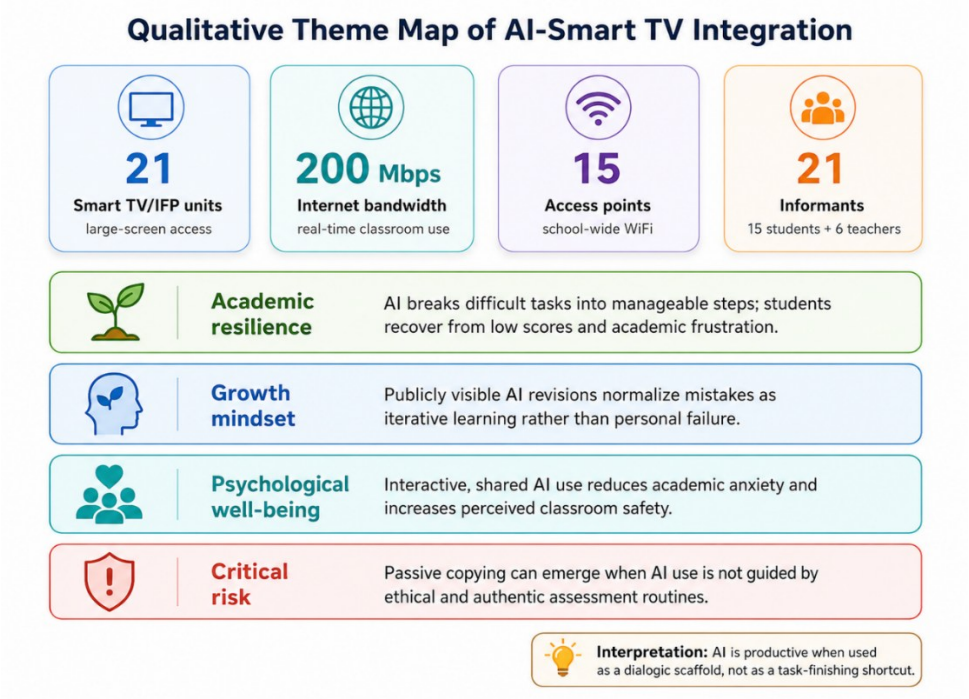

Figure 2. Digital context and thematic map of the AI-Smart TV case

Critical Analysis: Digital Dependency and the Role of Teacher Facilitation

Although most findings were positive, the negative case of S-13 provides a crucial critical insight. S-13 admitted using AI as a shortcut to copy answers efficiently, without deep cognitive engagement. S-13 stated: "Sometimes I used AI because it was faster. If there was an assignment, I asked AI for the answer and copied the parts that looked correct. I did not always read all the explanation because I only wanted to finish the task quickly." Observation notes also showed that during one classroom activity, S-13 submitted an AI-generated answer with minimal modification. When the teacher asked the student to explain the meaning of the answer orally, S-13 was unable to provide a clear explanation and repeatedly looked back at the AI-generated text. The teacher then asked S-13 to rewrite the answer in simpler words and explain which parts were personally understood. This case shows that AI does not automatically support resilience-related behavior or growth-oriented learning. When students use AI only as a task finisher, they may avoid productive struggle, reduce independent reasoning, and weaken authentic resilience.

This finding explains why the teacher remains central in AI-supported classrooms. At SMAN 1 Mentaya Hilir Selatan, teachers responded to the risk of passive copying through authentic assessment practices, including spontaneous oral questioning and requirements to paraphrase AI-generated answers independently. For example, G-INF explained: "I always remind students that AI may help them find ideas or explanations, but they must be able to explain the answer in their own words. If a student only copies the AI answer, I usually ask follow-up questions orally, such as why they chose that answer, which part they understand, and which part still needs revision." In another lesson, the teacher asked students not only to submit AI-assisted answers but also to explain which parts they accepted, rejected, or revised. These practices repositioned AI as a dialogic scaffold rather than a substitute for thinking. The counseling teacher and subject teachers also functioned as digital ethics navigators by helping students distinguish between assistance, plagiarism, and reflective learning (Al-Fattal, 2025; Chick, 2026; Nasr et al., 2025; Schultz, 2026).

Teacher facilitation occurred before, during, and after AI use. Before AI use, teachers explained the purpose of AI as a learning aid and reminded students that AI answers must be checked. During AI use, teachers guided prompt formulation, asked students to compare AI responses with textbooks or teacher explanations, and encouraged students to revise unclear prompts. After AI use, teachers used oral questions, paraphrasing tasks, and reflective discussion to ensure that students understood the content. This pattern shows that the educational value of AI-Smart TV integration depended not on the technology alone, but on teacher mediation.

The implication is that AI-Augmented Resilience requires a boundary condition: ethical and pedagogical mediation. Without teacher facilitation, the same technology that is perceived as reducing task pressure may produce dependency. With facilitation, however, AI can become a means for students to practice persistence, reflection, and responsible decision-making. This nuanced finding makes the discussion more balanced: the study does not celebrate AI uncritically, but identifies the conditions under which AI supports or undermines student development.

Theoretical Contribution: AI-Augmented Resilience and Digital Mirroring Effect

This study proposes AI-Augmented Resilience and Digital Mirroring Effect as interpretive concepts grounded in the case, not as fully generalizable theoretical models. AI-Augmented Resilience refers to a classroom mechanism in which students' resilience-related behaviors—such as persistence, help-seeking, revision, and re-engagement with difficult tasks—are supported by AI explanations, shared visualization, teacher facilitation, and ethical assessment. The concept does not mean that AI independently produces resilience. Rather, AI may augment resilience when it helps students remain engaged with academic challenges under teacher-guided conditions.

Digital Mirroring Effect refers to the observed phenomenon in which the Smart TV/IFP makes AI-supported trial, error, feedback, and revision visible to the class. This visibility allows students to see that mistakes are not final and that answers can be improved through better questions, better prompts, and reflective discussion. In this sense, Digital Mirroring Effect is best understood as a pedagogical mechanism and observed classroom phenomenon, not as a measured psychological effect.

These concepts connect resilience theory, growth mindset theory, and socio-technical learning theory. From resilience theory, the study highlights adaptive coping and re-engagement after difficulty. From growth mindset theory, it highlights revision, effort, and process-oriented feedback. From socio-technical learning theory, it shows that students' psychological and cognitive experiences are shaped by the interaction between human actors, AI tools, shared screens, classroom norms, and teacher mediation.

CONCLUSION

This study concludes that AI integration through Smart TV/IFP at SMAN 1 Mentaya Hilir Selatan was perceived as more than a cognitive instructional aid. In this case, AI-Smart TV integration appeared to support students' coping experiences, emotional comfort, and willingness to revise mistakes when it was guided by teachers and embedded in reflective classroom routines. AI helped students cope adaptively with difficult tasks by offering non-judgmental feedback and step-by-step explanations. Smart TV created a Digital Mirroring Effect by making trial, error, and revision visible to the class, thereby normalizing mistakes and encouraging process-oriented learning. Students reported feeling more comfortable and less afraid to ask questions; however, this study does not claim verified improvement in psychological well-being because it did not use pre-post measurement or validated psychological instruments.

The study contributes the AI-Augmented Resilience model, which explains how AI, shared visualization, teacher facilitation, and ethical assessment interact to construct academic resilience in digital classrooms. The model is especially relevant for Sekolah Penggerak and other schools investing in classroom digital infrastructure. However, the study also identifies the risk of digital dependency when AI is used merely to copy answers. Therefore, AI-Smart TV integration should be understood as a promising but conditional classroom practice: it can support learning resilience when mediated by ethical guidance, authentic assessment, and teacher-counselor collaboration.

RECOMMENDATION

Schools need AI literacy guidelines, authentic assessment, teacher-counselor collaboration, and an AI Honor Code to ensure that AI remains a capability builder rather than a task finisher. The AI Honor Code should include rules that students must disclose AI assistance, verify AI-generated information, paraphrase in their own words, cite or acknowledge AI use when required, and explain their reasoning orally or in writing. This recommendation is directly connected to the negative case of S-13, which showed that unguided AI use may lead to passive copying and dependency. Future studies should test this model through longitudinal and mixed-methods designs involving broader student populations.

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AUTHOR CONTRIBUTIONS STATEMENT

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Norhidayah	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓	
Arina Restian	✓		✓	✓			✓			✓	✓	✓	✓	
Husamah	✓		✓	✓			✓			✓	✓	✓	✓	

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

INFORMED CONSENT

Written informed consent was obtained from the school and parents/guardians, and student assent was obtained from all student participants before data collection. Participants were informed about the purpose of the study, the voluntary nature of participation, the right to withdraw without academic consequences, and the confidentiality of their data. Because the participants were senior high school students, the researchers anonymized all names and removed identifying information from interview excerpts, observation notes, and learning artifacts.

ETHICAL APPROVAL / INSTITUTIONAL PERMISSION

This study received institutional permission from SMAN 1 Mentaya Hilir Selatan and ethical/research approval from Postgraduate Program of Universitas Muhammadiyah Malang with approval number E.5./978/DPPs-UMM/X/2025 dated 27 October 2025. If formal ethics committee approval was not required by the institution, the study was conducted under school research permission and followed ethical principles of voluntary participation, parental consent, student assent, confidentiality, and secure data management.

DATA AVAILABILITY

The qualitative data supporting this study consist of interview transcripts, observation notes, and school documentation. Due to participant confidentiality and school privacy considerations, the raw data are not publicly shared. Anonymized excerpts may be made available from the corresponding author upon reasonable request and with permission from the school. Learning artifacts used in the analysis included AI prompts, revised prompts, selected AI responses, student work, classroom observation notes, and anonymized interview excerpts. Data are stored securely by the corresponding author. Any future sharing of anonymized excerpts will exclude personal identifiers and will require school permission to protect student privacy.

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