

A Proposed Framework for Developing an Artificial Intelligence -based Educational Platform

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ABSTRACT

This study aims to develop and validate an Artificial Intelligence-Based Educational Platform Framework designed to support secondary education within a smart learning environment. The proposed framework integrates pedagogical principles, artificial intelligence technologies, educational media systems, technical infrastructure, and usability features to provide a unified and adaptive digital learning ecosystem. It focuses on enhancing personalized learning, adaptive assessment, intelligent tutoring, learning analytics, interactive communication, and educational media integration.

To validate the framework, a questionnaire was developed and administered to experts in computer science, artificial intelligence, and educational media. The evaluation covered five main dimensions: pedagogical, technical, educational media, artificial intelligence, and usability. The results showed strong reliability of the instrument and a very high level of expert agreement, with an overall mean score of 4.71 (94.2%). The Artificial Intelligence dimension received the highest rating, confirming the effectiveness of AI-driven features within the framework.

The findings indicate that the proposed framework is valid, feasible, and applicable for developing intelligent educational platforms. It offers a comprehensive model that supports digital transformation in education and enhances learning quality, engagement, and accessibility.

General Terms

Artificial Intelligence, Educational Technology, E-Learning, Intelligent Systems

Keywords

Artificial Intelligence; Smart Learning Environment; Educational Platform; Adaptive Learning; Intelligent Tutoring Systems; Learning Analytics; Educational Media; Digital Transformation in Education; Personalized Learning; Secondary Education

1. INTRODUCTION

Education in the digital age has witnessed profound transformations driven by the rapid advancement of Artificial Intelligence (AI) and digital technologies, leading to the emergence of smart educational environments that provide interactive and personalized learning experiences. Smart

educational channels on digital platforms have become essential tools for enhancing the quality of educational content, increasing student engagement, and supporting individualized learning, particularly at the General Secondary Education stage, which requires specialized academic and pedagogical support. Through adaptive and learner-centered approaches, smart education contributes to improving learning outcomes and preparing students with the competencies needed for the 21st century(1) .

At the same time, the development of digital media technologies has transformed educational communication patterns and expanded the role of educational media beyond traditional methods. Educational media now relies on smart digital channels and platforms capable of delivering interactive content tailored to learners' needs and characteristics. Given the intellectual, cognitive, and cultural challenges facing secondary school students, there is a growing need to design AI-powered smart educational channels that enhance the effectiveness of educational media messages and support more engaging and impactful learning experiences (2).

Identifying the Problem

The research problem emerged from the researchers' observations and a review of recent trends in artificial intelligence and digital education, which revealed that secondary school students often depend on fragmented learning resources, such as digital platforms, educational channels, online materials, and communication applications. This fragmentation limits learner engagement, personalization, accessibility, and the effective utilization of educational media services. Moreover, existing educational systems generally lack a unified environment that integrates AI technologies, adaptive learning, educational media functions, and formal learning resources. Consequently, there is a need for a comprehensive framework to guide the design and development of an AI-based learning platform that provides an integrated, intelligent, and learner-centered educational environment.

Research Problem and Questions

Recent years have witnessed significant advances in artificial intelligence (AI) and digital transformation technologies, creating new possibilities for developing smarter and more personalized learning environments. However, despite the availability of various digital learning resources-such as e-

learning platforms, educational channels, and online libraries- these resources often operate independently, resulting in fragmented learning experiences and limiting the effective integration of educational services. In addition, many existing platforms do not fully utilize AI capabilities to support adaptive learning, intelligent assessment, learning analytics, and real-time feedback.

At the same time, educational media and digital educational channels continue to play a largely traditional role focused on content delivery rather than active integration within intelligent learning environments. This highlights the need for a unified framework that combines AI technologies, educational media, formal learning resources, adaptive learning services, and smart interaction tools. Accordingly, the research problem centers on the lack of an integrated framework for designing and developing an AI-based smart learning platform that meets the needs of secondary school students and enhances the quality and effectiveness of the educational process.

The research problem can be formulated in the following main question:

What is the proposed framework for the design and development of an artificial intelligence-based educational platform to support secondary education?

Sub-Questions

1-What are the requirements for designing and developing an artificial intelligence-based educational platform to support secondary education?

2-What are the main components and dimensions of the proposed framework for an artificial intelligence-based educational platform?

3-How can artificial intelligence applications, educational media services, and digital educational resources be integrated within the proposed platform?

4-To what extent is the proposed framework valid and applicable from the perspectives of experts and specialists?

Research objectives

1-Identifying the requirements for designing and developing an AI-based educational platform for secondary education.

2-Developing a comprehensive framework for an AI-based educational platform that integrates intelligent learning services, educational media, and digital educational resources.

3-Clarifying the mechanisms for integrating AI technologies and educational media services within the proposed platform.

4-Validating the proposed framework from the perspectives of experts in Educational Technology, Artificial Intelligence, and Educational Media.

Research Importance

The importance of this study lies in addressing the growing role of artificial intelligence in educational transformation by proposing a comprehensive framework for designing and developing an AI-based educational platform that integrates intelligent learning services, educational media, and digital resources within a unified learning environment, thereby supporting digital transformation and enhancing learning experiences.

The Importance of the study can be summarized as follows:

1-Developing an integrated AI-based framework for smart educational platforms

2-Enhancing educational quality and digital transformation through personalized and adaptive learning

3-Supporting the adoption of AI in education in line with global educational trends.

Research Methodology

Methodologically, the study followed a framework development and validation approach, which involved identifying design requirements, constructing the proposed framework, developing a prototype representation of the platform, and validating the framework through expert review and statistical analysis of expert judgments.

Research Tools

The study employed the following research Tools:

1-Literature and Previous Studies Analysis Form, which was used to identify the theoretical foundations, design requirements, and essential components of AI-based educational platforms.

2-The Proposed AI-Based Educational Platform Framework, developed based on the analysis of literature, previous studies, and recent trends in artificial intelligence and educational media .

3-Expert Evaluation Questionnaire, designed to assess the validity and applicability of the proposed framework. The Tool consisted of 35 items distributed across five dimensions: Pedagogical Dimension -Technical Dimension -Educational Media Dimension -Artificial Intelligence Dimension -Usability and User Experience Dimension .

4-Five-Point Likert Scale, which was used to measure experts' responses, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

2. LITERATURE REVIEW

The study by Vieriu & Petrea (2025) (3) examined the impact of artificial intelligence on learning and academic performance from students' perspectives using a questionnaire administered to 85 students.

The findings showed that most students use AI tools to access information more easily, save time, and improve learning efficiency, while also perceiving positive effects on academic performance.

However, concerns were raised regarding information accuracy, excessive dependence on AI, and reduced critical thinking, highlighting the need for ethical guidelines and structured integration of AI in education.

A study by Vallis (2025) (4) investigated the use of AI-generated videos and virtual avatars for delivering educational content in a university setting involving more than 1,200 students. Findings revealed that students generally accepted AI-generated video content and valued features such as clear audio and captions, although many found it less engaging than instructor-led videos and desired greater interactivity. study also identified ethical and technical challenges, including intellectual property concerns and the need for clear pedagogical objectives when integrating AI-generated media into education.

A study by Rama Gundam, Patil, & Karne (2022) (5) proposed an AI-based framework for optimizing real-time television broadcast scheduling using LSTM networks and a Q-learning algorithm enhanced by the Grey Wolf Optimizer. Findings showed that the proposed model improved viewer engagement,

broadcasting efficiency, and advertising revenue compared with traditional scheduling methods. study concluded that AI can make television broadcasting more adaptive to audience preferences and more effective in managing broadcasting operations.

A study by Bermúdez Guijo (2025) (6) investigated the use of Web Assembly to improve digital accessibility services, particularly subtitle rendering and sign language support, by addressing performance limitations in JavaScript-based systems. Findings showed that Web Assembly significantly improved processing speed, rendering accuracy, and playback stability, especially on resource-constrained devices. Study concluded that Web Assembly enhances the quality of accessibility services, though its adoption should be gradual due to differences in device support.

A study by Rouabhia (2024) (7) investigated the use of ChatGPT for generating complete educational curricula and found that AI can efficiently produce high-quality, original course materials in a very short time, while still requiring human oversight to ensure accuracy, privacy, and ethical use.

In a parallel experiment, the study also examined AI-generated instructional videos compared to human-led teaching using a mixed-methods design with 83 learners. The results showed no significant differences in learning outcomes between the two approaches.

Overall, the study concluded that AI-based content and video generation can serve as effective and scalable alternatives to traditional instructional methods without reducing educational effectiveness.

The study by Jaaouani & Alkaabi (2024) (8) examined the impact of AI applications on improving the educational process, particularly in enhancing teaching methods, learning efficiency, and learner engagement using a descriptive-analytical approach.

The findings indicated that AI positively contributes to adaptive learning, immediate feedback, and diversified instructional strategies that address individual learner differences.

However, the study also identified challenges such as weak technical infrastructure and insufficient teacher training, emphasizing the need to prepare the educational environment for effective AI integration.

A study by Sok & Heng (2024) (9) conducted a systematic literature review on the use of ChatGPT in higher education to identify its opportunities, challenges, and implementation strategies.

The findings showed that ChatGPT supports self-directed learning, improves writing and critical thinking skills, provides instant feedback, and assists instructors in designing educational content.

However, it also raised concerns about academic integrity, content accuracy, over-reliance on AI, and privacy issues, recommending clear usage policies and proper training for both educators and students.

The study by Al-Wali and Al-Khayyat (2022) (10) examined the effectiveness of educational satellite channels and digital platforms in supporting education during the COVID-19 pandemic from teachers' perspectives in Damietta Governorate using a descriptive survey approach.

The findings showed that digital platforms were highly

effective due to their continuous availability, while satellite channels also contributed to educational continuity during school closures.

However, the study identified key obstacles such as weak internet access, technical device issues, and high costs, and confirmed a significant relationship between the use of these media and the quality of educational services, emphasizing the need for better integration between them.

Commentary on previous studies

Based on previous studies, an analytical commentary can be provided that clarifies the points of agreement and disagreement and the ways in which they can be used for the current research, as follows:

First: Points of Agreement

Most previous studies agree with the current research on the growing role of artificial intelligence in improving the educational process, supporting adaptive learning, and personalizing educational content according to learners' needs. They also emphasize the importance of enhancing educational interaction through digital media such as educational videos, e-learning platforms, and smart technologies. In addition, the studies commonly highlight the importance of improving educational quality through the integration of modern technologies, providing flexible learning environments that support self-directed and continuous learning, as well as the importance of real-time assessment and learning analytics in improving learning outcomes.

Second: Points of Difference

The previous studies differ in their scope and focus. Some focused on specific AI applications such as ChatGPT, educational video production, or improving broadcasting and digital accessibility, while others addressed standalone platforms or media systems without providing a comprehensive integrated framework. Moreover, some studies were conducted in higher education or focused on technical aspects only, such as Web Assembly or broadcasting systems. In contrast, the current study is distinguished by presenting an integrated framework that combines artificial intelligence, educational media, digital content, adaptive assessment, and interactive learning within a unified platform designed for secondary school students.

Third: Benefits of Previous Studies for the Current Research

The current study benefited from previous research in several aspects, including building the theoretical foundation of AI in education, identifying key components of smart learning platforms, and supporting the concepts of adaptive and personalized learning. It also drew on findings related to the effectiveness of AI tools such as ChatGPT in educational content generation, as well as challenges related to accuracy, security, and over-reliance on technology, which helped in developing a more balanced framework. Furthermore, the studies supported the integration of educational media with digital platforms, improving user experience, and enhancing interaction and assessment mechanisms, all of which contributed to shaping the proposed model in the current research.

The Proposed Model

The proposed framework is based on integrating three main dimensions-pedagogical, media, and technical-to design and develop smart educational channels that deliver interactive,

purposeful, and intelligent content suitable for General Secondary Education students. It emphasizes the use of Artificial Intelligence as a supportive tool for enhancing educational media rather than replacing it, in order to improve learning quality and increase learner interaction within digital platforms. The model also aims to strengthen educational media in digital environments, support adaptive and interactive learning, optimize channel design using AI, and achieve full integration between pedagogical, media, and technical components within scalable digital educational systems.

Operational Workflow of the Educational Platform

The operational workflow of the educational platform can be summarized in the following points:

1-Account creation and login: The user begins by creating a personal account and securely logging in to access the platform's services.

2-Course browsing and enrollment: Courses are presented in an organized structure, and the learner selects and enrolls in the content that matches their level.

3-Interaction, assessment, and performance tracking: The learner engages in interactive activities such as quizzes and forums, receives immediate feedback, and their progress is continuously monitored through analytical reports highlighting strengths and weaknesses.

dimension, the technical dimension, and the educational media dimension. These dimensions are supported by the AI engine, which enables the platform to provide intelligent, adaptive, and personalized learning experiences.

Proposed Executive Framework for the Implementation of the Smart Educational Channel Platform

The platform is built on an integrated set of AI-supported systems designed to deliver interactive educational content, enhance learning experiences, reinforce values, and support educational decision-making.

It includes a Content Management System for organizing static, audiovisual, and AI-generated dynamic content, an Interactive Broadcasting System for live and on-demand learning, and a Smart Interaction System that enables personalized communication through voice, text, and image-based support. It also incorporates testing and assessment tools with adaptive evaluation and instant feedback, along with an educational media system that promotes ethical and value-based content.

In addition, the platform features dashboards for teachers, students, parents, and administrators, a smart guidance system for personalized recommendations, a gamification system to increase motivation, an AI-driven analytics system for learning insights, and a security system to protect user data and ensure responsible use of the platform.

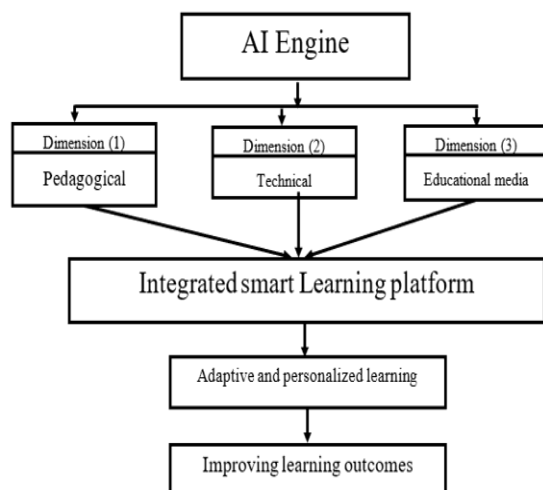


Figure (1). illustrates the conceptual framework of the proposed system

The figure illustrates the conceptual framework of the proposed Smart Learn HS system. The framework is based on the integration of three main dimensions: the pedagogical

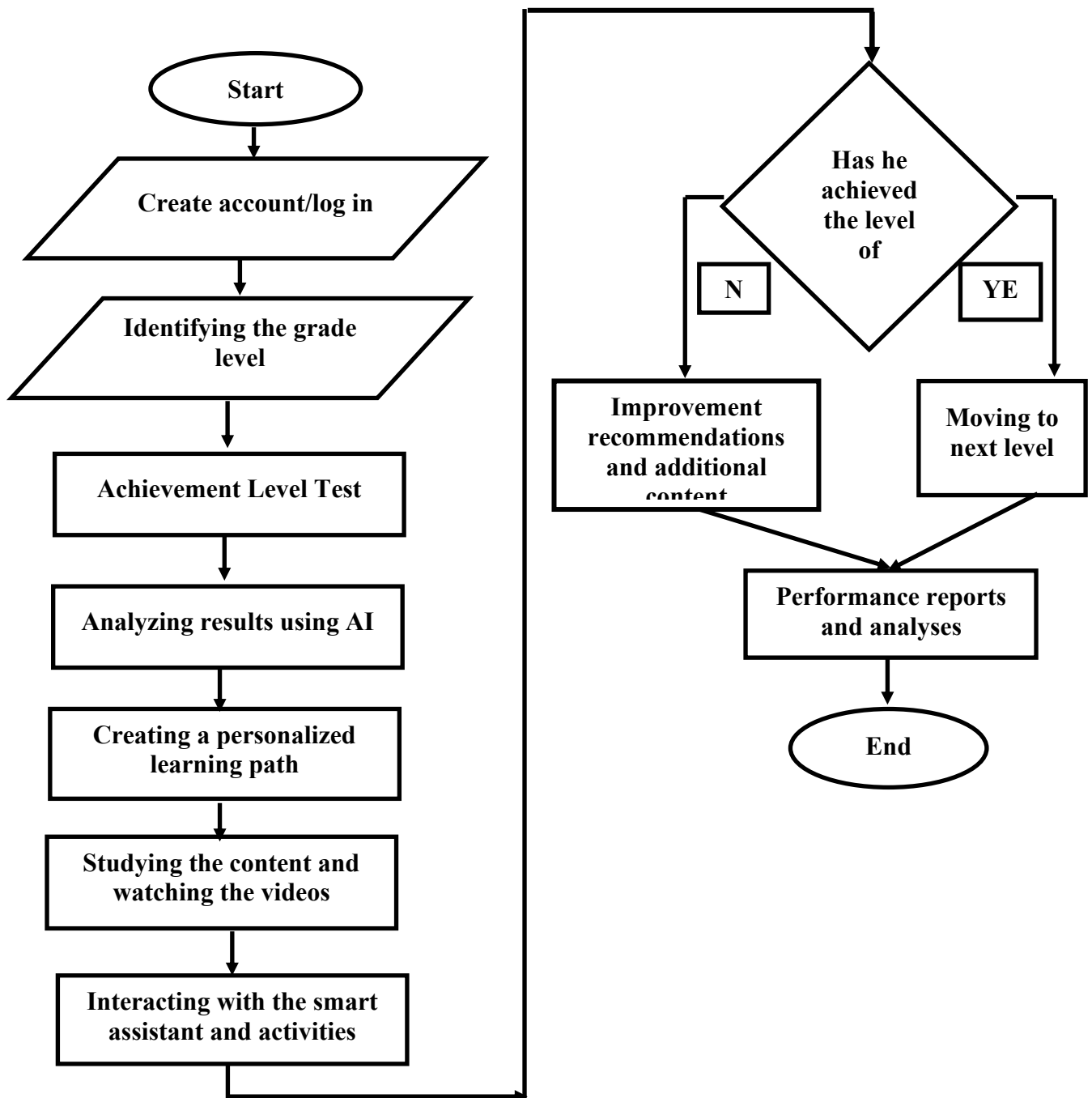


Figure (2) illustrates the flowchart of the actual platform operation steps

The figure illustrates the actual operation process of the proposed Smart Learn HS platform. The process begins with creating a user account or logging into the system, followed by identifying the learner's grade level. After that, the learner takes an achievement or placement test to determine the current academic level. The results are then analyzed using artificial intelligence techniques in order to create a personalized learning path that suits the learner's needs. Based on the generated learning path, the learner studies the educational content, watches related videos, and interacts with the smart assistant and other learning tools available on the platform. The system then checks whether the learner has achieved the required mastery level. If the learner has not achieved mastery, the platform provides improvement recommendations and additional learning content. If mastery is achieved, the learner

moves to the next level. Finally, the platform generates performance reports and analytics to support follow-up and decision-making.

Home Interface of the Smart Learn Platform

The home interface of the Smart Learn platform serves as the main entry point, offering a simple and user-friendly environment for students and teachers. It provides separate login and registration options, along with introductory sections that explain the platform's educational goals and services.

The interface highlights AI-based features such as adaptive learning tools and intelligent services to enhance the learning experience. It is designed to improve usability, simplify

navigation, and promote interactive engagement within an accessible and modern smart educational environment.



Figure (3) .Home Interface of the Proposed Smart Learn Platform

User Roles and Access Management

The Smart Learn platform uses a role-based access system to manage user permissions and organize functionalities according to user responsibilities. It includes four main user roles: students, teachers, parents, and administrators



Figure (4) Role-Based Access Interfaces in the Proposed Smart Learn Platform

Student Authentication and Personalization Module

The Smart Learn HS platform provides a secure login system that allows students to access the platform using a username or email and password

It also enables students to select their grade level and academic track, which is used by the system to personalize learning content, assessments, and learning paths

This module enhances usability and supports adaptive learning by offering a more personalized educational experience.

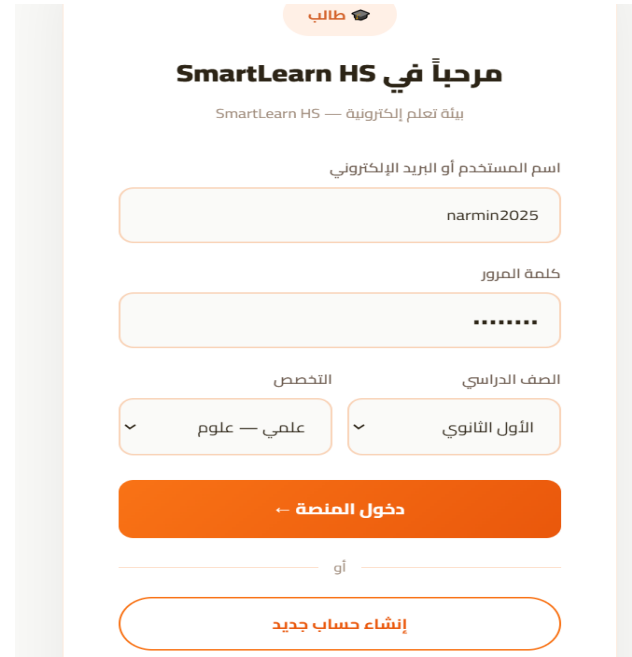


Figure (5) Student Login and Personalization Interface in Smart Learn HS Platform

Student Dashboard

The Student Dashboard is the main interactive interface of the Smart Learn platform, designed to provide a personalized and adaptive learning environment that supports self-learning and academic improvement. It gives students access to lessons, quizzes, assignments, summaries, and AI-generated content through a unified system, along with intelligent recommendations based on their performance and learning behavior.

It also displays progress tracking, quiz results, and feedback generated by AI analytics, while enabling communication with an AI chatbot for explanations and academic support. Additionally, the dashboard offers daily learning recommendations, personalized study plans, and adaptive learning pathways to enhance engagement and improve learning efficiency.

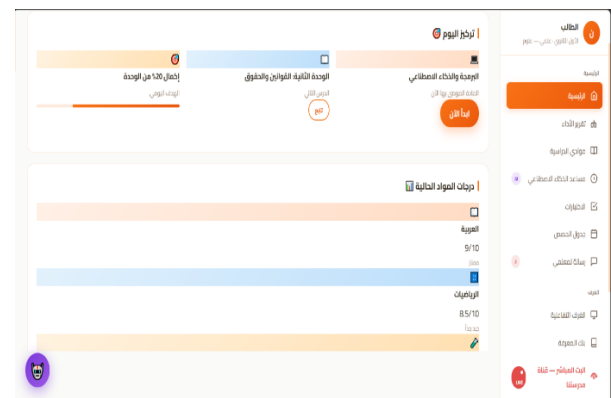


Figure (6) AI-Based Daily Focus and Smart Recommendation Module

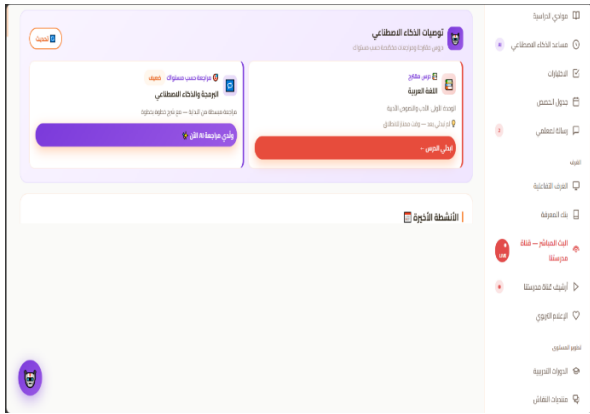


Figure (7) AI Educational Assistant and Recommendation Interface

The Smart Learn HS platform provides an intelligent, AI-powered student dashboard that supports personalized and adaptive learning. It offers daily recommendations for lessons, revision materials, and learning pathways based on student performance and academic needs, while also promoting continuous engagement through progress tracking and learning objectives.

The system includes real-time academic performance monitoring that allows students to track grades, achievements, and subject-level progress through visual indicators, helping them identify strengths and weaknesses and improve self-regulated learning.

Additionally, the platform integrates an AI educational assistant that provides interactive, personalized support by recommending simplified explanations and customized resources, enhancing student engagement and improving individualized learning experiences.

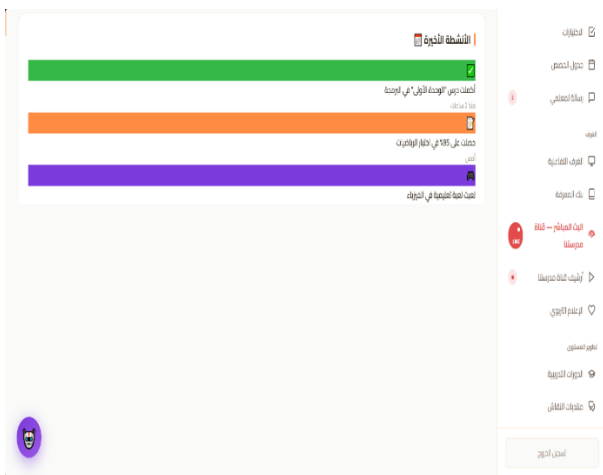


Figure (8) Student Academic Performance Monitoring Interface

The Smart Learn HS platform uses gamification and engagement features to increase student motivation and interaction with learning content. It tracks student activities such as lessons, exams, and educational games, while also recording media interaction history.

The system includes motivational tools such as achievement badges, learning streaks, and reward-based elements to encourage continuous participation and improve learner engagement and retention.

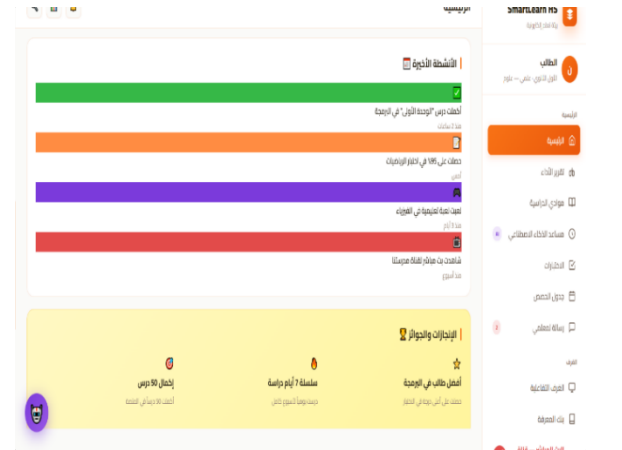


Figure (9) Student Activities and Gamification Components

The Smart Learn HS platform includes a smart notification and activity tracking system that enhances student engagement and supports continuous learning. It provides real-time alerts about live sessions, exams, revision activities, and upcoming academic events.

The system also tracks student interactions and learning activities to monitor progress and encourage participation, thereby improving communication, active learning, and real-time interaction within the platform.

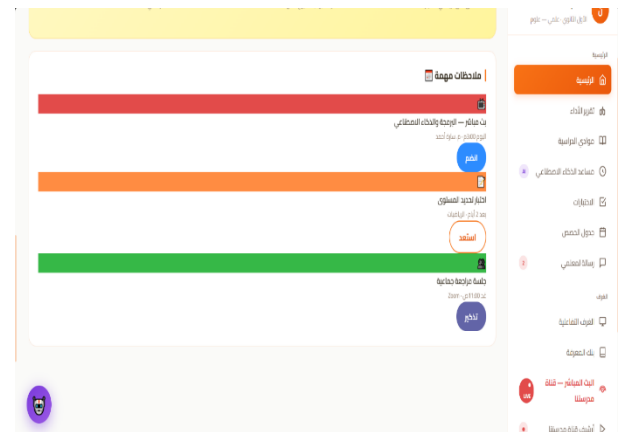


Figure (10) Smart Notifications and Educational Activity Tracking Interface

The Smart Learn HS platform includes an AI-powered educational assistant that provides personalized academic support and interactive learning guidance for secondary school students. It allows students to ask questions, receive simplified explanations, generate summaries, and obtain adaptive recommendations based on their performance and learning level.

The assistant uses AI technologies to enhance engagement, provide instant support, and promote self-directed learning within a digital environment.

Overall, it improves learning efficiency, supports adaptive learning, and strengthens intelligent interaction between students and the platform.

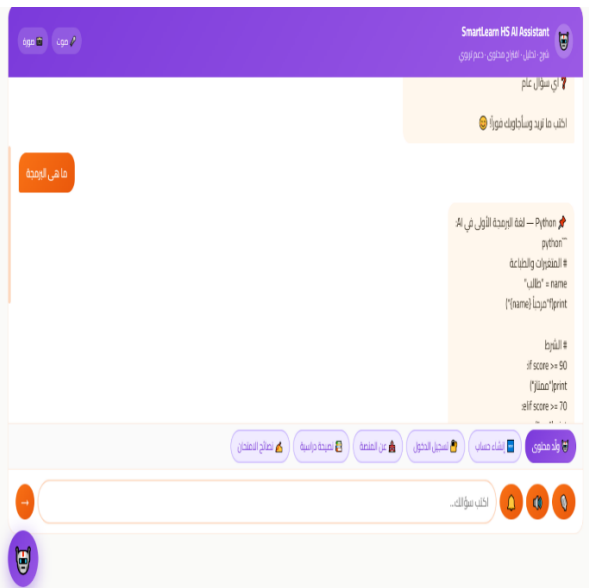


Figure (11) AI-Powered Educational Assistant Interface in the Smart Learn HS Platform

The Smart Learn HS platform offers an adaptive academic subject's interface that organizes educational content and supports personalized learning for secondary school students. It provides structured access to subjects, learning materials, and progress tracking within an interactive environment.

Subjects are categorized according to academic track and level, with AI-based indicators that monitor performance and generate personalized recommendations.

Overall, the module enhances accessibility, improves content organization, and supports adaptive learning through an intelligent educational system.

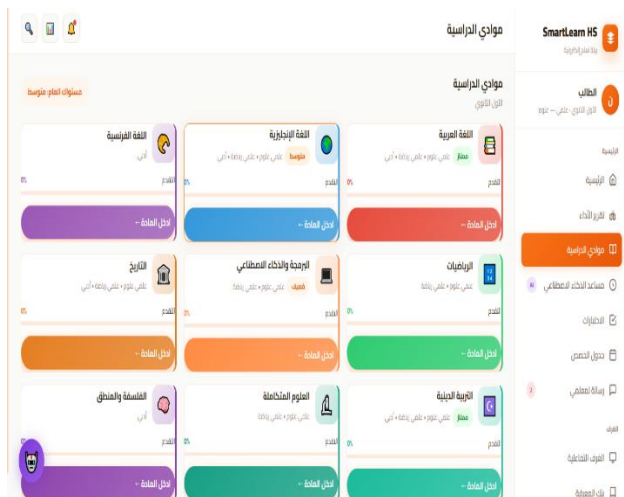


Figure (12) Smart Academic Subjects and Adaptive Learning Interface in the Smart Learn HS Platform

The figure shows an example of a Programming and Artificial Intelligence course interface for first-year secondary students within the proposed platform. It provides interactive learning tools such as lessons, PDFs, videos, exercises, assessments, and AI-based tools to enhance understanding and engagement

It also offers access to the digital textbook and organized learning activities, supporting self-learning and improving the overall user experience in the digital educational environment.



Figure (13) Interface of the Programming and Artificial Intelligence Course for First-Year Secondary Students within the Proposed Educational Platform

The figure presents an AI-supported educational video for first-year secondary students within the proposed platform, designed to simplify artificial intelligence concepts through interactive visual content that enhances understanding and engagement. It is complemented by additional learning resources such as digital books, mind maps, podcasts, and presentation files, which support self-learning and improve the overall educational experience.

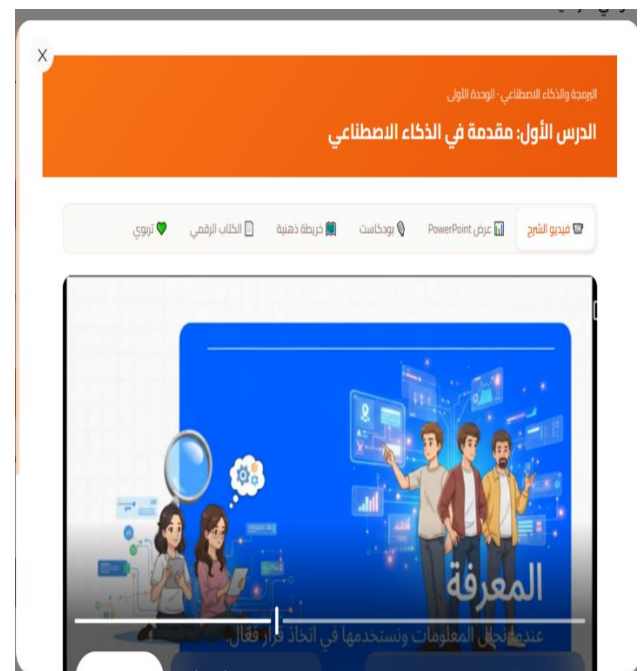


Figure (14). AI-Supported Educational Video Interface for the Programming and Artificial Intelligence Course within the Proposed Educational Platform.

The figure shows an AI-based educational content generation interface within the proposed platform, allowing students to create personalized learning materials such as summaries,

simplified explanations, quizzes, mind maps, revision notes, and exercises tailored to their academic level.

This supports self-learning and enhances student interaction with educational content through intelligent, adaptive learning tools.

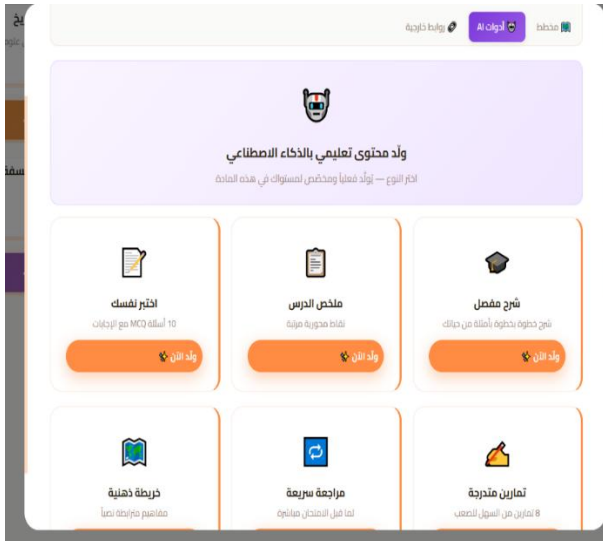


Figure (15). Example of an Artificial Intelligence Tool for Generating Personalized Educational Content within the Proposed Educational Platform.

The figure shows the live broadcasting interface of the “Madrastna” educational channel within the proposed platform, allowing students to access live streams and recorded curriculum-based lessons.

It also provides broadcast schedules and an archive of educational videos, supporting continuous learning and improving student interaction with digital educational media.

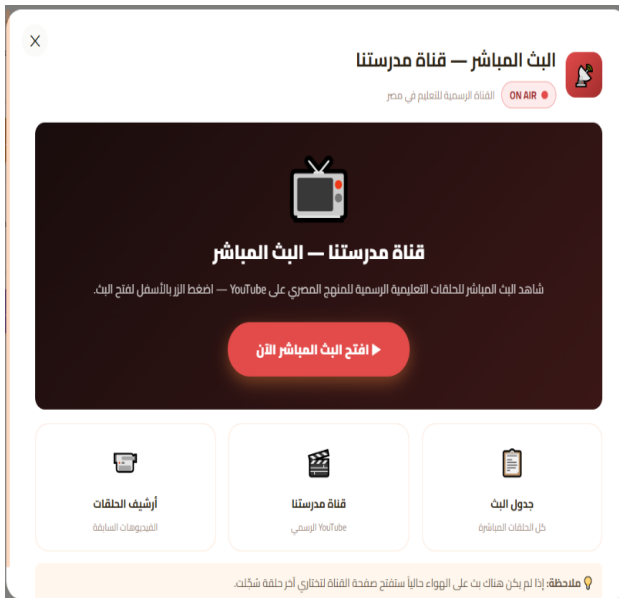


Figure (16) Live Broadcasting Interface of the “Madrastna” Educational Channel within the Proposed Educational Platform

The figure presents a set of interactive educational rooms integrated into the proposed platform to support digital learning and strengthen educational media. These environments combine live broadcasting, practical application, and

interactive communication within a unified system.

They include a live broadcasting room linked to the “Madrastna” channel, virtual laboratories for simulations, a programming lab for coding skills, educational games to increase engagement, and media rooms for value-based content and guidance. The platform also provides discussion forums and 3D models and simulations to enhance understanding and visualization.

Overall, these components create an intelligent, interactive learning environment that promotes self-learning, increases student participation, and improves the effectiveness of digital educational media through AI and modern technologies.

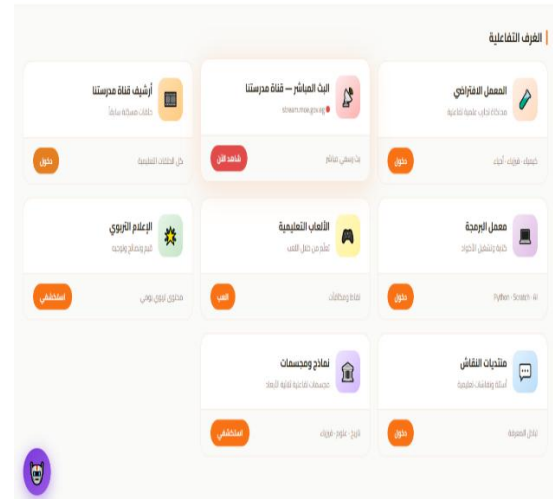


Figure (17.) Interactive Educational Rooms within the Proposed Educational Platform

The figure shows an interactive virtual laboratory within the proposed educational platform, offering simulated experiments in subjects such as chemistry, physics, and biology.

It allows students to conduct experiments and observe results in real time, while AI tools provide guidance, enhance understanding, and support the development of practical skills in a safe and flexible learning environment.

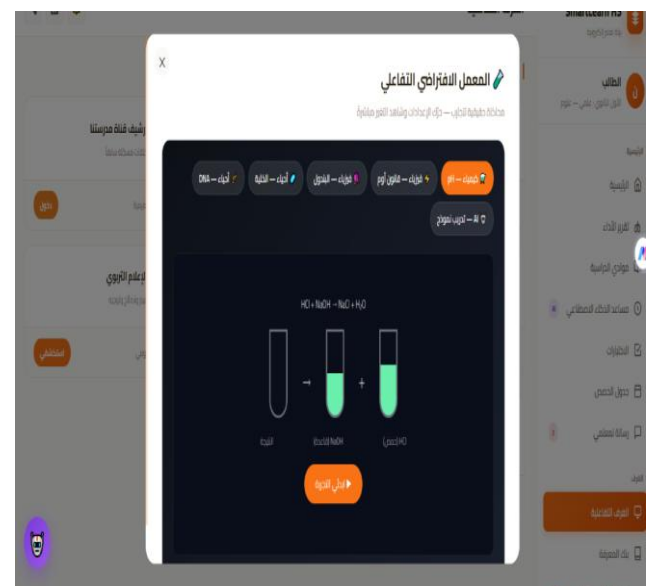


Figure (18) Example of an AI-Supported Interactive Virtual Laboratory within the Proposed Educational Platform

The figure presents interactive 3D models and simulations within the proposed educational platform, allowing students to explore scientific and educational structures such as atoms, DNA, cells, geometric shapes, and historical buildings

These tools enable learners to manipulate and examine models interactively, enhancing conceptual understanding, visual learning, and engagement with complex ideas

Overall, they support experiential and self-directed learning by converting abstract concepts into clear, visual, and interactive educational experiences.

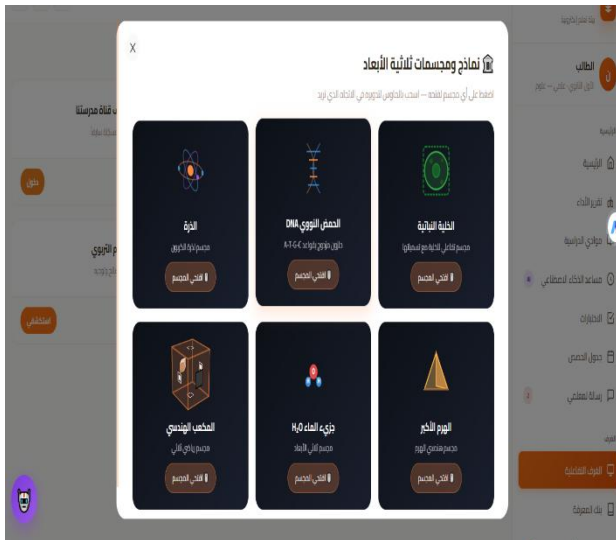


Figure (19) Example of Interactive Three-Dimensional Educational Models Integrated into the Proposed Educational Platform

The figure presents an adaptive assessment system within the proposed educational platform, including placement tests, quick assessments, and AI-based adaptive exams used to determine students' academic levels before learning begins

Based on the results, the system uses AI to personalize content delivery, learning activities, explanations, and assessment difficulty according to each learner's abilities and needs, enhancing understanding and engagement.

It also stores performance data for continuous monitoring and learning analytics, enabling personalized recommendations and improved academic outcomes.

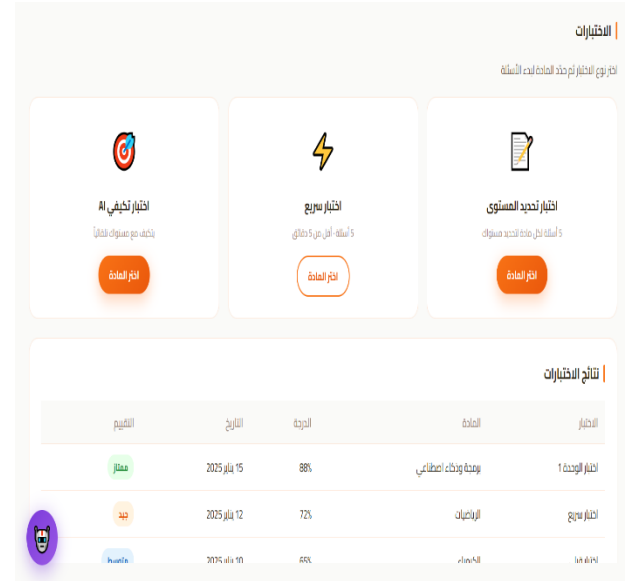


Figure (20) AI-Based Placement and Adaptive Assessment System within the Proposed Educational Platform

The figure shows the communication interface within the proposed educational platform, enabling interactive communication between students and teachers in a digital learning environment.

It allows students to send academic questions, messages, and feedback, while teachers provide guidance, feedback, and updates about learning activities and sessions, supporting continuous interaction.

Overall, the system enhances engagement, improves academic support, and promotes a collaborative learning environment that strengthens the effectiveness of AI-supported education.

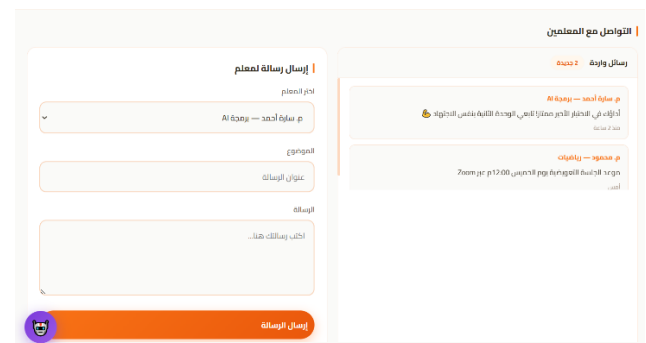


Figure (21) Interactive Communication System between Students and Teachers within the Proposed Educational Platform

The figure presents an integration interface for official educational resources within the proposed platform, offering unified access to services such as the Egyptian Knowledge Bank, "Madrasatna" channels, official digital textbooks, and other approved educational platforms.

The platform aims to organize and integrate these resources rather than replace them, allowing students to access multiple trusted sources through a single interface and reducing the need to navigate between separate platforms.

This integration improves accessibility, reduces digital fragmentation, and enhances the learning experience while supporting continuous, flexible, and technology-driven education aligned with digital transformation trends.



Figure (22) Integration of Official Educational Resources within the Proposed Educational Platform

The figure presents the educational media section within the proposed platform, designed to support students academically, behaviorally, psychologically, and socially through guidance-oriented digital content.

It integrates educational media directly into the learning process, providing materials on values, motivation, mental health, time management, leadership, critical thinking, and self-learning to enhance students' personal development and engagement.

Overall, this approach transforms educational media into an interactive component within the smart learning environment, strengthening its role in supporting holistic student development through AI-powered digital education.

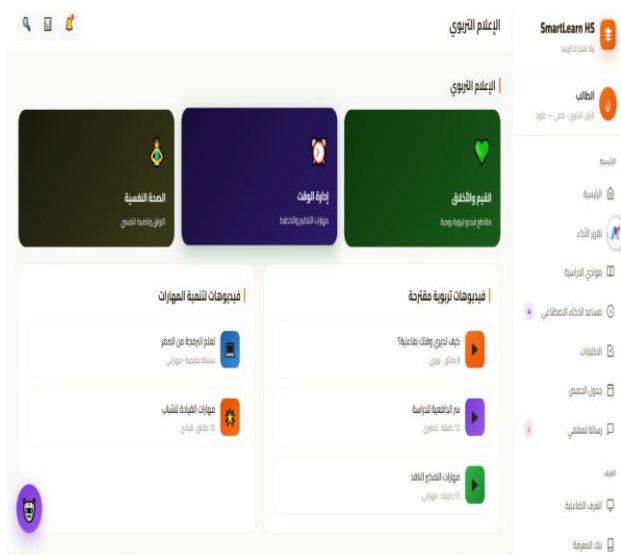


Figure (23) Integration of Educational Media Content within the Proposed AI-Supported Educational Platform

Validation and Comprehensive Evaluation of the Proposed Framework

Objective of Validation

The validation stage aimed to evaluate the proposed AI-based educational platform framework from the perspectives of specialists in computer science, artificial intelligence, and

educational media.

It focused on assessing the framework's appropriateness, feasibility, usability, pedagogical value, and technical effectiveness prior to its practical implementation

Participants.

Because the proposed framework integrates educational, technological, and media dimensions, expert opinions from these fields were required to ensure a comprehensive evaluation. A purposively selected group of specialists was therefore asked to assess the framework in terms of validity, applicability, comprehensiveness, and suitability for use in smart learning environments.

The experts were chosen based on their academic experience, research contributions, and professional expertise in educational technology and digital learning systems

Table (1) shows the distribution of experts across the various disciplines.

Table (1) Distribution of Experts

Specialization	Number
Educational Technology	8
Artificial Intelligence	6
Educational Media	6
Total	20

Validation Tool

An evaluation questionnaire was developed based on the dimensions of the proposed framework, drawing on its theoretical foundations, previous studies, and principles of instructional design, educational media, and AI in education. It aimed to assess experts' perceptions of the framework's adequacy, coherence, practicality, and effectiveness.

The questionnaire included 35 items covering pedagogical, technical, educational media, artificial intelligence, and usability dimensions, as shown in Table (2).

Table (2) Dimensions of the Evaluation Tool

Dimension	Number of Items
1-Pedagogical Dimension	8
2-Technical Dimension	7
3-Educational Media Dimension	6
4-Artificial Intelligence Dimension	7
5-Usability and User Experience	7
Total	35

Responses were measured using a five-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

Tool Reliability

Cronbach's Alpha was used to assess the reliability and internal consistency of the evaluation tool, as it measures how consistently the questionnaire items evaluate the same construct. Reliability was computed for each dimension and for the overall instrument.

The results showed that all coefficients exceeded acceptable levels (0.70) and reached high reliability levels (above 0.80), indicating strong internal consistency and confirming that the tool is suitable for evaluating the proposed framework

Table (3) summarizes the reliability coefficients obtained for each dimension and the overall Tool.

Table (3) Reliability Coefficients

Dimension	Cronbach's Alpha
1-Pedagogical Dimension	0.91
2-Technical Dimension	0.89
3-Educational Media Dimension	0.88
4-Artificial Intelligence Dimension	0.93
5-Usability and User Experience	0.90
Overall, Tool	0.92

3. RESULTS

After confirming the validity and reliability of the evaluation tool, the collected data were analyzed to explore experts' perceptions of the proposed framework across its different dimensions. Descriptive statistical methods, including means, standard deviations, and agreement percentages, were used to assess the level of consensus regarding the framework's suitability and effectiveness.

The analysis was organized according to five main dimensions: pedagogical, technical, educational media, artificial intelligence, and usability, providing a clear overview of the framework's strengths and its applicability in AI-supported educational environments.

Pedagogical Dimension

The pedagogical dimension is a key component of the proposed framework as it reflects the core educational principles guiding the design of the AI-based platform. It assesses the framework's ability to support learner-centered instruction, adaptive learning, continuous assessment, personalized feedback, and effective learning experiences.

It also examines how the platform enhances student engagement, promotes self-regulated learning, and helps achieve educational objectives in secondary education. The results of experts' evaluations for this dimension are presented in Table (4).

Table (4) Evaluation of the Pedagogical Dimension

Item	Mean	SD
1-Learning objectives are clearly defined	4.80	0.41
2-Content supports personalized learning	4.75	0.44
3-Activities enhance student engagement	4.70	0.47
4-Assessment mechanisms are appropriate	4.65	0.49
5-Learning paths are adaptive	4.75	0.44
6-Platform supports self-learning	4.80	0.41
7-Educational content is well organized	4.70	0.47
8-Platform supports learning outcomes	4.75	0.44

To evaluate the pedagogical dimension overall, the arithmetic means of all items were combined to calculate a composite mean score, and the agreement percentage was computed using the formula: $(\text{Mean Score} \div \text{Maximum Scale Score}) \times 100$

The results showed a mean score of 4.74 out of 5, corresponding to an agreement percentage of 94.8%, indicating a very high level of expert agreement on the effectiveness of the pedagogical dimension.

These findings confirm strong support for self-directed and adaptive learning, personalized experiences, continuous assessment, and learner engagement, demonstrating the educational validity and effectiveness of the proposed framework.

Technical Dimension

The technical dimension represents the technological foundation of the proposed framework and evaluates its system architecture, infrastructure, and intelligent functionalities. It focuses on the platform's ability to support AI services, adaptive learning, learning analytics, secure data management, and interactive applications.

It also examines key technical aspects such as scalability, interoperability, reliability, and information security, which are essential for implementing AI-based educational platforms. The experts' evaluations of this dimension highlight the framework's technical feasibility and readiness for application, as presented in Table (5).

Table (5) Evaluation of the Technical Dimension

Item	Mean	SD
1-System architecture is appropriate	4.65	0.49
2-Platform scalability is adequate	4.60	0.50
3-Security measures are sufficient	4.70	0.47
4-AI integration is technically feasible	4.80	0.41
5-Data management procedures are suitable	4.65	0.49
6-Dashboard organization is effective	4.55	0.51
7-Technical modules are integrated	4.70	0.47

The results in Table (5) show that the technical dimension received a highly positive evaluation from experts, with a mean score of 4.66 and an agreement percentage of 93.2%

This indicates strong consensus on the technical feasibility and robustness of the proposed framework, including system integration, scalability, security, and AI-based functionalities

Overall, the findings confirm that the framework has a solid technological foundation capable of supporting adaptive learning and future expansion in AI-supported educational environments.

Educational Media Dimension

The Educational Media Dimension evaluates how effectively the proposed framework integrates educational media principles and digital communication strategies within the learning environment. It focuses on the role of media content in achieving educational goals, promoting values, increasing learner engagement, and enhancing communication between students and the platform.

It also examines the suitability of videos, awareness campaigns, interactive broadcasting, and digital communication tools included in the framework. As a core component of the platform, this dimension is essential for assessing its contribution to improving learning experiences and supporting students' academic, social, and behavioral development. The results are presented in Table (6).

Table (6) Evaluation of the Educational Media Dimension

Item	Mean	SD
1-Media content supports learning	4.60	0.50
2-Media messages enhance values	4.70	0.47
3-Interactive broadcasting is effective	4.55	0.51
4-Digital communication tools are	4.65	0.49

appropriate		
5-Awareness campaigns are useful	4.50	0.51
6-Educational videos are suitable	4.70	0.47

The Educational Media Dimension achieved a mean score of 4.62 out of 5, corresponding to an agreement percentage of 92.4%, indicating a strong level of expert agreement.

This reflects the effectiveness of the educational media components in enhancing learning experiences, promoting educational awareness, and increasing student interaction

Overall, the findings confirm the strong suitability of integrating educational media tools within the proposed AI-supported framework.

Artificial Intelligence Dimension

The Artificial Intelligence Dimension is a core component of the proposed framework, focusing on evaluating the effectiveness of integrating AI technologies within the educational platform. It assesses the system's ability to support personalized learning, adaptive assessment, intelligent tutoring, learning analytics, automated feedback, and recommendation services.

It also examines how AI enhances decision-making, improves learner engagement, and provides individualized learning experiences that address student differences. As the main technological driver of the platform, this dimension is essential for determining the framework's capacity to support innovative and intelligent education. The results are presented in Table (7).

Table (7) Evaluation of the AI Dimension

Item	Mean	SD
1-Smart recommendation system is useful	4.85	0.37
2-AI assistant supports learning	4.90	0.31
3-Adaptive assessment is effective	4.80	0.41
4-Predictive analytics are valuable	4.75	0.44
5-Personalized learning is supported	4.85	0.37
6-Intelligent feedback is beneficial	4.90	0.31
7-AI tools are appropriate	4.80	0.41

The Artificial Intelligence Dimension achieved a mean score of 4.84 out of 5, corresponding to an agreement percentage of 96.8%, indicating an exceptionally high level of expert agreement.

This reflects strong confidence in the effectiveness of integrating AI technologies to support adaptive learning, personalized services, intelligent assistance, and data-driven decision-making.

Overall, the findings emphasize the central role of AI in improving the quality, flexibility, and effectiveness of modern digital learning environments.

Usability Dimension

The Usability Dimension evaluates the ease of use, accessibility, and overall user experience of the proposed educational platform. It focuses on how efficiently users can navigate the system, access resources, and interact with its features while completing learning tasks with minimal effort

It also assesses interface clarity, content organization, and design suitability for secondary school students and other users. As usability is a key factor in technology acceptance and user satisfaction, this dimension is essential for evaluating the platform's effectiveness in supporting continuous engagement

and positive learning experiences. The results are presented in Table (8).

Table (8) Evaluation of Usability and User Experience

Item	Mean	SD
1-Interface is user-friendly	4.70	0.47
2-Navigation is easy	4.65	0.49
3-Dashboard organization is clear	4.75	0.44
4-Accessibility requirements are met	4.60	0.50
5-User interaction is effective	4.70	0.47
6-Design is attractive	4.65	0.49
7-Learning resources are easy to access	4.75	0.44

As shown in Table (8), the Usability Dimension received a highly positive evaluation from experts, with a mean score of 4.69 and an agreement percentage of 93.8%

This indicates a high level of satisfaction with the platform's usability, including its intuitive interface, clear navigation, and easy access to educational resources for all users.

Overall, the findings confirm that the framework follows user-centered design principles and effectively enhances user engagement and interaction within the learning environment.

Overall Evaluation of the Framework

To provide a comprehensive evaluation of the proposed framework, all dimensions were collectively analyzed to determine how well it meets pedagogical, technical, educational media, artificial intelligence, and usability requirements.

This holistic assessment highlights the overall strengths, applicability, and effectiveness of the framework, as well as the consistency and integration among its components

The results confirm that the framework is well-suited to support secondary education within AI-based intelligent digital learning environments, as presented in Table (9).

Table (9) Overall Evaluation Results

Item	Mean	SD	Agreement %
1-Pedagogical	4.74	0.45	94.8
2-Technical	4.66	0.48	93.2
3-Educational Media	4.62	0.49	92.4
4-Artificial Intelligence	4.84	0.37	96.8
5-Usability	4.69	0.47	93.8
Overall Framework	4.71	0.45	94.2

The results in Table (9) indicate a highly positive overall evaluation of the proposed framework across all dimensions, with a mean score of 4.71 and an agreement percentage of 94.2%, reflecting strong expert consensus on its validity and effectiveness.

The Artificial Intelligence Dimension received the highest rating, highlighting confidence in the framework's intelligent and adaptive features, while the pedagogical, technical, educational media, and usability dimensions also achieved high scores, confirming balanced integration.

Overall, the findings support the feasibility of implementing the framework and its potential to enhance learning experiences and educational outcomes in AI-supported environments.

Comprehensive Evaluation of the Proposed Framework Across Multiple Educational Scenarios

Although the expert evaluation demonstrated a very high level of agreement regarding the validity and applicability of the proposed framework, a broader evaluation is necessary to investigate its applicability across different educational contexts. Therefore, an additional qualitative evaluation was conducted by analyzing the framework under multiple educational scenarios and comparing its functional capabilities with widely adopted learning management systems. This complementary evaluation aims to demonstrate the flexibility, scalability, and practical applicability of the proposed framework beyond expert judgment alone.

Scenario-Based Evaluation

Scenario 1: Low-Achieving Student

Educational Situation

A first-year secondary student demonstrates weak academic performance in mathematics and computer science and frequently fails formative assessments.

Framework Response.

The proposed framework first performs an AI-based diagnostic assessment to identify knowledge gaps. Based on the results, the intelligent recommendation engine generates an individualized learning pathway consisting of simplified lessons, additional videos, interactive exercises, AI-generated summaries, and continuous formative assessments.

The adaptive assessment module continuously monitors learner performance. If the learner fails to achieve mastery, the system automatically recommends **supplementary** learning materials before allowing progression to the next learning level.

Expected Educational Benefits :Personalized remediation- Reduced learning gaps -Improved learner engagement- Continuous monitoring.

Evaluation Outcome

The evaluation of this scenario demonstrates that the proposed framework effectively identifies learners' knowledge gaps and provides adaptive instructional interventions tailored to individual learning needs. By continuously monitoring learner progress and dynamically recommending remedial resources, the framework enhances learning efficiency and supports improved academic performance.

Scenario 2: High-Performing Student

A student consistently achieves excellent scores across all subjects.

Instead of repeating standard instructional content, the AI engine automatically recommends advanced learning resources, enrichment projects, programming activities, scientific competitions, and higher-order thinking exercises.

The recommendation engine also adjusts assessment difficulty dynamically according to learner performance.

Expected benefits include :talent development -enrichment learning -advanced personalization -sustained motivation.

Evaluation Outcome

This scenario confirms the framework's capability to support advanced learners through personalized enrichment activities

and adaptive learning pathways. The AI-driven recommendation engine promotes higher-order thinking, sustained learner motivation, and continuous academic development without imposing unnecessary instructional repetition.

Scenario 3: Student with Irregular Attendance

A student misses several live educational sessions because of personal circumstances.

The platform automatically analyzes missed activities and generates a recovery learning plan.

The system recommends: Recorded lectures- Interactive summaries- AI-generated explanations- Self-assessment quizzes- Progress monitoring

This mechanism minimizes learning loss while maintaining educational continuity.

Evaluation Outcome

The evaluation indicates that the proposed framework effectively maintains learning continuity by automatically generating personalized recovery plans and recommending appropriate educational resources. This adaptive mechanism minimizes learning loss and enables students to resume their learning activities with minimal disruption.

Scenario 4 :Inclusive Learning

A learner requires accessible educational content because of hearing or visual limitations.

The proposed framework supports :AI-generated captions- speech-to-text- text-to-speech- adaptive font sizes- interactive multimedia- alternative learning resources

This increases accessibility and improves equal learning opportunities.

Evaluation Outcome

This scenario demonstrates the framework's ability to provide an inclusive learning environment by integrating AI-supported accessibility features and adaptive educational media. These capabilities enhance equal learning opportunities and improve learner engagement for students with diverse educational needs.

Overall Scenario Evaluation

Collectively, the four educational scenarios demonstrate the flexibility and adaptability of the proposed framework in addressing diverse learner characteristics and educational situations. Across all scenarios, the framework consistently provides intelligent personalization, adaptive learning support, continuous assessment, and AI-driven educational recommendations. These findings further strengthen the practical applicability of the proposed framework in real-world educational environments.

Table (10) Evaluation of the Proposed Framework Across Different Educational Scenarios

Scenar io	AI Servi ces	Adap tive Learn ing	Personaliz ed Recommen dation	Learn ing Analy tics	Expecte d Outcom e
Low-achiev ing studen	✓	✓	✓	✓	Perform ance improve ment

t					
High-achieving student	✓	✓	✓	✓	Talent development
Irregular attendance	✓	✓	✓	✓	Learning continuity
Inclusive learning	✓	✓	✓	✓	Better accessibility

The scenario-based evaluation demonstrates that the proposed framework is capable of adapting to multiple educational situations while maintaining personalized learning, continuous assessment, intelligent recommendations, and effective learner support.

Comparative Evaluation with Existing Educational Platforms

To further investigate the practical contribution of the proposed framework, its major functionalities were compared with several internationally adopted educational platforms. The comparison focused on intelligent educational services, adaptive learning capabilities, AI integration, educational media support, learning analytics, and personalization mechanisms.

Table (11) Comparative Evaluation of the Proposed Framework and Existing Educational Platforms

Feature	Proposed Framework	Moodle	Google Classroom	Blackboard
AI Educational Assistant	✓	✗	Limited	Limited
Personalized Learning Paths	✓	Partial	Partial	Partial
Adaptive Assessment	✓	Partial	Partial	Partial
Learning Analytics	✓	✓	✓	✓
Educational Media Integration	✓	Partial	Partial	Partial
AI Recommendation Engine	✓	✗	✗	Partial
Smart Notifications	✓	Partial	✓	✓
Predictive Analytics	✓	✗	✗	Limited
Virtual Laboratories	✓	Limited	✗	Partial
Gamification	✓	Partial	Partial	Partial
AI Content Generation	✓	✗	✗	✗

The comparison indicates that the proposed framework integrates a broader collection of AI-supported educational services within a unified architecture. While existing learning management systems mainly provide course management and communication services, the proposed framework combines intelligent tutoring, adaptive assessment, personalized learning pathways, educational media integration, predictive analytics, and AI-generated educational content into one comprehensive educational environment.

Scalability Across Educational Contexts

The proposed framework was also analyzed from the perspective of scalability.

Unlike frameworks designed for a single educational level, the proposed architecture can be adapted for: Primary Education- Preparatory Education- Secondary Education- Higher Education- Professional Training- Lifelong Learning

The modular architecture allows additional AI services and educational modules to be integrated without changing the core framework.

Table (12) Scalability Evaluation of the Proposed Framework Across Different Educational Contexts

Educational Level	Suitability
Primary Education	High
Preparatory Education	High
Secondary Education	Very High
University Education	High
Technical Education	High
Lifelong Learning	High

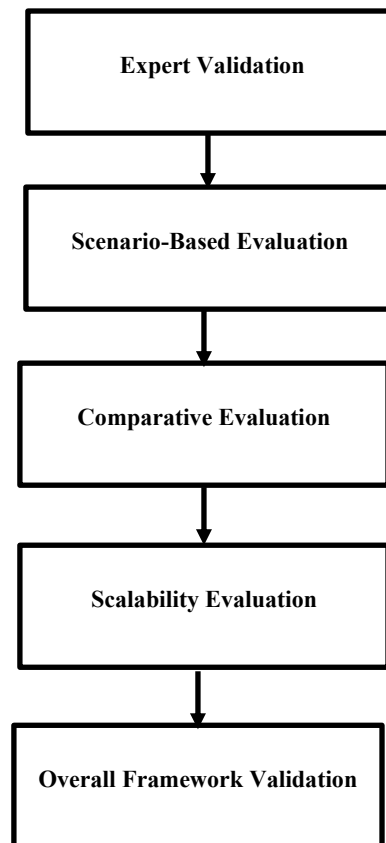


Figure (24) Comprehensive Evaluation Process of the Proposed Framework

Figure (24) illustrates the overall process adopted to perform the comprehensive evaluation of the proposed framework, including scenario-based, comparative, and scalability evaluations.

Overall Discussion of the Comprehensive Evaluation

The additional evaluation demonstrates that the proposed framework is not limited to a single educational context or user

category. Instead, it provides a flexible architecture capable of supporting diverse learner characteristics, multiple educational scenarios, and different institutional requirements.

The scenario analysis confirmed the framework's ability to provide adaptive learning, personalized educational services, intelligent recommendations, continuous assessment, and educational media integration under different educational conditions.

Similarly, the comparative evaluation highlighted several functional advantages over existing educational platforms, particularly regarding AI integration, adaptive learning, predictive analytics, and intelligent educational support.

Finally, the scalability analysis demonstrated that the framework can be extended to different educational stages while preserving its pedagogical and technological foundations.

These additional evaluations significantly strengthen the practical applicability of the proposed framework and provide further evidence supporting its implementation in future intelligent educational systems.

4. DISCUSSION

In addition to the expert validation results presented in Table (9), the comprehensive evaluations summarized in Tables (10)–(12) further confirmed the robustness, flexibility, and scalability of the proposed framework. These complementary evaluations demonstrated that the framework can effectively support different learner profiles, educational contexts, and institutional settings while maintaining its pedagogical coherence and intelligent adaptive capabilities. These complementary evaluations demonstrated that the framework can effectively support different learner profiles, educational contexts, and institutional settings while maintaining its pedagogical coherence and intelligent adaptive capabilities.

The findings of this study revealed a high level of expert agreement regarding the validity and applicability of the proposed Artificial Intelligence-Based Educational Platform Framework. The overall evaluation score ($M = 4.71$, Agreement Percentage = 94.2%) indicates that the framework successfully integrates the pedagogical, technological, media-related, and usability requirements necessary for the development of modern intelligent educational environments.

The results showed that the Artificial Intelligence Dimension achieved the highest evaluation score among all dimensions ($M = 4.84$, Agreement Percentage = 96.8%). This finding may be attributed to the framework's emphasis on adaptive learning, intelligent tutoring, personalized educational content, learning analytics, and AI-supported assessment systems. Experts recognized the potential of these technologies to address individual learner differences and enhance educational effectiveness. This result is consistent with the findings of Holmes et al. (2019), OECD (2021), and Huang et al. (2024), who emphasized the transformative role of artificial intelligence in supporting personalized learning and improving educational outcomes.

The Pedagogical Dimension also received a highly positive evaluation ($M = 4.74$, Agreement Percentage = 94.8%). This result reflects the framework's alignment with contemporary learner-centered instructional approaches and adaptive learning principles. The proposed platform was designed to support self-directed learning, continuous assessment, personalized learning pathways, and active student engagement. These findings support previous studies that highlighted the

importance of integrating pedagogical principles with intelligent technologies to maximize learning effectiveness.

Similarly, the Technical Dimension achieved a high level of expert approval ($M = 4.66$, Agreement Percentage = 93.2%). Experts indicated that the proposed framework provides a suitable technological infrastructure capable of supporting AI applications, adaptive services, learning analytics, and digital educational resources. The positive evaluation of this dimension suggests that the framework possesses the technical feasibility required for future implementation and scalability within educational institutions.

The Educational Media Dimension obtained a high evaluation score ($M = 4.62$, Agreement Percentage = 92.4%). This result demonstrates the importance of integrating educational media, digital broadcasting services, awareness-oriented content, and interactive communication tools within a unified educational environment. Experts viewed educational media not merely as a supplementary component but as an essential element that enhances learner engagement, supports value formation, and strengthens communication between educational content and students' real-life experiences.

Furthermore, the Usability Dimension achieved a strong evaluation score ($M = 4.69$, Agreement Percentage = 93.8%), indicating that the proposed framework successfully addresses user experience considerations. Experts agreed that the platform design promotes accessibility, ease of navigation, effective interaction, and user satisfaction. These findings are particularly important because usability is widely recognized as a key factor influencing technology acceptance and the successful adoption of digital learning systems.

Overall, the results suggest that the proposed framework provides a comprehensive and integrated model for the design and development of AI-based educational platforms. The combination of pedagogical principles, artificial intelligence technologies, educational media services, and user-centered design features contributes to the creation of a smart learning environment capable of supporting digital transformation initiatives in education. Therefore, the findings provide strong evidence supporting the feasibility and potential effectiveness of the proposed framework for secondary education and potentially for other educational contexts.

Recommendations for Future Development

- Implement and test the proposed platform in real educational environments to evaluate its impact on learning outcomes and student engagement .
- Integrate advanced AI technologies such as predictive analytics, intelligent tutoring systems, and generative AI to enhance personalization and adaptive learning
- Expand the platform to support mobile learning, advanced data analytics dashboards, and wider educational stages (primary, preparatory, and higher education) .
- Enhance accessibility features for learners with special educational needs through assistive technologies and inclusive design principles .
- Incorporate emerging technologies such as virtual reality (VR), augmented reality (AR), and immersive simulations to enrich learning experiences .
- Conduct large-scale experimental studies to assess the framework's impact on academic achievement, motivation,

digital skills, and overall educational effectiveness.

5. CONCLUSION

The study concludes that the proposed Artificial Intelligence-Based Educational Platform Framework represents a comprehensive and integrated model that combines pedagogical, technological, media, and usability dimensions within a unified smart learning environment. It effectively supports personalized learning, adaptive assessment, intelligent tutoring, learning analytics, and educational media integration, thereby improving the overall quality of secondary education in the context of digital transformation.

The validation results demonstrated a high level of expert agreement regarding the framework's validity, feasibility, and effectiveness, with an overall mean score of 4.71 (94.2%). All evaluated dimensions achieved high ratings, particularly the Artificial Intelligence dimension, which reflects the strong potential of AI in enhancing educational processes and outcomes. These results confirm that the proposed framework is suitable for implementation in real educational settings and provides a solid foundation for developing AI-supported educational systems.

Finally, the study contributes to advancing knowledge in educational technology by presenting an integrated and scalable model for smart learning environments. It is recommended that future research focus on real-world implementation, large-scale experimental validation, and the integration of emerging technologies to further enhance educational effectiveness and innovation.

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