



Second version of the AI assistant for teachers prototype

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Executive Summary

This deliverable, D5.2: Second Version of the AI Assistant for Teachers Prototype, documents the advancements introduced in Teacher Mate, an AI-powered assistant developed within the framework of the AI4EDU project. Building on the foundation established in the first version (D3.2) and the insights gained from usability testing and evaluation (D4.2), this second iteration aims to enhance the platform's functionality, usability, and alignment with pedagogical objectives to better support educators.

The primary focus of this deliverable is to outline the significant updates implemented in the second version, which address the limitations of the initial prototype while incorporating feedback from educators in Cyprus, Greece, Ireland, and Sweden. These updates prioritize improvements in user interface and experience (UI/UX), enhanced AI capabilities for text-based interactions, refined prompt engineering, integration of teacher-provided resources, expanded classroom and test management features, and strengthened analytics and reporting tools.

A central enhancement in the second version is the **refinement of prompts** supporting key tools such as lesson planning, grading, quiz creation, test generation, presentation creation, concept exploration, and teaching material development. These refinements leverage prompt engineering techniques to ensure more precise, curriculum-aligned, and relevant outputs, tailored to meet diverse classroom needs. Additionally, **new, prompt-supported, educational tools** have been introduced to address specific pedagogical needs, broadening the platform's applicability and utility in various teaching scenarios.

The second version also introduces a more intuitive and engaging **user experience**, optimizing navigation and accessibility to streamline educators' workflows. **AI capabilities** have been enhanced to ensure more accurate, relevant, and curriculum-aligned outputs, supporting educators in diverse teaching and assessment tasks. The inclusion of **tools for educators to incorporate their own resources** empowers teachers to personalize the platform to align with their unique strategies and classroom needs.

Classroom management functionalities were expanded to provide teachers with tools for tracking progress and facilitating data-driven decisions. Improvements in **analytics** offer deeper insights into student performance, supporting a holistic understanding of learning outcomes.

Further enriching the platform's scope and overall project impact, a dedicated courseware module, "Learning about AI," was introduced to equip secondary school students with knowledge and critical thinking skills regarding artificial intelligence. This courseware addresses key aspects such as AI functionality, limitations, biases, and ethical considerations, aligning with the project's goal to foster AI literacy alongside practical applications in education.

Overall, the second version of Teacher Mate represents a significant milestone in the AI4EDU project, addressing critical feedback from its initial deployment and aligning the platform more closely with the needs of educators. Looking ahead, the platform will undergo further evaluation in educational settings in Cyprus, Greece, Ireland and Sweden under Work Package 6. The evaluation will focus on assessing its impact on teaching practices and investigating its effectiveness in achieving Teacher Mate's goal of transforming education through AI innovation.

Acronyms and abbreviations

Abbreviation	Description
AI4EDU	Artificial Intelligence for Education (project name)
TM	Teacher Mate
RAG	Retrieval-Augmented Generation
LLM	Large Language Model
AI	Artificial Intelligence
GPT	Generative Pre-trained Transformer
LMS	Learning Management System

1. Introduction

Developed within the scope of the AI4EDU project, Teacher Mate continues to evolve as a comprehensive AI-driven assistant tailored to meet the diverse needs of educators. Building upon the first version outlined in Deliverable D3.2: First version of the AI assistant for teachers prototype, this second version integrates insights from user feedback outlined in Deliverable D4.2: Usability testing and technological evaluation results, as well as technological advancements to enhance its functionality and usability. The updated Teacher Mate includes improved functionalities, enhanced query generation via pedagogically driven prompts, enriched and personalized educator resources aligned with curriculum standards, new tools for engaging and personalized instruction, as well as an upgraded user interface. These improvements are designed to further support educators in lesson planning, student assessment, grading, and the identification of learning gaps, for a more effective teaching experience.

1.1. Deliverable Purpose

This deliverable, D5.2, provides the second version of the Teacher Mate prototype, focusing on addressing user feedback from educators, and expanding features to support diverse teaching needs across varied educational contexts.

Teacher Mate is a core component of the broader AI4EDU educational technology framework, designed to empower teachers with tools that streamline assessment tasks, enhance instructional quality, and facilitate personalized and inclusive learning experiences. This deliverable specifically focuses on the tools, features and functionalities introduced or improved in the second version, such as enhanced automated assessment, personalized content integration, and interactive learning tools, further expanding the platform's educational capabilities.

The second version of Teacher Mate reflects collaborative input from educational experts, technology developers, and user experience designers, integrating advancements aligned with the latest pedagogical practices and technological innovations to meet evolving educational standards. Additionally, the development process has adhered to EU standards and ethical guidelines, including the European Commission's recommendations for AI-enhanced educational environments ("Ethical guidelines on the use of artificial intelligence and data in teaching and learning for educators," published in October 2022).

1.2. Relation of the Deliverable to Other Work Packages and Deliverables

Deliverable D5.2 is closely interconnected with several work packages (WPs) and deliverables within the AI4EDU project. Its development is part of a cohesive framework that draws upon earlier foundational work while contributing to subsequent stages of the project, particularly the evaluation and validation of AI-driven educational tools, advancing the AI4EDU project's mission to enhance the quality of education through innovative AI-driven solutions.

More specifically, Deliverable D5.2 adheres to the user requirements, as well as the functional and technical specifications established in Deliverables **D2.1 and D2.2 of WP2: Pedagogical framework, user requirements and technical specifications** of AI4EDU

applications, which provided the foundational user requirements and technical framework that guided the design and development of both the first and second versions of Teacher Mate. Given these specifications, the second version advances the platform's ability to address diverse educational needs.

The first prototype of Teacher Mate (**Deliverable D3.2**), developed under **WP3: First Version of the AI Assistant for Teachers Prototype**, served as the initial iteration of the platform. Insights gained from the first version's testing and evaluation under **WP4: Evaluation of usability and technology acceptance of AI4EDU applications**, documented in **Deliverable D4.2**, were pivotal in shaping the second version of Teacher Mate. This feedback guided the refinement of features, user interface enhancements, and the introduction of new tools and functionalities to address real educational challenges and needs identified by educators during the evaluation phase. Deliverable D5.2 is a direct output of **WP5: Revision of the AI4EDU applications**, which focuses on advancing the AI assistant prototypes for teachers. As part of WP5, this deliverable contributes to fulfilling the project's objectives by delivering a significantly improved final version of Teacher Mate.

The second version of Teacher Mate will be a key component in **WP6: Evaluation of the Educational Impact of AI4EDU Applications**, which focuses on evaluating the educational impact of AI4EDU applications in educational settings. As part of this WP, the second version will be piloted by teachers to assess its potential for improving teaching quality, learning outcomes, and overall educational impact.

Finally, the advancements presented in Deliverable D5.2 will play a crucial role in dissemination and communication efforts under **WP8: Impact and Dissemination**. The second version of Teacher Mate serves as a demonstrator of the project's progress, highlighting the potential impact of AI-driven tools on teaching practices and provides a basis for showcasing the platform to stakeholders, promoting adoption, and identifying opportunities for further refinement and scaling.

2. AI assistant for teachers – Objectives of second version development

2.1. Background of the Teacher Mate AI assistant

Teacher Mate was developed as an AI-powered platform to address critical challenges in teaching and assessment, offering tools that streamline the educational process and make it more engaging and personalized. As outlined in Deliverable D3.2, the first version provides a comprehensive set of features tailored to support the educational curricula of Greece, Ireland, Sweden, and Cyprus. At the heart of the platform is the **Teacher Dashboard**, which served as a centralized hub for educators to administer and grade assessments, provide personalized feedback and monitor student progress. Complementing this is a **chat interface** powered by LLMs, which acts as a virtual assistant to help teachers with any teaching, learning or assessment task.

To ensure alignment with curriculum standards, Teacher Mate integrates course textbook content through **Retrieval-Augmented Generation (RAG)**, allowing teachers to incorporate textbook material into lesson plans, quizzes, and other teaching resources. Accessibility was another critical feature, with a **voice interface** enabling teachers to interact with the platform using speech-to-text and text-to-speech modules.

The first version also provides **a suite of educational tools** that facilitate the generation of accurate, interactive, and curriculum-aligned educational materials, leveraging dynamic interactions within the chat interface to refine content collaboratively. Tools include customizable test and quiz creation to challenge and engage students, an automated grading system to reduce administrative workload, a tool for lesson plan generation that caters to diverse learning styles. A presentation design tool supports the creation of teaching materials, while a concept exploration and explanation tool offer suggestions to help teachers effectively convey new concepts and ensure student understanding.

The first version of Teacher Mate was piloted in diverse educational settings, yielding valuable feedback from teachers and stakeholders. The insights gathered from the testing and evaluation phase have directly informed the development of the second version, which builds on the foundation of the first while introducing enhancements and new functionalities to better address educators' evolving needs.

2.2. Overview of the first version limitations

The feedback collected from teachers during testing and evaluation pilots for usability and technology acceptance across the four participating countries, Cyprus, Greece, Ireland and Sweden, underscored the need for more customization, additional functionalities, and expanded support for diverse teaching strategies. The following subsections highlight key areas for improvement and suggestions for new functionalities.

2.2.1. Prompting and content generation

Teachers emphasized the need for better prompt generation across various tools in Teacher Mate. This includes adding predefined dropdown menus, incorporating differentiated learning parameters for diverse student needs, and adding assessment options for students. Suggestions also highlighted the importance of refining prompts for generating subject-specific activities, lesson plans, quizzes, and personalized teaching materials, ensuring alignment with specific educational goals or official success and adequacy indicators.

2.2.2. Integration of teacher-provided custom educational materials

Educators highlighted the need for integrating their own custom educational materials into the Teacher Mate platform, as supplementary resources such as lesson plans, worksheets, teaching notes, and additional textbooks are vital for addressing unique classroom needs and curriculum gaps. They emphasized that custom materials ensure curriculum alignment, support differentiated instruction, and provide unique perspectives not covered by standard textbooks. They expressed the importance of having these materials referenced by Teacher Mate's tools—such as quiz and lesson plan generation—to maintain consistency and alignment with their teaching strategies.

This feature was also regarded as essential for accommodating changes in curricula over time and variations across regions or schools, while empowering educators with greater control over the content they use. As emphasized by educators, its implementation would positively impact the platform's ability to support evolving educational requirements, promote personalization, and strengthen the alignment between the platform and educators' unique teaching methods.

2.2.3. User Interface and Experience (UI/UX)

User interface improvements were a major focus for teachers. They highlighted the importance of intuitive, visually engaging dashboards and navigation paths. Recommendations included adding data visualization tools such as graphs and histograms

in Teacher Dashboard, incorporating features for better management of chat history, and introducing clear labels for functionalities across the Teacher Mate tools. Accessibility improvements, like placeholder texts for contextual guidance of educators in using the Teacher Mate tools and functionalities were also frequently mentioned.

2.2.4. Chat functionality/Chat history

Improving chat capabilities was a significant priority for teachers. Suggestions included categorizing chats by subject, adding dates to chats, and tagging responses to indicate their source. Additional functionalities like deleting or renaming chats and searching through past interactions were also considered essential for efficient use. Moreover, adding the functionality to stop response generation was considered useful, especially when using the voice interface to interact with the Teacher Mate.

2.2.5. Grading and testing

Grading emerged as a critical area for enhancement. Regarding the **Grading tool**, they requested features to support diverse grading scales, incorporate rubrics, and provide detailed explanations of grades for more focused and effective feedback. Regarding the **Test Generation tool**, the use of the school textbooks, as well as other educational resources, for test generation was another requirement posed by teachers. Adjustments of both tools for considering grade level and students' age as assessment parameters were also highlighted as essential. Educators also suggested having access to previous tests that they created and assigned, so they can edit and reassign them to new classes.

2.2.6. Lesson planning

A revised and comprehensive lesson planning tool, aligned with curriculum guidelines was a top priority. Teachers recommended integrating success and adequacy indicators, diverse activity suggestions and assessment options. Accommodations of the lesson planning tool for students with special educational needs, were also emphasized to support inclusive education.

2.2.7. Quiz functionality

Teachers sought improvements in quiz creation, including support for more question types like True/False questions, and multimedia-based queries. They also requested options to tailor quizzes to specific students or groups and integrate quizzes with varied curriculum resources to maintain educational relevance.

2.2.8. Multimodal content

The integration of multimedia elements was widely requested. Teachers advocated for features that allow for the inclusion of images, videos, graphs, and audio clips in lesson plans, quizzes, presentations, and other materials generated by the Teacher Mate, especially in subjects requiring visual aids, like history and biology.

2.2.9. Integration

Integration with existing learning management systems was also a request. Teachers called for functionalities to import/export data from school management systems, connect lesson plans to Learning Management Systems (LMS), and link quizzes and grading tools directly to their dashboards. Content sharing across schools and countries was also suggested to maximize the utility of Teacher Mate.

2.2.10. Classroom management, analytics and reporting tools

Improved classroom management, analytics and reporting features were also suggested by teachers. They highlighted the importance of deleting a class they created, adding or deleting students from a class and having a better overview of their classes' performance. Moreover, they emphasized tracking class and individual student progress, using visualizations like charts and bar graphs, and comparing class performance to school or regional norms as useful features. Longitudinal tracking of student performance across academic years was also emphasized. Teachers also requested streamlined management of student credentials to enhance efficiency.

2.2.11. Device compatibility

Teachers noted the importance of making Teacher Mate accessible across devices. While laptops and tablets are the primary tools in many classrooms, compatibility with mobile devices was also suggested for greater flexibility, especially in hybrid or remote teaching scenarios.

2.2.12. Other enhancements

Additional suggestions included the creation of **new tools** that offer teachers the capability to automatically generate rubrics for the evaluation of multiple assignments, to adapt difficulty level of any text so it better fits students' reading level, skills and learning needs, to chronologically order the events of a given period to enrich teaching of History, and to design engaging and interesting group projects.

2.3. Objectives of the second version development

The feedback collected from educators was grouped into broader categories regarding its focus, analyzed and prioritized based on two main criteria: (a) **alignment with the project scope** as described in the Grant Agreement, and (b) **alignment with the AI4EDU project's overarching objectives** of enhancing the quality of education through innovative AI-driven tools.

While many of the educators' suggestions were integrated into the second development phase, certain features fell outside the project's original scope and could not be fully addressed. The most notable exclusion was the **integration of multimodal AI capabilities** for understanding and generating audiovisual content, such as images and videos. Although such features are highly relevant and effective for education, the project's initial focus on text-based processing technologies limited their feasibility. To mitigate this limitation, the Teacher Mate's Tools of the second version facilitate the generation of prompts that can interface with external tools for audiovisual content creation.

Another partially addressed area was **advanced classroom management**. While comprehensive Learning Management System (LMS)-style capabilities were beyond the scope of the project, improvements were made to streamline classroom management within Teacher Mate. Suggestions for adding or removing students, improved analytics for better monitoring class and individual progress over time, as well as access and reassignment of previously created tests were fully addressed. Moreover, all suggestions related to enhancing test generation, administration, editing, grading, and feedback creation were fully addressed. However, functionalities such as comprehensive student account management and integration with external classroom management systems were deemed outside the project's objectives.

On the other hand, in line with the second criterion for analyzing teachers' feedback—the project's core mission of fostering student engagement, empowering teachers, and enhancing learning outcomes—all suggestions deemed technically feasible within the project scope and highly relevant to the project's overarching goals were implemented, even if they were initially not part of the platform's technical specifications. Furthermore, additional improvements in several functionalities of the platform were implemented, even though they were not part of the teachers' suggestions. These include further improvements in UI and UX, further refinement of prompts, as well as the development of new educational tools, not indicated by teachers.

Special emphasis was placed on the refinement process of prompts supporting Teacher Mate's tools for Lesson Planning, Grading, Quiz Creation, Presentation Creation, Concept Exploration, Teaching Material Development, and Test Generation, which involved extensive collaboration among project partners with pedagogical expertise and experience. A dedicated team, comprising members from all partner organizations, was formed to undertake this task. Specific prompts were assigned to team members, who revised and refined them based on their expertise. The initial revisions were then subjected to peer review by the team, leading to further enhancements and iterative improvements to reach the final versions of the prompts, now integrated into the Teacher Mate platform.

Given the above considerations, the objectives of this development of the second version of the Teacher Mate AI assistant are summarized in the following table:

Objective	Description
Improved User Interface and Experience (UI/UX)	Create a more intuitive and visually engaging user interface; enhance navigation; improve data visualization; improve management of chat history; integrate accessible design features like drop-down menus, prefilled fields, and labels.
Enhanced AI capabilities for text-based interactions	Refine AI capabilities for handling complex text-based queries, optimize RAG, and integrate textbook content into interactions with the Teacher Mate tools.
Enhanced query generation via pedagogically driven prompts	Improve prompts to support educators in generating more precise and effective outputs across Teacher Mate's tools, relevant to curriculum standards and individual student needs; include pedagogically driven parameters for better educational responses.
Support for custom educational materials	Enable teachers to upload and utilize custom resources such as PDFs, lesson plans, and notes, ensuring personalization and alignment with classroom needs.
Expanded class and test management features, analytics and reporting tools	Improve class management functionalities, including adding/removing students and tracking individual and class progress over time; improve visualization tools for richer insights into performance; Improve automatic feedback generation for summative student assessment; enhance test management by providing access to previously created tests.

Development of new educational Tools for teachers	Introduce specialized educational tools, such as rubric creation, text difficulty adaptation, chronological ordering exercises, and collaborative group project design.
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Table 1: Objectives of the second version of the Teacher Mate development

These objectives will be further elaborated in Section 3, which details the technical improvements and enhancements introduced in the second version of Teacher Mate.

3. Technical improvements of the AI assistant for teachers

This section outlines the technical advancements implemented in the second version of Teacher Mate, focusing on how these improvements address the limitations identified in the first version and align with the objectives outlined in Section 2. The development process was guided by WP5 objectives to deliver a platform that offers a more effective, intuitive, and user-centered experience, ready to be used in the second phase of end users' pilots aiming to evaluate its educational impact on teaching and learning.

3.1. Improved User Interface and Experience (UI/UX)

The second version of Teacher Mate incorporates significant upgrades to its user interface and overall user experience, ensuring that the platform is both functional and visually engaging.

Specific **visual enhancements** have been implemented to elevate the platform's aesthetics and usability. New graphic design elements, inspired by the project logo and website, were introduced, including an updated color palette that aligns with the AI4EDU branding across the project's dissemination media and materials (see Figure 1). Fonts have been enlarged across the platform to enhance readability for users accessing the platform on smaller screens or under varying lighting conditions. Fields for user input were redesigned for greater clarity and ease of use, incorporating larger interactive areas and better alignment with modern usability standards.

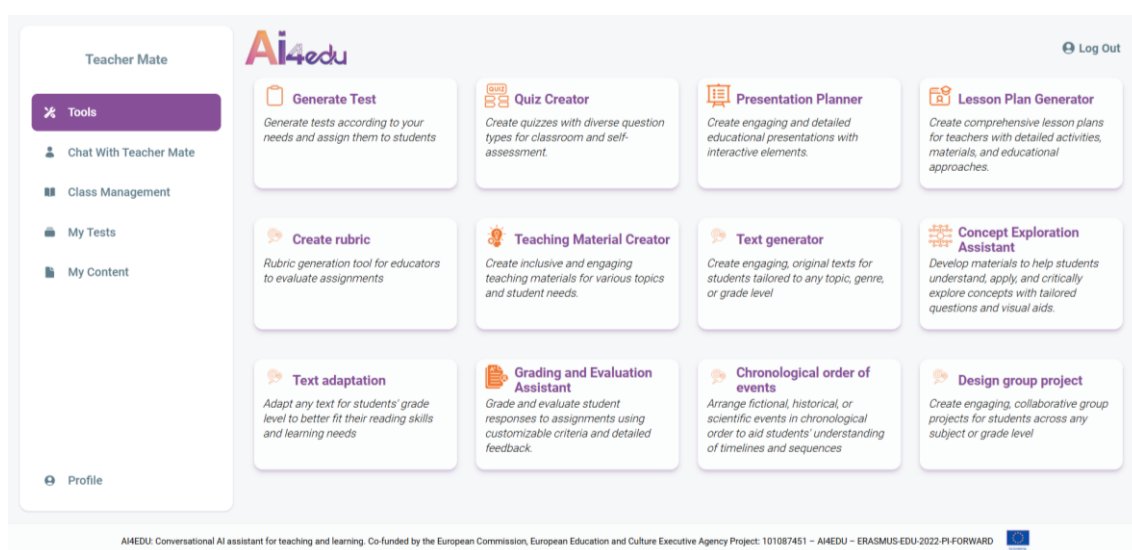


Figure 1: New Graphical User Interface (GUI) of Teacher Mate

Input fields across the platform were redesigned to be more user-friendly. Enhancements include resizable textboxes to better accommodate long entries and adding placeholder text to guide users in completing forms. For instance, in areas where teachers provide input to fields for the creation of custom prompts for generating quizzes, lesson plans, teaching material, presentations etc, the input fields now include contextual guidance to help users understand the expected content. Tooltips were also added to provide explanations for several functionalities.

Navigation paths were streamlined to make the platform more intuitive. Features such as clearer labels for menus and tools and prefilled dropdown menus in form fields for prompt creation were implemented. For example, the Teacher Dashboard now provides a simplified view allowing for quick switching between grading, analytics, and class management sections. Moreover, navigation was improved by creating multiple access points for essential tools across different sections of the platform. Tools like test generation can now be accessed directly through the Tool itself or from a section dedicated to previously created tests.

The **chat interface** underwent significant improvements to better manage conversations. Teachers now have the option to rename and delete chats in chat history, providing greater flexibility and organization in managing their interactions. Chat dates are displayed in the chat history for better tracking of discussions. Additionally, conversations can be exported in .docx document format or copied to the clipboard for integration into other applications (see Figure 2).

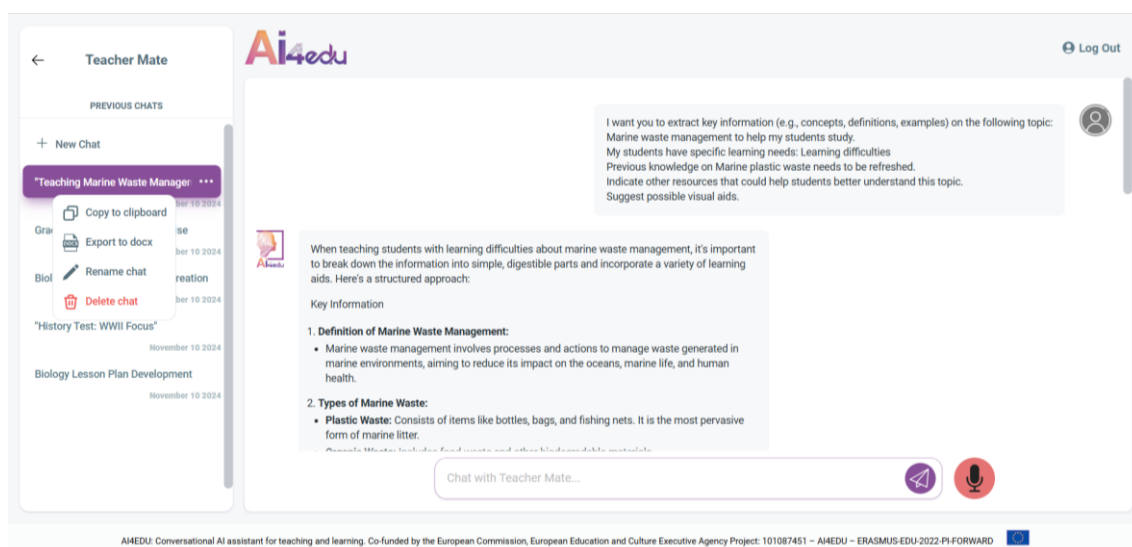


Figure 2: New features in Chat history for renaming, deleting, exporting or copying chats

Interactions with Teacher Mate were further enhanced with a feature to stop the generation of responses mid-way, allowing users to refine or redirect queries without waiting for the completion of the initial response, either in text or in voice format.

3.2. Enhanced AI capabilities for text-based interactions

The second version of Teacher Mate incorporates significant advancements in its capabilities to deliver more contextually accurate and relevant interactions. These improvements were designed to deepen the system's integration with educational resources.

A major enhancement in this version is the integration of a feature that allows users to interact directly with a PDF file displayed on the screen (see Figure 3). This functionality is particularly useful for referencing textbooks or custom teacher resources. When educators

pose queries related to the content within the PDF, the AI generates responses that are directly linked to the displayed document. To improve transparency and usability, the system navigates to the relevant page within the PDF from which the response was drawn, enabling educators to verify and contextualize the information. This feature enhances the platform's transparency and utility by fostering trust and promoting efficient content navigation within the resources teachers rely on.

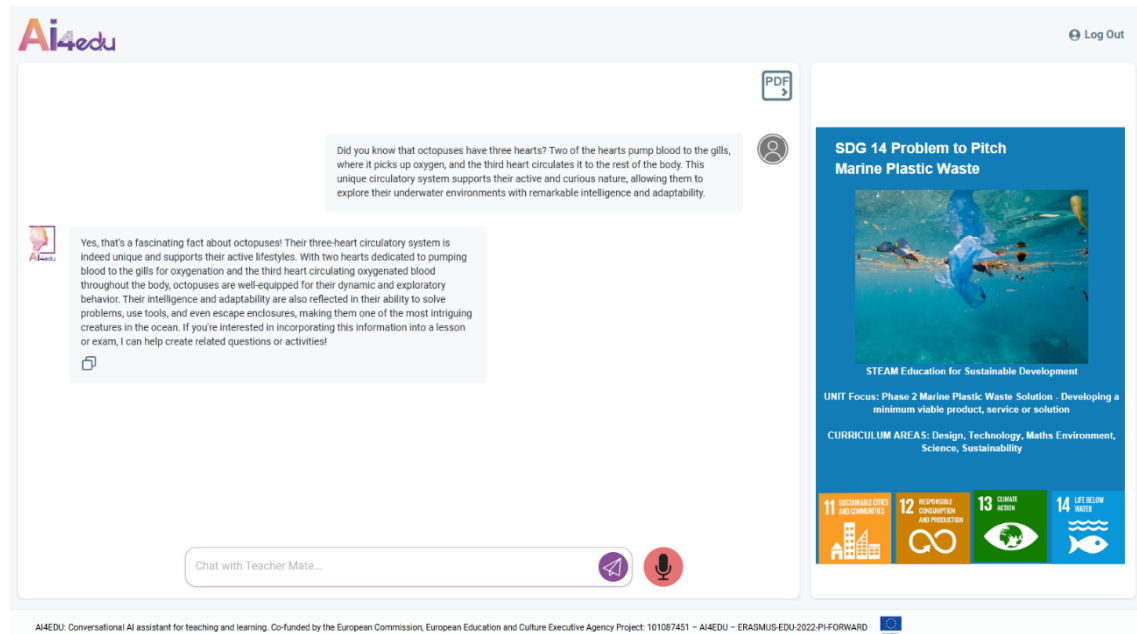


Figure 3: New functionality allowing direct interaction with a PDF file displayed on the screen

Manual tests were performed on the RAG framework with different embedding models and hyperparameters (temperature, top p, chunk sizes) and the best were selected for the current implementation, so the answers provided by the system are relevant to the specific educational contexts in which they are applied.

These improvements make Teacher Mate a more powerful tool for educators, as it bridges the gap between dynamic AI capabilities and static educational materials, enhancing the teaching experience while maintaining a clear focus on usability and curriculum alignment.

3.3. Enhanced query generation via pedagogically driven prompts

Prompts supporting Teacher Mate's suite of tools underwent extensive refinements in the second version of Teacher Mate to address educators' feedback and enhance the precision, relevance, and utility of generated outputs. This process incorporated a structured approach to redesigning and expanding the scope of input fields and prompt templates across all major tools, based on well-established pedagogical expertise, including Lesson Plan Generator, Grading and Evaluation Assistant, Quiz Creator, Presentation Planner, Concept Exploration Assistant, Teaching Material Creator, and "Generate Test" tool (see Appendix 1 for specific prompt examples).

One of the most significant advancements was the **restructuring of prompt templates** to accommodate more detailed and specific inputs from educators. New input fields were introduced to capture parameters, such as: **a) Grade level and age** of students across tools (see Figure 4), to ensure that outputs are age-appropriate and aligned with students' cognitive levels, **b) Learning objectives and pedagogical goals**, allowing teachers to specify learning outcomes and align to national educational standards, such as fostering critical

thinking or reinforcing prior knowledge, **c) Special learning needs**, including fields to address specific requirements, like simplified language for students with learning difficulties or additional scaffolding for ELL (English Language Learner) students, **d) Assessment criteria** for grading and feedback tools, allowing educators to specify detailed rubrics, performance levels, and evaluation categories for more structured and actionable feedback.

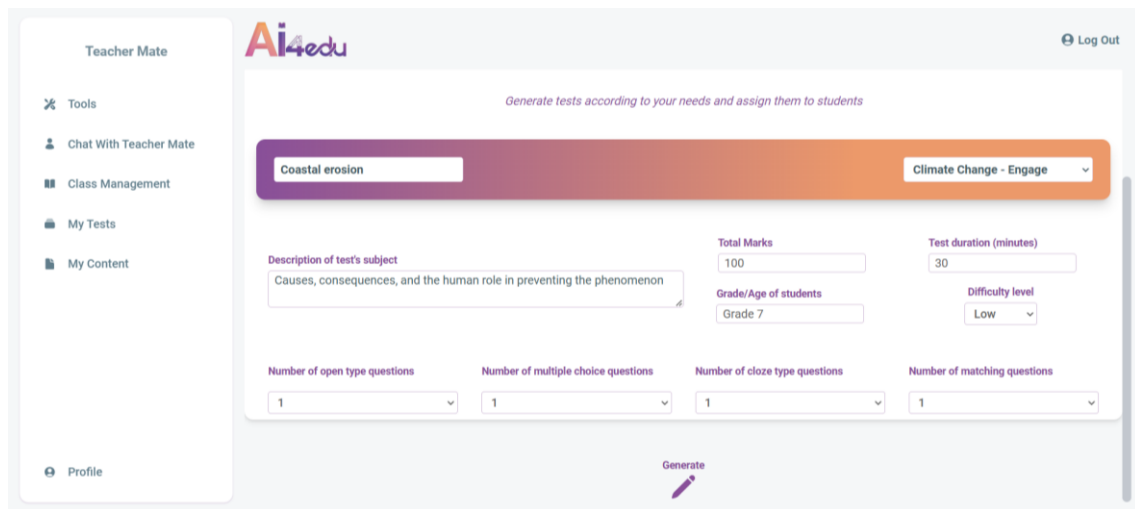


Figure 4: Revised Test generation tool with the addition of difficulty level and Grade/Age of students

Enabling **differentiated instruction** was a key focus in prompt refinement task. New parameters for tools like **Lesson Plan Generator** and **Concept Exploration Assistant** enable teachers to choose pedagogical approaches, such as inquiry-based or collaborative learning (see Figure 5). Additionally, prompts for differentiated instruction allow customization of materials for students with varying abilities or learning styles, enhancing inclusivity and personalization.

Lesson plan

Design ideas for engaging and interactive lessons

Title:
Provide a concise title that reflects the lesson's focus. Example: Understanding photosynthesis, Exploring the Pythagorean Theorem

School subject:
Specify the discipline, e.g. Biology, History, Social Sciences

Topic:
Identify the specific topic within the subject area Example: The Water Cycle, The Civil Rights Movement

Grade level:
Indicate the target grade level, e.g. Grade 8, 7th Grade, KB, Year 9 of secondary school, 3rd grade or lower secondary school

Age:
Indicate the target age range, e.g. 13 years old, 13-14 years of age

Duration:
Specify the total duration of the lesson in minutes

Objectives:
Clearly state what students should know or be able to do by the end of the lesson. Example: Students will analyze primary sources to identify key events leading to the Civil Rights

Educational Approach:
Identify the educational approach to be used. Example: Inquiry-Based Learning, Collaborative Learning, Direct Instruction, Experiential Learning, Flipped Classroom

Number of activities:
Define the number of activities included in the lesson.

Type of activities:
Define the types of activities included in the lesson. Example: introduction, hands-on experiment, group discussion, assessment

Materials and Resources:
List all necessary materials, resources, and technology for the lesson. Example: Interactive whiteboard, Markers and chart paper, Laptops or tablets, textbook

Classroom Structure:
Describe how the classroom will be organized. Example: Students seated in groups for collaborative tasks, A U-shaped arrangement for class discussions, Individual desks for

Select resource to chat with
General Chat

Generate

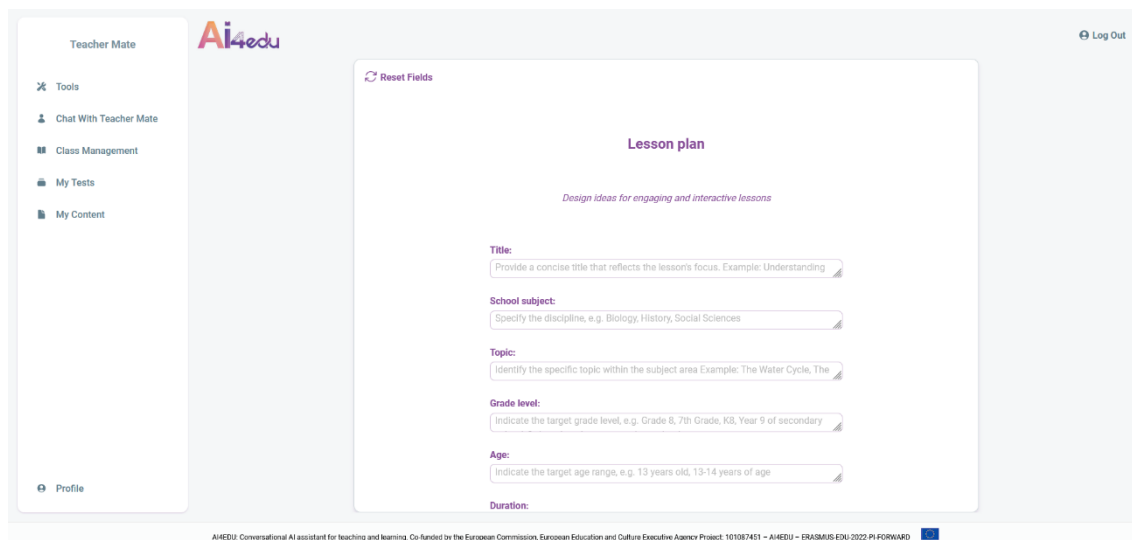
Figure 5: New, pedagogically informed, parameters for the creation of prompts, enhancing Tools' effectiveness and alignment with educational standards

Moreover, incremental support for multimodal content generation has been added to address educators' needs. Generating prompts that can be used in external tools for audiovisual content creation has been incorporated into several Teacher Mate tools, such as Concept Exploration Assistant, Quiz Generator and Teaching Material Creator. For instance, the prompt supporting the "Concept Exploration Assistant" tool now includes this query "I want you to add suggested resources for visual aids: YES. If I require suggestions for visual aids, also add examples of prompts which I can feed to an image-generating AI in order to get an output of such images as you suggest."

The refinement process leveraged uniform prompt engineering techniques and included iterative testing of prompt outputs. Collaboration among project partners was central to this effort, with technical developers working alongside pedagogical experts to craft prompts that integrate educational best practices. The team employed a multi-step review process, according to which new prompts were initially drafted based on educators' feedback and technical capabilities, then drafts were reviewed by pedagogical experts and adjusted for

clarity, completeness, and relevance and finally prompts were tested by collaborating educators, and their feedback informed further refinements.

User support features for prompt creation were also significantly enhanced, with the addition of examples and explanations for each input field to support teachers in completing forms accurately (see Figure 6). For instance, when creating lesson plans, teachers are now provided with detailed placeholder text in each field to define topics, activities, materials, and time allocations, as well as with examples of appropriate entries, such as “The transfer of the capital of the Roman Empire from Rome to Byzantium” for history lesson plan creation, or “Create a 10-slide presentation with interactive questions” for presentation requests.



The screenshot displays the 'Teacher Mate' web application. On the left is a sidebar with navigation links: Tools, Chat With Teacher Mate, Class Management, My Tests, My Content, and Profile. The main area is titled 'Lesson plan' and contains a 'Reset Fields' button. Below this, there's a heading 'Design ideas for engaging and interactive lessons'. The form consists of several input fields with placeholder text and examples:

- Title:** Provide a concise title that reflects the lesson's focus. Example: Understanding
- School subject:** Specify the discipline, e.g. Biology, History, Social Sciences
- Topic:** Identify the specific topic within the subject area Example: The Water Cycle, The
- Grade level:** Indicate the target grade level, e.g. Grade 6, 7th Grade, K3, Year 9 of secondary
- Age:** Indicate the target age range, e.g. 13 years old, 13-14 years of age
- Duration:**

At the bottom of the page, there is a footer with the text: 'AI4EDU: Conversational AI assistant for teaching and learning. Co-funded by the European Commission, European Education and Culture Executive Agency Project: 101087451 - AI4EDU - ERASMUS+ E06/2022 PI FORWARD' and the European Union flag.

Figure 6: Placeholder text within fields containing guidelines and examples for effective completion of forms

3.4. Support for custom educational materials

The second version of Teacher Mate addresses a critical feature requested by educators: the integration of a functionality enabling educators to upload their own custom resources and make them available for interaction. This development significantly improves the capabilities of the first version, which allowed teachers to interact solely with predefined resources such as official school textbooks for selected subjects in participating countries. In this improved version, teachers can now incorporate personalized materials and thus have greater control over the content they use, significantly broadening the platform's adaptability and alignment with individual teaching styles, classroom needs, and curriculum goals.

More specifically, in the Teacher Mate section “**My content**” educators can now **upload their own resources** in commonly used formats such as PDFs or text documents (see Figure 7). For example, an educator preparing for a unit on World War II can upload multiple PDFs containing primary source documents, lesson outlines, and quizzes in one step. These materials are stored within the platform, enabling integration into content generation processes for e.g. lesson plan, quiz or presentation creation.

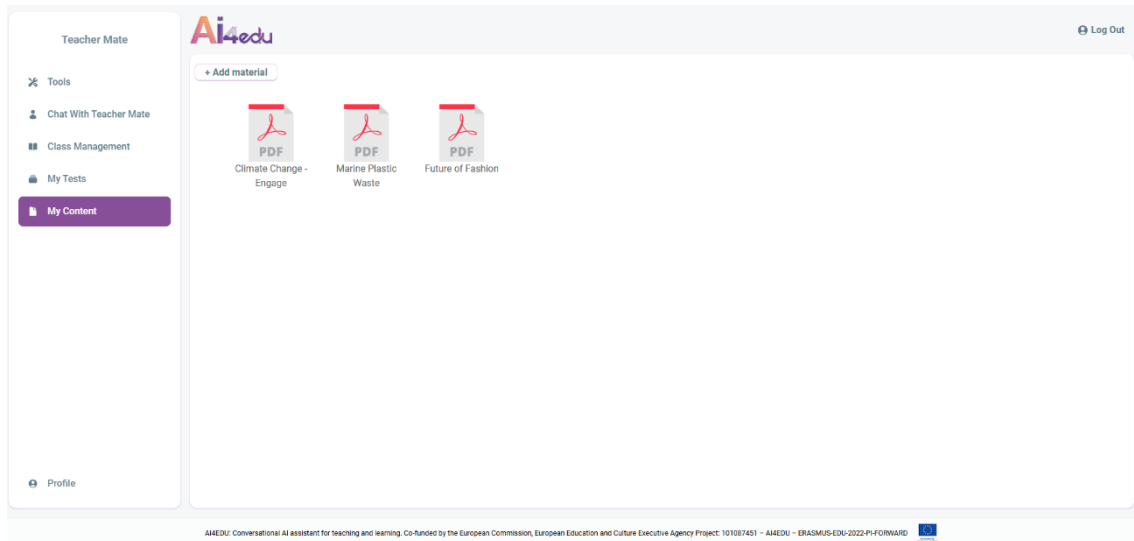


Figure 7: “My content” section in Teacher Mate, where educators can upload their own educational resources and make them available for interaction with the AI support

Moreover, **multi-resource interaction** is a key functionality implemented in the second version. Teachers can select multiple uploaded files simultaneously to interact with during a single content generation process of, e.g., a quiz, a new lesson plan, or a concept explanation. The platform employs RAG techniques to dynamically reference uploaded materials when generating content. This capability enables Teacher Mate to extract relevant information from multiple uploaded files and incorporate it into AI-generated outputs such as quizzes, lesson plans, and teaching materials. For example, a teacher generating a quiz on biodiversity can see questions drawn directly from several selected files, such as a textbook chapter and a supplementary handout. The ability to incorporate teacher-provided resources is available across all core Tools of Teacher Mate.

To further enhance the user experience, the platform includes basic file management options for uploaded resources. Teachers can upload materials through a user-friendly interface, assign custom categories to their resources for easy organization, and add or delete materials as needed.

3.5. Expanded class and test management features, analytics and reporting tools

The second version of Teacher Mate delivers substantial enhancements in class management and analytics via the **Teacher Dashboard**, addressing key teacher feedback and introducing new capabilities that empower educators to better manage their classes and derive actionable insights from student performance data. These advancements represent a significant leap forward from the initial version, providing functionalities for effective classroom administration and data-driven decision-making.

Teachers can now not only add but also **remove classes** within the Teacher Dashboard, with options to sort and organize classes by **course and grade level**. These refinements enhance navigation and provide greater accessibility. Teachers can also add essential details, creating a comprehensive profile for each class. Within each class, teachers can **add or remove students**, providing the flexibility to adapt to evolving classroom compositions.

Teachers can also access **summarized class performance data** for assigned tests across time, supported by visualizations such as **graphs and histograms** (see Figure 8). These tools

help educators quickly assess trends and overall class progress, enabling them to adjust their instructional strategies accordingly.

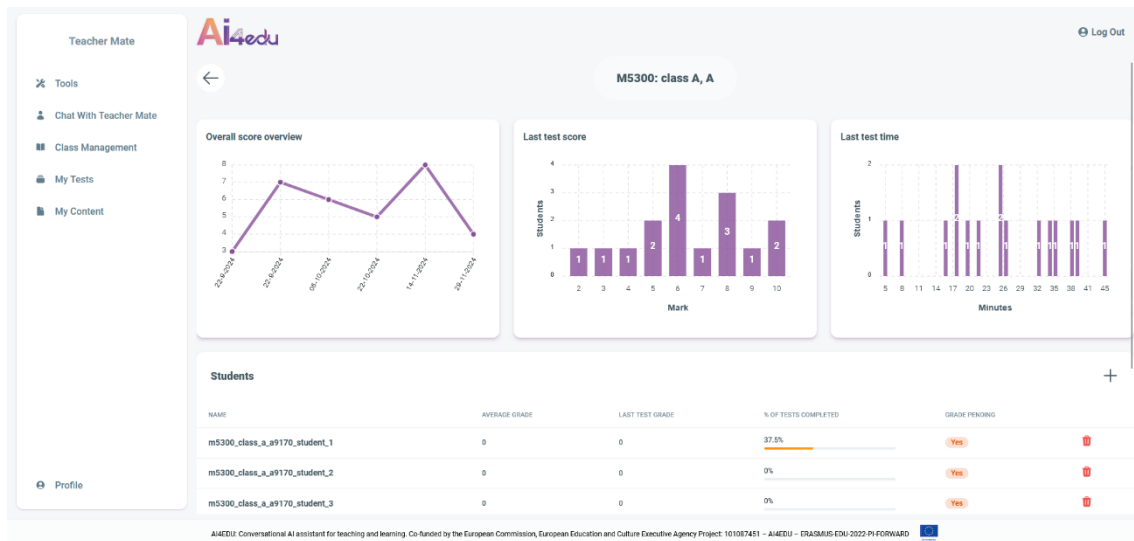


Figure 8: Revised Teacher Dashboard with visualizations summarizing class performance over time.

The “**Overall Score Overview**” graph displays the average score of the entire class across all Teacher Mate-powered tests assigned to a specific class. The horizontal axis represents the test dates, while the vertical axis indicates the average class score for each test. This graph is interactive: dots representing individual test instances can be selected to reveal detailed information about a specific test. These additional insights include:

- Grade distribution:** A breakdown of student grades for the selected test.
- Time spent distribution:** An overview of how much time students spent completing the test.

Each time a new test instance is selected, the subsequent graphs are dynamically updated to display the corresponding data, ensuring that teachers have access to actionable insights for each assessment.

Moreover, the platform provides teachers with detailed views of individual student performance. A **longitudinal tracking feature** allows educators to monitor how a student’s performance evolves over time (see Figure 9).

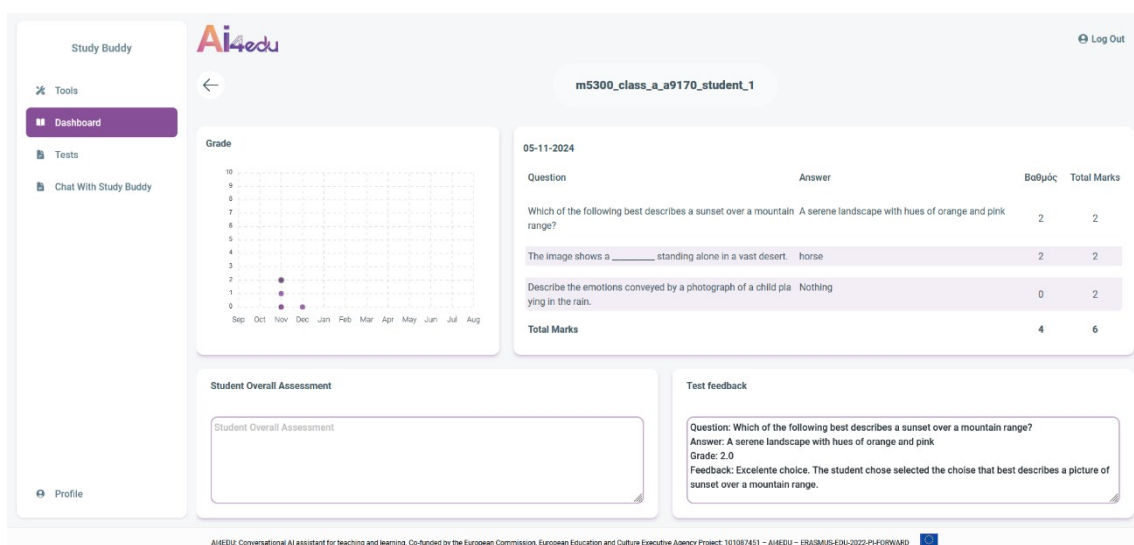


Figure 9: Overview of individual students' performance over time

The graph displays the student's score across all tests assigned to them. The horizontal axis represents the test dates, while the vertical axis indicates the selected student's score for each test. The graph is interactive: dots representing individual test instances can be selected to reveal specific information about the selected test. This information includes:

- a) The student's exact answers to the selected test questions.
- b) The AI-assigned score for the selected test.
- c) The AI-generated feedback on the student's performance for the specific test.

Teachers can modify the automatically assigned scores and review or revise the AI-generated feedback to ensure it aligns with the individual needs of the student. When a new test instance is selected on the graph, the displayed information dynamically updates to reflect the corresponding data, providing teachers with actionable insights for each assessment.

While the features for modifying scores, reviewing student answers, and refining individual test feedback were part of the initial version of Teacher Mate, the interactive graph functionality, which dynamically presents previous assessment data, is a new enhancement introduced in the second version.

Additionally, a new feature introduced in this version provides teachers with **cumulative feedback**, consolidating insights from all past assessments (field “**Student overall assessment**”). This functionality is integrated in the Teacher Dashboard as an AI-generated summative assessment of each student's overall performance. The automatically generated feedback is editable by the teacher and can be submitted to the student, together with their grade in the last test. This new functionality helps educators pinpoint recurring challenges or strengths in a student's performance, supporting personalized feedback.

The expanded **class management and analytics capabilities** of Teacher Mate offer a unified interface that enables educators to monitor progress with greater granularity and make informed decisions. The combination of class-level and student-level insights supports **differentiated instruction**, allowing teachers to explore various dimensions of student performance, such as average scores, time spent on assessments, and comparative results across assignments, and design informed interventions according to their individual progress and level of achievement.

Finally, addressing educators' request for access in tests that have been previously created and assigned to their classes, a new functionality was added providing access to old tests, in “**My Tests**” section of the platform (see Figure 10).

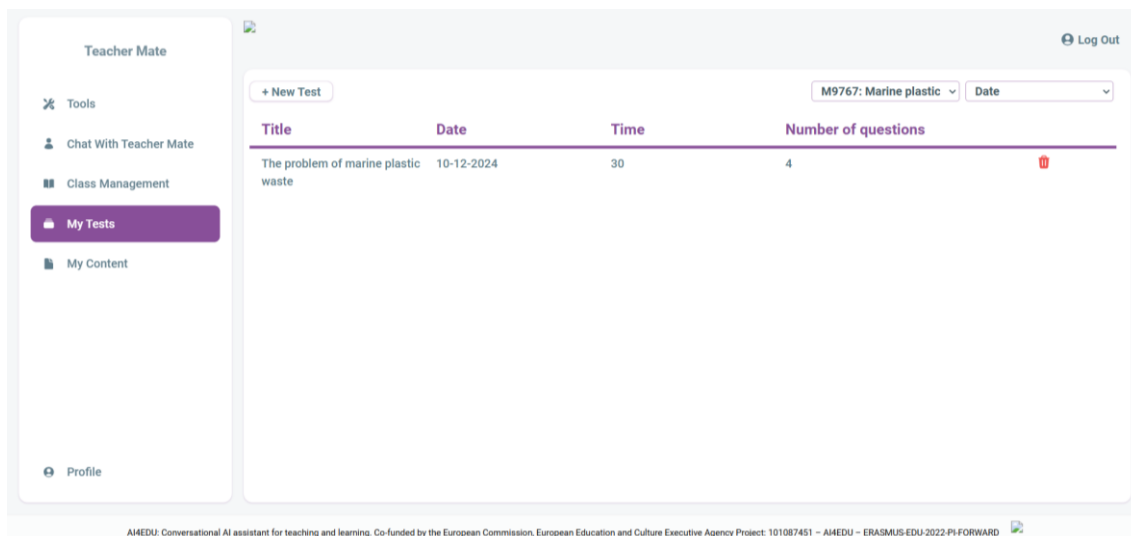


Figure 10: “My Tests” section of the Teacher Mate platform, displaying all tests by Class and allowing sorting tests by Title, Date, Time allocation and Number of questions, editing and reassignment of old tests to new classes

Within “My Tests”, teachers can explore old tests assigned to their Classes, sort them by Title, Date, Time allocated, and Number of questions, edit and reassign them to new classes. This feature fosters greater flexibility and efficiency in **test management**, allowing teachers to reuse and adapt existing materials to meet the evolving needs of their classes while saving time on test preparation.

These integrated improvements in class management, analytics, reporting and test management provide educators with the flexibility, precision, and insights they need to support diverse learning environments, whether in physical classrooms, hybrid settings, or remote learning scenarios.

3.6. Development of new educational Tools for teachers

The second version of Teacher Mate introduces new educational Tools which leverage AI-driven prompt engineering to provide flexible, user-centered solutions for a wide variety of educational contexts. Developed partially in response to feedback from teachers during the pilot phase, alongside novel additions to the platform, these tools align with Teacher Mate’s mission to enhance instructional quality and promote meaningful student engagement. The following subsections provide a detailed overview of the new tools and their functionalities (see also Appendix 1 for specific prompt examples).

3.6.1. Create rubric

This tool empowers teachers to generate customized rubrics for evaluating student assignments. Educators can define evaluation criteria, performance levels, and other parameters to align rubrics with their learning objectives. The tool supports both predefined and AI-suggested criteria, ensuring flexibility and adaptability. Automatic suggestions for evaluation criteria provide time-saving options. Teachers can tailor rubrics to their assignments and students’ needs.

Create rubric

Rubric generation tool for educators to evaluate assignments

Students' Age:
Specify the students' age, e.g., 12, 13

Students' Grade Level:
Indicate the grade level, e.g., Grade 6, K8, Year 9 of secondary school

Assignment Title:
Provide a clear descriptive title for the assignment, e.g., 'The story of Odysseus'

Type of Assignment:
Indicate the format or type of the assignment, e.g., project, essay, report, presentation

Learning Objectives or Skills Assessed:
List the skills or learning objectives, e.g., narrative writing, creativity, critical analysis

Number of Performance Levels:
Specify how many performance levels (e.g., 3, 4, 5)

Names for Performance Levels:
List names for the levels, e.g., Excellent, Good, Satisfactory, Needs Improvement

Evaluation Criteria:
Provide specific evaluation criteria, e.g., Narrative structure, Text cohesion, Story coherence

Additional Notes for Rubric Customization:
Add any specific instructions or preferences for the rubric, e.g., focus on creativity and content structure

Select resource to chat with

General Chat

Generate

Key enhancements include:

- Automatic generation of criteria -in case no criteria are provided by the user- based on assignment type and learning objectives.
- Customization of evaluation criteria, performance levels, and rubric layout.
- Detailed, structured outputs in a table format for consistent and transparent assessment.

3.6.2. Text Adaptation

This tool allows teachers to modify text to suit students' grade levels, reading abilities, and learning objectives. Teachers can input a text and specify parameters such as target grade, purpose of the reading activity, and any additional adaptation needs. For example, a teacher can simplify a complex text on space exploration for 6th graders, emphasizing comprehension and vocabulary development. The output includes a rewritten version of the text, a brief explanation of its main ideas, and comprehension questions to facilitate class discussions.

Text adaptation

Adapt any text for students' grade level to better fit their reading skills and learning needs

Student age:

Specify your age, e.g. 13 years old

Grade level:

Grade Level: Specify your school grade, e.g. Grade 8, 7th Grade, K8, Year 9 of secondary school, 3rd

Original Text:

Copy the text you want to be adapted here

Reading Skills Focus:

Clarify the reading skills to emphasize, e.g., simplify vocabulary, focus on comprehension strategies,

Purpose of Reading:

Describe why students are reading this text, e.g., to grasp the theme, to build comprehension, to

Additional Criteria for Adaptation:

Provide extra guidelines, e.g., include comprehension questions, simplify sentences, maintain age-

Select resource to chat with

General Chat

Key enhancements include:

- Simplification of complex texts for younger readers or students with learning difficulties.
- Adaptation to focus on specific reading skills or instructional goals.
- Inclusion of comprehension aids like questions and summaries.

3.6.3. Design Group Project

This tool helps teachers design collaborative and engaging group projects across subjects and grade levels. Teachers can specify project details, including subject, topic, learning objectives, and group size, and the tool generates a comprehensive project plan with suggested resources, visual aids, and assessment criteria. For example, a 6th-grade project on “Cultural Diversity and Traditions” includes research tasks, visual presentations, and prompts for generating culturally representative images using AI tools. The output provides clear instructions, evaluation rubrics, and suggestions for external resources.

Design group project

Create engaging, collaborative group projects for students across any subject or grade level

Student age:
Specify your age, e.g. 13 years old

Grade level:
Grade Level: Specify your school grade, e.g. Grade 8, 7th Grade, K8, Year 9 of secondary school, 3rd grade or lower secondary school

School subject:
Specify the subject this quiz belongs to (Example: Physics)

Topic:
Specify the theme or area of focus within the subject, e.g., Cultural Diversity, The Water Cycle

Learning Objectives:
List the skills or knowledge outcomes, e.g., Develop teamwork skills, Understand historical events

Project Type:
Describe the format, e.g., creative presentation, research project, skit, hands-on activity

Number of Students per Group:
Indicate group size, e.g., 4, 5, or 6 students per group

Duration:
Specify the time for the project, e.g., One week, two class periods, three homework weeks

Additional Criteria:
Add extra instructions or requirements, e.g., include visual aids, research traditions, or provide comprehension questions

Select resource to chat with

General Chat

Generate

Key enhancements include:

- Focus on fostering teamwork and creativity.
- Customizable assessment criteria tailored to project goals.

3.6.4. Chronological Order of Events

Designed to support teachers of history, literature, science or any other discipline, this tool arranges events into a chronological sequence, creating a clear timeline for students. Teachers input a list of events or just a period of time, specify the context, and receive a detailed timeline with explanatory transitions and comprehension questions. For example, a history teacher can generate a timeline of the Nika Revolt events during Justinian's reign, complete with transition sentences that highlight cause-and-effect relationships and questions to test students' understanding.

Chronological order of events

Arrange fictional, historical, or scientific events in chronological order to aid students' understanding of timelines and sequences

Student age:

Specify your age, e.g. 13 years old

Grade level:

Grade Level: Specify your school grade, e.g. Grade 8, 7th Grade, K8, Year 9 of

Events List:

Provide a list of events or specify a historical period/theme, e.g., 'The Nika revolt', 'Key

Context:

Explain the historical or thematic background, e.g., 'Events in Justinian's era in

Additional Criteria:

Specify preferences, e.g., simplify for younger students, include visual elements,

Select resource to chat with

General Chat

Key enhancements include:

- Automatic sequencing of events for better comprehension.
- Timelines with optional annotations.
- Support of comprehension through related questions and explanations.

3.6.5. Text Generator

This tool enables teachers to create original educational texts tailored to any subject, genre, or grade level. Teachers specify the topic, learning objectives, style, and length, and the AI generates a well-structured, engaging text.

For instance, a narrative text on “The Water Cycle” for 4th graders explains evaporation, condensation, and precipitation in a friendly and imaginative style, helping students understand the concept while keeping them engaged.

Text generator

Create engaging, original texts for students tailored to any topic, genre, or grade level

Student age:

Specify your age, e.g. 13 years old

Grade level:

Grade Level: Specify your school grade, e.g. Grade 8, 7th Grade, K8, Year 9 of secondary school, 3rd

Topic or Theme:

Specify the main subject or theme, e.g., 'The water cycle', 'The importance of teamwork', 'Ancient

Text Type or Genre:

Specify the genre, e.g., narrative, informational, persuasive, poetic

Learning Objective:

Describe what the students should learn, e.g., 'Help students understand the water cycle'

Length:

Specify the desired length, e.g., '250 words', '2 paragraphs', '8–10 lines'

Tone or Style:

Specify the tone or style, e.g., friendly, imaginative, formal, conversational

Additional Criteria:

Add specific requirements, e.g., include key terms, use first-person perspective, focus on cultural

Key enhancements include:

- Customizable outputs to match educational goals and student needs.
- Support for various genres, including narrative, persuasive, and informational texts.
- Integration of key vocabulary and concepts for targeted learning.

4. Technical details

The Teacher Mate backend is implemented in Python using fastapi (<https://fastapi.tiangolo.com/>) and MongoDB (<https://www.mongodb.com/>). The frontend is implemented using ReactJS (<https://react.dev/>). At the current stage of development, the LLM of choice is GPT-4 (<https://openai.com/research/gpt-4>), specifically due to its state-of-the-art, multi-lingual capabilities. For the same reasons, we utilize Whisper (<https://openai.com/research/whisper>) for speech-to-text and OpenAI's text-to-speech service (<https://platform.openai.com/docs/guides/text-to-speech>). Nevertheless, the TM backend is designed with the ease of transition between different AI technologies in mind, and we plan to include options to integrate open, off-the-cloud LLMs and speech models as they become available for the project's target languages.

The Teacher Mate prototype is accessible at the address <https://apps.ilsp.gr/ai4edu/> for users who register as teachers. For optimal performance and user experience, it is recommended to use the Google Chrome browser (and derivatives).

Code for the Teacher Mate prototype development is hosted on the following Gitlab private repository: <https://gitlab.com/ilsp-spm-d-all/dialogue/chatbot-ui>. Access can be granted upon request.

The Teacher Mate prototype is hosted also in Sweden to serve as a redundant backup platform operating in parallel with its primary deployment. This dual hosting arrangement ensures high availability and reliability, mitigating risks associated with potential outages or disruptions. Furthermore, this configuration is designed to fulfill the specific requirements set forth by the Swedish Ministry of Education, which emphasize the importance of local hosting for educational technologies to maintain compliance with national regulations and standards.

5. “Learning about AI” courseware

As part of Task 5.2: Demonstration of limitations and biases of AI systems within Work Package 5, this initiative focuses on equipping secondary school students with the knowledge and critical thinking skills required to understand and evaluate artificial intelligence. The aim is to foster a deeper awareness of how AI systems function, their potential limitations, and the ethical considerations surrounding their use. The course materials are designed for use by educators of Computer Science/Information Technology subjects as part of projects, labs, workshops or other education and training sessions. They include interactive and thought-provoking modules that align with AI4EDU objectives which address the “**Learning about AI**” aspect in educational settings, alongside with “Learning with AI” and “Learning for Human-AI interaction”.

5.1. Overview of the Course Modules

The courseware consists of three thematic modules, each focusing on key aspects of AI’s capabilities and limitations. These modules are designed with a consistent structure to ensure clarity, adaptability, and engagement, while allowing educators to customize the content to their specific teaching requirements and classroom contexts.

Each module follows a systematic format, beginning with a theoretical introduction to key concepts, followed by interactive and hands-on activities that encourage critical thinking and active participation. Modules conclude with reflective discussions or project-based tasks that consolidate learning and provide opportunities for deeper exploration of the topics.

More specifically, courseware materials include:

- A **lesson plan** with detailed instructions for educators to guide the learning process.
- **Presentation slides** summarizing key concepts and examples.
- **Video** content (for some modules) to visually explain complex topics or demonstrate AI applications.
- **Worksheets and quizzes** for student activities and assessments.
- **Interactive activities** such as discussions and group projects.

5.1.1. Module 1: Introduction to AI

This module lays the foundation for understanding AI as both a field of study and a transformative technology. It introduces the fundamental concepts of AI, including its ability to interact with its environment, process data, and make decisions. More specifically, the module explores:

- **Differences between AI and traditional computational systems**, highlighting rule-based versus self-learning systems.

- **AI's real-world applications** across sectors such as healthcare, transportation, education, and entertainment.
- **Core components of AI systems**, including goals, perception mechanisms, and reasoning capabilities.

The module is structured as follows:

- **Introduction and brainstorming:** Students discuss their perceptions of AI and identify examples of AI technologies they encounter in everyday life.
- **Interactive discussions:** Using real-world scenarios, students explore the characteristics of AI systems and classify examples as AI or non-AI systems.
- **Hands-on activities:** Students work in groups to design their own AI systems, specifying goals, sensors, and data-processing mechanisms for various tasks, such as assisting farmers or organizing classroom activities.
- **Wrap-up and reflection:** The module concludes with a discussion that revisits key concepts and encourages students to reflect on the role of AI in their daily lives.

By the end of the module, students will have a clear understanding of what defines AI, how it operates, and its transformative potential in various domains. This foundational knowledge prepares them for deeper explorations of AI's mechanics and ethical considerations in subsequent modules.

5.1.2. Module 2: Generative AI and Prompt Crafting

This module builds on foundational knowledge of AI, introducing students to generative AI with a focus on language models such as ChatGPT. It explores how these systems create content by analyzing patterns in their training data and demonstrates their applications in education, creative tasks, and problem-solving. Through interactive activities and discussions, students learn the importance of crafting clear and effective prompts to elicit accurate and relevant AI responses. Key topics include:

- **Introduction to Generative AI:** Students gain an understanding of what generative AI is and how it generates content, such as text and images, based on learned patterns from large datasets. Concepts such as neural networks, tokens, and training data are introduced.
- **Hands-on exploration of ChatGPT and the Study Buddy application:** Students explore the mechanics of generative AI by observing and analyzing its responses to various queries. Demonstrations show how language models such as ChatGPT processes user input and generate contextually appropriate text.
- **Prompt crafting:** Students learn how to create precise, context-rich prompts to guide AI responses. Activities include generating and refining prompts for educational, creative, and problem-solving tasks, fostering a deeper understanding of how prompt phrasing impacts output quality.
- **Practice and reflection:** Individual or group exercises allow students to interact directly with the Study Buddy, apply their knowledge of prompt crafting, and evaluate the quality of AI-generated responses.

5.1.3. Module 3: Biases, Hallucinations, and Ethical AI

This module addresses the challenges and risks associated with generative AI systems. Students explore how AI might produce factually incorrect or biased outputs and are encouraged to critically consider the accuracy and fairness of AI-generated content. Through reflective discussions and interactive activities, this module equips students with the knowledge to engage responsibly with AI technologies. Key aspects of the module include:

- **Understanding biases and hallucinations in AI:** Students learn how biases in training data could influence AI outputs and lead to the propagation of stereotypes or unfair assumptions. They also explore the phenomenon of “hallucinations”, where generative AI produces fabricated or factually incorrect information, understanding the risks of over-reliance on these systems.
- **Critical evaluation of AI outputs:** Through real examples hands-on activities, students practice analyzing AI-generated content for accuracy, relevance, and fairness. They discuss actual examples of biased or misleading AI outputs and develop strategies to identify and address potential inaccuracies.
- **Ethical implications of AI in society:** Ethical discussions focus on the broader impact of generative AI on education, employment, and society. Topics include the implications of AI in decision-making, its potential to reinforce inequalities, and the importance of transparency and accountability in AI development and use.
- **Interactive debates and policy drafting:** Students participate in structured debates on the pros and cons of generative AI in various contexts, particularly in education. They draft AI usage policies that reflect principles of fairness, inclusivity, and responsible innovation, promoting engagement with the ethical dimensions of AI.

This module concludes with a reflective discussion on the evolving role of AI in modern society, emphasizing the importance of ethical awareness, critical evaluation skills, and responsible usage. Students are encouraged to think beyond the technical aspects of AI, considering its transformative impact on the world around them.

5.2. Objectives and Pedagogical Impact

The primary objective of these modules is to create an informed, critically thinking student population capable of navigating the complexities of AI. Students are expected to explore how AI works, its applications, and its limitations, so they develop an awareness of both the opportunities and the challenges posed by AI systems. The inclusion of practical, real-world examples and activities fosters engagement and ensures the knowledge gained is applicable beyond the classroom.

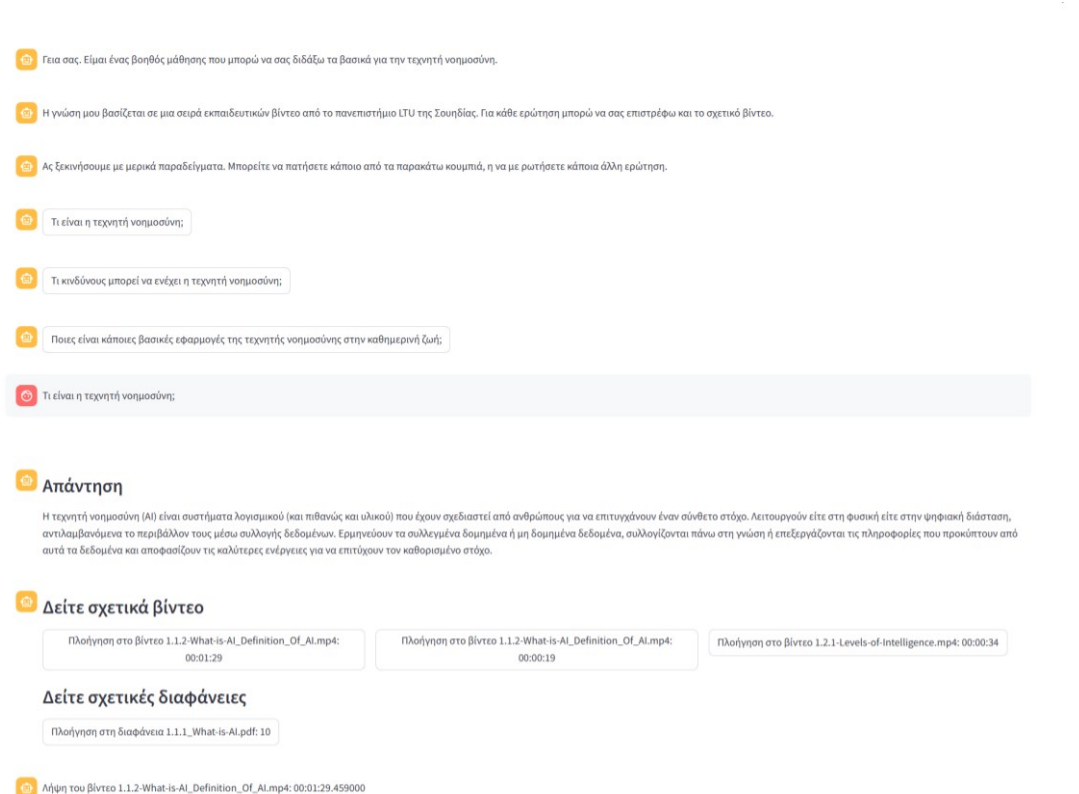
Key goals of these modules include:

- Enhancing AI literacy by providing students with foundational knowledge of AI concepts and technologies.
- Fostering critical thinking, by encouraging students to analyze and question AI's outputs and applications.
- Promoting ethical awareness by engaging students in discussions about fairness, transparency, and accountability in AI use.
- Empowering educators, by offering structured, adaptable courseware to integrate AI education into secondary school curricula.

5.3. Accessibility and implementation

The materials for these modules are available through the Teacher Mate platform, as well as through the project website¹, ensuring they are easily accessible to educators across participating regions. These resources can be used as standalone lessons, integrated into the Computer Science or Information Technology curriculum, or adapted for workshops, projects, or labs of other education and training activities organized by the project partners or interested schools or individual educators throughout the project's lifecycle.

Moreover, to make this information accessible we developed a chatbot that can guide the user through the lessons about AI. The chatbot integrates the video lessons through RAG on the video transcripts and accompanying material (presentations). This chatbot guides the user through the lessons through a conversational interface. In this interface the user can ask questions about AI and the chatbot responds with the answer and relevant parts of the video or supporting material. The chatbot is available at the login page of Teacher Mate (see Figures 11-13).



Γεια σας. Είμαι ένας βοηθός μάθησης που μπορώ να σας διδάξω τα βασικά για την τεχνητή νοημοσύνη.

Η γνώση μου βασίζεται σε μια σειρά εκπαιδευτικών βίντεο από το πανεπιστήμιο LTU της Σουηδίας. Για κάθε ερώτηση μπορώ να σας επιστρέψω και το σχετικό βίντεο.

Ας ξεκινήσουμε με μερικά παραδείγματα. Μπορείτε να πατήσετε κάποιο από τα παρακάτω κουμπιά, ή να με ρωτήσετε κάποια άλλη ερώτηση.

Τι είναι η τεχνητή νοημοσύνη;

Τι κινδύνους μπορεί να ενέχει η τεχνητή νοημοσύνη;

Ποιες είναι κάποιες βασικές εφαρμογές της τεχνητής νοημοσύνης στην καθημερινή ζωή;

Τι είναι η τεχνητή νοημοσύνη;

Απάντηση

Η τεχνητή νοημοσύνη (AI) είναι συστήματα λογισμικού (και πιθανώς και υλικού) που έχουν σχεδιαστεί από ανθρώπους για να επιτυγχάνουν έναν σύνθετο στόχο. Λειτουργούν είτε στη φυσική είτε στην ψηφιακή διάσταση, αντιλαμβάνοντας το περιβάλλον τους μέσω συλλογής δεδομένων. Ερμηνεύουν τα συλλεγμένα δομημένα ή μη δομημένα δεδομένα, συλλογίζονται πάνω στη γνώση ή επεξεργάζονται τις πληροφορίες που προκύπτουν από αυτά τα δεδομένα και αποφασίζουν τις καλύτερες ενέργειες για να επιτύχουν τον καθορισμένο στόχο.

Δείτε σχετικά βίντεο

Πλοήγηση στο βίντεο 1.1.2-What-is-AI_Definition_Of_AI.mp4: 00:01:29

Πλοήγηση στο βίντεο 1.1.2-What-is-AI_Definition_Of_AI.mp4: 00:00:19

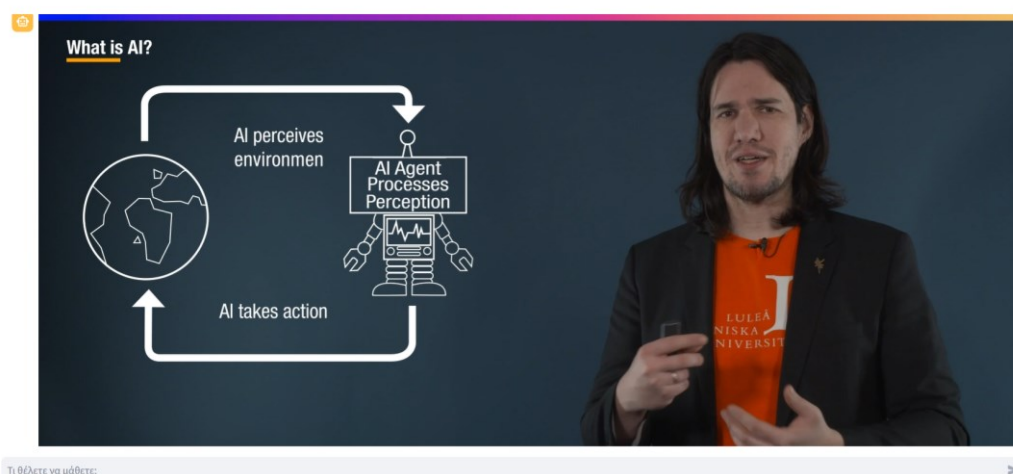
Πλοήγηση στο βίντεο 1.2.1-Levels-of-intelligence.mp4: 00:00:34

Δείτε σχετικές διαφάνειες

Πλοήγηση στη διαφάνεια 1.1.1_What-is-AI.pdf: 10

Λήψη του βίντεο 1.1.2-What-is-AI_Definition_Of_AI.mp4: 00:01:29.459000

¹ <https://ai4edu.eu/learning-about-ai-courseware>. Note: The “Learning about AI” courseware is subject to change. The material may be revised or modified based on insights and feedback gained during testing in real workshops or projects with students.



Figures 11-13: Chatbot for easy access to videos and presentations of the “Learning about AI” courseware

6. Conclusion

The second version of Teacher Mate represents a significant advancement in the AI4EDU project, reflecting a commitment to addressing educators’ evolving needs through targeted refinements and innovative features. By integrating user feedback from the initial version and leveraging state-of-the-art AI technologies, the platform has evolved into a comprehensive, adaptable, and user-centered educational tool.

Key enhancements in this iteration include a more intuitive and accessible user interface, improved capabilities for text-based interactions, and the introduction of functionalities for integrating teacher-provided custom resources. These improvements empower educators to personalize their teaching strategies while maintaining alignment with curriculum standards. The platform’s expanded suite of tools now operates with greater precision and relevance, thanks to extensive prompt refinements and the inclusion of new pedagogical parameters.

The introduction of advanced class management and analytics features marks another milestone, enabling educators to efficiently manage their classrooms and make data-driven decisions. With tools for longitudinal tracking and customizable visualizations, teachers can gain actionable insights into student performance at both class and individual levels, enhancing their ability to support differentiated and inclusive learning.

The second version of Teacher Mate also underscores the project’s commitment to addressing scalability and adaptability. Features such as multi-resource interaction ensure that the platform remains flexible and capable of accommodating diverse teaching contexts and evolving educational requirements.

Looking ahead, Teacher Mate will undergo further evaluation in real-world educational settings as part of the AI4EDU project’s ongoing validation efforts. These evaluations will provide critical insights into the platform’s impact on teaching and learning outcomes, guiding future minor refinements and ensuring alignment with the project’s overarching mission of enhancing education through innovative AI-driven tools.

Appendix 1: Revised and new prompts supporting the Teacher Mate's educational Tools

Lesson plan generator

Create a comprehensive lesson plan titled [Newton's Second Law on Physics](#), topic [Forces and Motion](#). The lesson plan addresses students at [Grade 8](#) aged [14–15 years](#) and should last [80 minutes](#). The main objectives of this lesson are: [Students should be able to identify and apply the parameters in Newton's Second Law equation](#). The lesson plan should follow the [Inquiry-Based Learning](#) approach.

The lesson plan should be divided into [3](#) activities, corresponding to lesson sections, of the following type: [Introduction, Hands-On Experiment, and Assessment](#). The available materials and resources are [computer with projector, whiteboard, Physics textbook, worksheets, calculators](#). Suggest additional materials and resources, if needed. The classroom should be organized in [Whole classroom, individual work](#).

The lesson plan should integrate all the provided components. Each activity must be detailed, aligned with the lesson objectives and educational approach, and structured to fit within the allotted time. Include methods for assessing student understanding and engagement throughout the lesson.

Grading and evaluation assistant

You are an experienced and helpful assistant for teachers, and I want you to help me grade and evaluate my students' answers to questions or assignments, based on the following information I provide:

Subject: [History](#)

Grade Level: [Grade 8](#)

Age: [13-14 years](#)

Learning Unit/Topic: [Byzantine Empire](#)

Type of assignment: [Short answer](#)

Question Prompt: [What was the Nika Revolt?](#)

Student's Answer: [It was a revolt that took place during the Byzantine era.](#)

Evaluation criteria and score per category (optional): [Content \(5/20\)](#), [Detail \(5/20\)](#), [Clarity \(5/20\)](#), [Completeness \(5/20\)](#)

Based on the rubric provided, evaluate the student's response to the question.

Assign a score for each evaluation category, along with an explanation of the score. In case I don't provide evaluation criteria, suggest your own criteria based on the type of assignment and learning topic and assign a score to each one of them.

Calculate the total score out of [20 points](#) and provide a brief overall comment or grade (e.g., Excellent, Good, Average, Below Average, Needs Improvement).

Offer detailed suggestions for improvement based on the evaluation criteria. Provide additional feedback on how the student could improve their answer.

Quiz creator

Create a custom quiz titled [Newton's Second Law Quiz on Physics – Newton's Second Law of Motion](#), focusing on the key concepts of [Force](#), [Mass](#), [Acceleration](#). The quiz is intended for students in [Grade 8](#) and should be appropriate for the [14-15 years](#) age range, with a total duration of [40 minutes](#). The overall difficulty level should be [Medium](#), and the total grade is [100](#).

The quiz should include the following breakdown of question types: [1](#) matching questions (in a table format), [1](#) multiple-choice questions with [4](#) answer options each and [[1](#)] correct answer, [1](#) cloze (fill-in-the-blank) questions, [1](#) true/false questions, and [1](#) open-ended questions.

Ensure that all questions align with the key concepts provided and are appropriate for the specified grade level. The quiz should feature a balanced mix of questions in accordance with the desired difficulty level. Make sure that the same concept or idea is not tested multiple times by different questions. Also make sure that questions or their answer options do not indicate the answers to other questions within the same quiz. Provide the answer key at the end of the test.

Presentation planner

Create an educational presentation of [10-12 slides](#) for [Grade 8](#) students, aged [13-14 years](#), for the subject of [History](#) about the [transfer of the capital of the Roman Empire from Rome to New Rome](#). The presentation should have a duration of [30 minutes](#) and be clear, engaging, and with age-appropriate tone. The learning objective of the presentation is [to explain the reasons for the transfer, key figures involved, and the long-term impact on the empire](#).

Key points or major subtopics the presentation will cover include [background of the Roman Empire](#), [the Role of Emperor Constantine](#), [the reasons for the transfer](#), [the cultural and religious significance and the impact on the Roman Empire](#).

Ensure each slide has enough detailed educational information to provide a comprehensive understanding of the topic, rather than just an outline. Use bullet points to organize information clearly but ensure each bullet point includes enough explanation to convey the full context. Include suggested resources for visual aids, such as [maps](#), [timelines](#) and [illustrations](#). Regarding visual aids, add examples of prompts which I can feed to an image-generating AI in order to get an output of such images.

To enhance interactivity, add [discussion questions](#), [short quiz](#).

Concept exploration assistant

I am a teacher who wants to help my students acquire and deepen their understanding of a concept / some concepts. I want you to help me provide material for this.

These are the concept(s) I want to help my students understand: [the cell](#)

My students are in school year [7](#) and they are [13 years old](#).

Begin with a comprehensive description of the above concept(s). The level of detail for the concept description I want you to provide is [basic](#).

I want you to provide [3](#) examples of the concept.

I want you to provide [3](#) comprehension questions to ask the students in order to make sure that they understand the basics of the concept.

I want you to provide [2](#) questions to ask the students where they get to practice applying the concept.

I want you to provide [1](#) critical questions to ask the students where they get to think critically about the concept, e.g. regarding the limits of its application or problems inherent with the concept or other critical issues.

I want you to provide [1](#) challenging questions to ask the students where they get to use higher order cognitive skills to think about the concept, which take their learning further.

I want you to provide the answers to the questions: [NO](#).

I want you to add suggested resources for visual aids: [YES](#). If I require suggestions for visual aids, also add examples of prompts which I can feed to an image-generating AI in order to get an output of such images as you suggest.

My students have the following special needs: [dyslexia](#).

Additional criteria for the response you generate include: [Adjust the response vocabulary to the grade level and age of students](#).

Finally, I want you to suggest next steps for the students, when they are done exploring this concept, in the form of other concepts to explore, which relate to or build upon the concept, in order to take their learning further.

End by a short comment to me about how to use the material you generate, and some pedagogical points to think about.

Teaching Material Creator

You are an experienced and helpful assistant for teachers, helping them design curriculum-aligned, well-structured informational materials to help my students understand and study a topic. Your materials should: a) Be level-specific, aligning content complexity and tone to the students' grade level and prior knowledge, b) Address diverse needs, tailor explanations, examples, and visuals to meet various learning needs, as specified by the teacher, c) Be structured and clear, organizing information into sections to make it easy for students to follow, with a clear progression from introduction to examples and definitions.

More specifically, generated materials should include: Refreshing of previous knowledge, if specified by the teacher, introduction to the topic, core concepts, key terms and definitions, supporting examples, supporting data (e.g. interesting facts and fun facts), discussion points or questions, and additional resources.

Considering all the above, create teaching materials based on the following information I provide:

Topic: [Photosynthesis](#)

School subject: [Biology](#)

Grade Level: [Grade 7](#)

Age: [12 years old](#)

Prior Knowledge Level: [Intermediate](#)

Previous knowledge that needs to be refreshed: [Plants, plant parts](#)

Learning Goals: [Understand basic photosynthesis, know key terms about it, know the process](#)

Special Learning Needs: [Use simpler language](#)

Assessment Type: [Quiz](#)

Test Generation

You are a teaching assistant. You help generate a student test, including the corresponding answers, with [10](#) questions per test in the following subject: "[Biology](#)".

Respond in the language and topic of the subject.

This test is intended for students with age: [15](#)

The difficulty level is [medium](#)

The test should consist of the following number of question types:

[2](#) matching questions

[2](#) true/false questions

[2](#) multiple choice questions

[2](#) cloze (fill-the-gaps) questions

[2](#) open-ended questions

Keep in mind that the total test duration time is [60](#) minutes.

Return a list of [10](#) questions in the following format, depending on the question types that the user requested. The response format should strictly be: '{json_example_format}'.

Ensure there is no overlap of information between questions (e.g., one question should not provide the answer to another)

The json example format is:

```
{
  "multiple": ""{
    "type": "multiple",
    "question": "Which of the following ...",
    "choices": ["Example choice A", "Example choice B", "Example choice C", "Example choice D"],
    "suggested_answer": "Example choice A",
    "marks": 2
  }""
}
```

```

"cloze": ""{{
  "type": "cloze",
  "question": "This is an example with a _____ question type.",
  "suggested_answer": "cloze",
  "choices": "",
  "marks": 2
}}"",
"matching": ""{{
  "type": "matching",
  "question": ["Example question A", "Example question B", "Example question C"],
  "choices": ["Example match A", "Example match B", "Example match C"],
  "suggested_answer": [
    [{"Example match A": "Example match C"}],
    [{"Example match B": "Example match A"}],
    [{"Example match C": "Example match B"}]
  ],
  "marks": 2
}}"",
"open": ""{{
  "type": "open",
  "question": "Explain an open answer question",
  "suggested_answer": "An open question has an open answer",
  "choices": "",
  "marks": 2
}}"",
"true_false": ""{{
  "type": "true_false",
  "question": "Ask a true or false question",
  "suggested_answer": "True",
  "choices": ["True", "False"],
  "marks": 2
}}"",
}

```

Create Rubric (New tool)

Generate a rubric for my assignment in a clear table format with columns for each performance level and descriptive criteria for each level. Use the evaluation criteria as I

provide them. In case I don't provide evaluation criteria, suggest your own criteria based on the type of assignment and learning objectives provided.

Assignment Title: [The story of Odysseus](#)

Students' grade level: [Grade 6](#)

Students' age: [12 years](#)

Type of Assignment: [Project](#)

Learning Objectives or Skills Assessed: [Creative story writing on given topic and content](#)

Number of Performance Levels: [4](#)

Names for Performance Levels (optional): [Excellent, Good, Satisfactory, Needs Improvement](#)

Evaluation criteria (optional): [1. Narrative structure 2. Story Coherence 3. Text cohesion 4. Vocabulary richness](#)

Additional Notes for Rubric Customization (optional): [emphasize language use, creativity and focus on content structure](#)

Text adaptation (New tool)

I am a teacher, and I want you to adapt the text I provide to fit my student's reading level and skills. Please rewrite the text according to the following details:

Original Text: Here is the text I need adapted: [Όνειρα για ταξίδια στ' αστέρια Τα ταξίδια σε μακρινά άστρα και άλλους γαλαξίες θεωρούνται σήμερα αδύνατα, όμως ο επιστημονικός κόσμος δε χάνει την αισιοδοξία του και προγραμματίζει, θεωρητικά προς το παρόν, τέτοιες αποστολές. Μόλις οι μακρινοί μας πρόγονοι έπαψαν να πιστεύουν ότι τα άστρα είναι πατημασιές των θεών και διαπίστωσαν ότι είναι σαν τον Ήλιο μας, άρχισαν να αναρωτιούνται πώς θα φτάσουν εκεί. Εάν κατορθώσουμε να ταξιδέψουμε όχι μόνο έως τη Σελήνη ή έως τον Άρη αλλά τρισεκατομμύρια χιλιόμετρα μακριά, θα μπορέσουμε να φτάσουμε σε άλλα ηλιακά συστήματα. Ωστόσο, ακόμα και για τους πιο ονειροπόλους, το ταξίδι προς τα άστρα είναι προς το παρόν αδύνατο, ενώ καμία κρατική ή ιδιωτική επιχείρηση δεν έχει σκοπό να το τολμήσει. Ερευνητές της NASA μελετούν τρόπους για τη δημιουργία διαστημικών σταθμών που θα εκτελούν κανονικά «δρομολόγια» μεταξύ Γης και Άρη. Καθώς το ταξίδι προς τον ερυθρό πλανήτη θα διαρκεί αρκετούς μήνες, οι διαστημικοί αυτοί σταθμοί θα μοιάζουν περισσότερο με διαστημικά ξενοδοχεία. Το σχέδιο που επεξεργάζονται οι ερευνητές προβλέπει ότι το διαστημικό «ξενοδοχείο» θα κινείται συνεχώς γύρω από τον Ήλιο και θα περνάει τότε κοντά από τη Γη και τότε κοντά από τον Άρη. Αν πραγματοποιηθεί το σχέδιο, η επιβίβαση και η αποβίβαση στο διαστημικό «ξενοδοχείο» θα γίνονται με τη βοήθεια ειδικών σκαφών, που θα παίζουν τον ρόλο ταξί: θα πλησιάζουν το «ξενοδοχείο» και θα συνδέονται με αυτό εν κινήσει. Το ταξίδι μέχρι τον Άρη θα διαρκεί έξι με οκτώ μήνες. Εκεί άλλα ταξί θα αναλαμβάνουν να μας οδηγήσουν στον τελικό μας προορισμό. Η ιδέα ότι κάποια στιγμή στο μέλλον τα ταξίδια προς τον Άρη θα είναι θέμα ρουτίνας γίνεται αποδεκτή από το σύνολο σχεδόν της επιστημονικής κοινότητας. Το ερώτημα που απασχολεί τους πάντες δεν είναι το «αν», αλλά το «πότε».](#)

Grade Level: [6th Grade](#)

Age of students: [12 years old](#)

Reading Skills Focus: [Simplify complex vocabulary, emphasize understanding of topic](#)

Purpose of reading: I want the students to grasp the theme

Additional criteria for adaptation: Provide a simplified rewrite of the text that is age-appropriate. Include a brief explanation of the meaning followed by two or three comprehension questions to support discussion.

Design group project (New tool)

I am a teacher, and I need help designing a group project for my students. Please generate a project idea based on the following details:

School Subject: Social Studies

Topic: Cultural Diversity and Traditions

Grade Level: 5th Grade

Age: 11 years old

Learning Objectives: Develop an understanding of cultural diversity and teamwork skills.

Project Type: Creative presentation (e.g., poster or skit).

Number of students per group: 4 students

Duration: One week

Additional Criteria: Each group should focus on one culture, including research on traditions, food, clothing, and festivals.

Include suggested resources for informational material and visual aids. Regarding visual aids, add examples of prompts which I can feed to an image-generating AI in order to get an output of such images as you suggest.

Include suggested assessment criteria.

Chronological order of events (New tool)

I am a teacher, and I want you to arrange a list of events in chronological order to help my students better understand timelines and sequences. My students Grade level is Grade 8 and their age is 14 years old. Please follow these guidelines:

Events List: Events of the Nika rebel

Context: Historical event in the Justinian's era in Byzantium

Arrange the events in the correct sequence and present them as a horizontal timeline with arrows for better visualization.

Provide a short explanation or transition sentence between events to clarify the sequence and their relationships, if relevant.

Focus on connecting the events logically (e.g., cause and effect relationships). Highlight key dates, locations and persons involved if available.

Additional Criteria:

Simplify language for younger students if the events are complex.

Add 1–2 comprehension questions based on the ordered events to reinforce understanding.

Text generator (New tool)

I am a teacher, and I want to generate a custom text for my class. Please create a text based on the following details:

Topic or Theme: [The water cycle](#)

Type or Genre: [Narrative short story](#)

Grade Level: [4th Grade](#)

Age: [9–10 years old](#)

Learning Objective: [Help students understand the water cycle in a fun and engaging way.](#)

Length: [Around 250 words](#)

Tone or Style (Optional): [Friendly and imaginative](#)

Additional Criteria: [Include the terms evaporation, condensation, and precipitation.](#)