

Open Classroom: A teacher-in-the-loop LLM platform for personalized teaching in open classes

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Abstract

Open classes typically require teachers to manage heterogeneous groups of learners and to adapt teaching materials to different linguistic, cognitive, and educational needs. This paper presents Open Classroom, a web-based, AI-enhanced platform designed to support personalized teaching in open-class settings, with particular attention to small, multilingual, and peripheral school contexts such as the Aosta Valley. The platform enables teachers to transform a single source document into multiple differentiated teaching materials by combining automated text extraction, semantic analysis, prompt engineering, and large language model-based content generation. Its workflow allows teachers to define reusable learner profiles, upload educational resources, generate adapted versions for selected groups, revise AI outputs at each stage, and export finalized materials in distributable formats. By keeping teachers in control of the personalization process, Open Classroom positions AI as an assistive tool rather than an autonomous decision-maker. The proposed platform aims to leverage AI to reduce the workload associated with differentiated instruction while improving the consistency, accessibility, and sustainability of personalized learning materials in open-class environments.

Keywords

Open classes, Personalized learning, Large language models, AI-assisted teaching, Inclusive education.

1. Introduction

The transformation of contemporary educational ecosystems increasingly relies on digital infrastructures capable of supporting differentiated, adaptive, and inclusive learning pathways [1]. One of the most significant innovations in this domain is the emergence of platforms capable of automatically transforming teaching materials into differentiated versions adapted to diverse student profiles [1, 2, 3]. Within this context, the Open Classroom platform presented in this paper represents an innovative technological solution conceived to support the organizational teaching model of *open classes* (in Italian, *classi aperte*). The platform has been developed in the context of the “NODES - Nord Ovest Digitale e Sostenibile” research project, Spoke 4, which aimed at promoting digitalization and innovation in Italian mountain and peripheral areas¹. Open Classroom is a web-based, AI-enhanced educational platform conceived to support the personalization of teaching materials, particularly in contexts characterized by varying learning levels, linguistic backgrounds, and special educational needs. The primary functionality of the platform is to enable educators to generate personalized learning materials from a single source document, thereby enhancing inclusivity and teaching effectiveness. By leveraging advances in artificial intelligence, especially large language models (LLMs), Open Classroom assists teachers in producing accessible, level-appropriate content tailored to cognitive, linguistic, and stylistic learning factors. The platform integrates automated text extraction, semantic analysis, and customizable content generation into a unified workflow. In this paper, we outline the conceptual foundations, technical implementation, and functional capabilities of Open Classroom, which has been developed

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¹<https://ecs-nodes.eu/>

with two objectives: (i) enabling the automated transformation of learning materials through AI-driven text processing pipelines, and (ii) supporting teachers’ workflows in tailoring such materials to the heterogeneity of learners’ profiles.

We make three primary contributions. First, we introduce a teacher-in-the-loop LLM workflow for transforming a single educational resource into multiple differentiated materials for open-class settings. Second, we present a reusable profile-based personalization architecture that separates group-level learner descriptors from project-specific resources, reducing the burden of repeated adaptation. Third, we discuss design and deployment considerations for using LLMs in small, multilingual, and peripheral school contexts, including human oversight, resource monitoring, and a prospective evaluation in authentic classroom settings. The remainder of this paper is organized as follows. Section 2 reviews the background on open classes and the use of large language models in education. Section 3 presents the functional rationale and overall architecture of the platform. Section 4 describes the personalization workflow and the main components of the graphical user interface, from profile creation and source-material upload to content generation and export. Section 5 reports preliminary findings from the ongoing experimentation with teachers in the Aosta Valley. Section 6 discusses the expected organizational and educational impact of the platform. Section 7 outlines the current limitations of the prototype and identifies directions for future development. Conclusions end the paper.

2. Background

2.1. Open classes

An *open class* (classe aperta) is an organizational model in which students are not kept in fixed, traditional age-based classroom groups but are instead redistributed flexibly according to learning needs, interests, levels of competence or specific activities [4, 5]. In this approach, students from different sections or grade levels may work together, and groups can change depending on the task at hand. Teachers coordinate their efforts to design activities and reorganize students dynamically. The overall goal is to create a learning environment that is more adaptive, inclusive and capable of supporting personalized educational pathways by moving beyond the rigid structure of the standard class group. The term “open classroom” has also been used historically to describe a broader reform movement concerning classroom organization and teaching practices [6]. This model builds upon a long-standing tradition of multigrade and multi-age teaching, which has spread globally due to diverse geographical, social, and economic factors aimed at securing basic education in rural or remote areas [4, 7, 8]. As highlighted in [7], multigrade settings are widely adopted in both developed and developing countries, albeit driven by different structural constraints. In high-income contexts (e.g., Japan), multigrade schooling is primarily a response to low student enrollment (a demand-side issue), whereas in developing nations (e.g., Nepal, Zambia), it is often necessitated by severe shortages of teachers and school infrastructure (a supply-side issue). Beyond addressing structural necessity, multigrade and open environments offer distinct educational advantages for learners. Interacting with peers of different ages allows students to develop key soft skills, such as leadership, peer mentoring, and empathy, while enhancing critical problem-solving abilities as they navigate diverse daily tasks [9, 10]. In a territory like the Aosta Valley, a mountain region in northwestern Italy, the open-class model takes on particular significance because of the region’s geographical, demographic and linguistic characteristics. Schools often serve small, dispersed communities, and student groups may be heterogeneous in age, linguistic background and learning needs. Within this context, the open-class model provides a flexible way to overcome the limitations of rigid class structures and to manage variability more effectively. By allowing students to be reorganized across sections or even grade levels, teachers can form groups that address specific learning goals, such as reinforcing foundational skills, supporting multilingual learners, or extending activities for more advanced students. This flexibility enables schools within the region to respond to the everyday challenges of mixed-ability classes and small cohorts. It also aligns with the region’s emphasis on inclusion and multilingual education, where instruction often needs to be adapted to students with diverse linguistic backgrounds. In this sense, the open-class model becomes not only

an organizational approach, but also a strategic response to the educational needs of a mountainous, multilingual region. It supports more efficient use of teaching resources, promotes collaboration among teachers and helps ensure that every student can access learning pathways suited to their abilities and context.

2.2. Large Language Models

Large Language Models (LLMs) represent one of the most significant recent developments in Artificial Intelligence (AI), particularly in the field of natural language processing (NLP) [11, 12, 13]. These models are trained on vast quantities of textual data and are capable of processing, generating and transforming natural language with a level of fluency that approaches human performance. Their architectures allow them to analyze linguistic patterns, infer contextual meaning, and produce coherent responses or reformulations, making them particularly suitable for tasks such as summarization, translation, simplification and content generation. In educational contexts, LLMs can support activities such as content generation, summarization, explanation, and feedback, while complementing rather than replacing the professional role of teachers [14, 15, 16, 17]. More specifically, they can be used to simplify texts, adjust linguistic complexity, reorganize information, and generate materials adapted to different learner needs [1, 12, 2, 3, 18, 19]. These applications are consistent with the broader pedagogical principle of differentiated instruction, according to which content and instructional approaches should respond to learner readiness and educational needs [20]. LLMs operate by processing input prompts, i.e., structured or unstructured instructions supplied by the user in natural language, and generating corresponding outputs that respect the constraints or objectives indicated. The quality and relevance of the output depend heavily on the clarity of the prompt, which has led to the development of specialized techniques known as “prompt engineering” [11, 13]. Such AI models can play a particularly meaningful role in supporting the open-class model. LLMs help address their structural complexity by enabling rapid and consistent adaptation of teaching content: they can simplify or enrich a text depending on the group’s competence, modify the format to suit different presentation preferences or instructional needs, or extract essential concepts to support targeted reinforcement activities. In multilingual contexts such as the Aosta Valley, they can adjust linguistic difficulty or provide parallel explanations that accommodate students with different language repertoires. Despite their potential, it is important to emphasize that the use of LLMs in education must be guided by responsible oversight. These models generate content based on patterns in their training data and may reproduce unintended biases or inaccuracies. For this reason, effective human supervision remains essential, particularly when adapting curricular materials or supporting students with specific needs.

3. Functional rationale and platform architecture

The rationale behind the Open Classroom platform emerges from the need to support schools that work with small, heterogeneous and often multilingual student populations. Because open classes require teachers to reorganize students flexibly and to personalize instruction and teaching materials at multiple levels, the platform is designed to streamline this process by offering a structured, AI-assisted workflow that reduces the manual workload typically associated with differentiated teaching. The functional requirements met by the platform are therefore tied to three core needs. First, teachers must be able to transform a single teaching resource into multiple versions that correspond to different learner profiles, such as varying linguistic competence, cognitive levels or specific educational needs. Second, the adaptations must be consistent, transparent and modifiable, ensuring that teachers retain complete control over pedagogical decisions. Third, the platform must allow teachers to manage these transformations quickly and reliably, given that open-class configurations may change frequently and require rapid production of tailored materials. To meet these needs, the architecture of the platform (shown in Figure 1) is organized into distinct but interdependent components. A dedicated space is used to store and manage “profiles”, which represent groups of students who share certain learning characteristics. These profiles do not contain personal data but describe relevant traits that guide

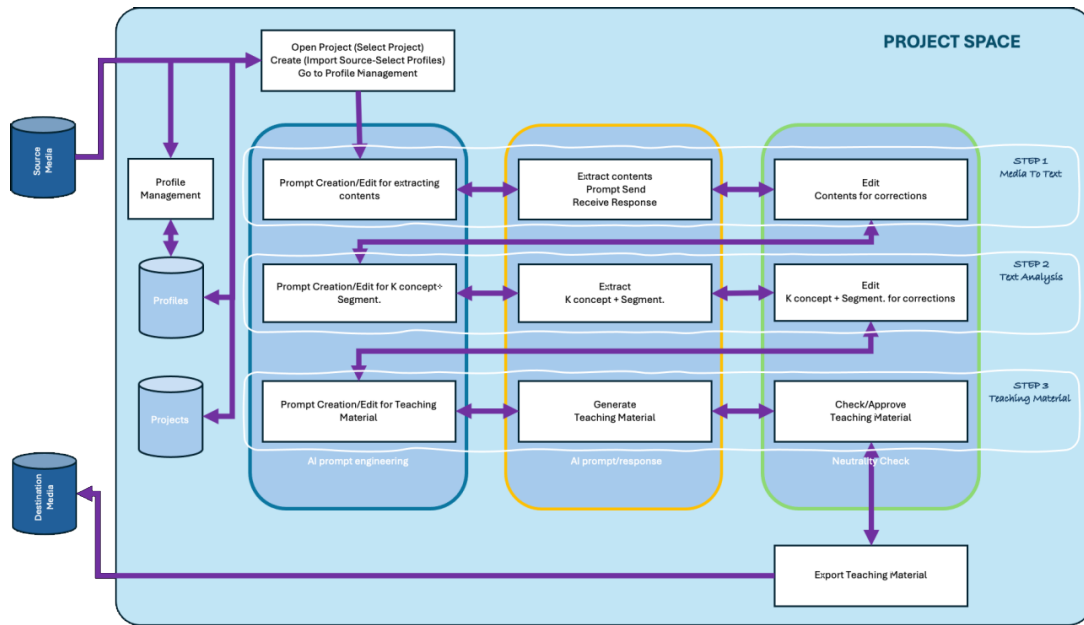


Figure 1: General architecture of the Open Classroom platform.

the personalization process. A second space manages “projects”, which are the actual units of work where teachers upload source materials, trigger AI-based analysis, and generate adapted versions. This separation makes it possible to reuse student-group profiles across multiple teaching activities and to maintain clear, customizable workflows. Behind these interfaces, the application encompasses several structured computing layers. One contains the original teaching materials, another captures the intermediate steps and instructional transformations applied by the teacher, and a final one stores the generated personalized outputs. The workflow typically proceeds through automatic extraction of text from the original media, semantic analysis of that text and the creation of personalized versions aligned with selected profiles. At each stage, teachers can inspect, edit and refine the results, thus ensuring that AI functions as an assistant rather than an autonomous decision-maker. The platform is implemented as a web-based environment using modular, scalable components, in order to make it adaptable to the different digital constraints and infrastructural diversity that characterize educational information systems. It is designed to support multiple large language models (e.g., OpenAI’s GPT and Google’s Gemini) so as to allow teachers to choose the most appropriate one for each task. It also allows teachers to monitor resource consumption so that the system use remains sustainable.

4. Personalization workflow and GUI overview

The personalization workflow is designed to translate the teacher’s personalization intentions into concrete, machine-interpretable instructions for the AI models, ensuring that the generated materials reflect the specific needs of the groups involved in an open-class setting. This process begins when the teacher interacts with the graphical interface to define two types of information: the characteristics of the student profiles and the goals or constraints of the project. These inputs include factors such as age, learning level, linguistic competence, preferred learning modalities, presence of special educational needs and the intended structure or depth of the final materials. Although the teacher expresses these elements intuitively through selections, text fields or toggles in the interface, the system internally reformulates them into a sequence of highly structured and coherent prompts. This transformation is a crucial stage of the workflow. Rather than sending raw or loosely formulated instructions to the AI, the platform interprets each user selection and translates it into a prompt segment carefully engineered for the specific step of the process. The extraction step, for example, uses a prompt focused on recovering text faithfully from the media source while applying any initial adaptations required

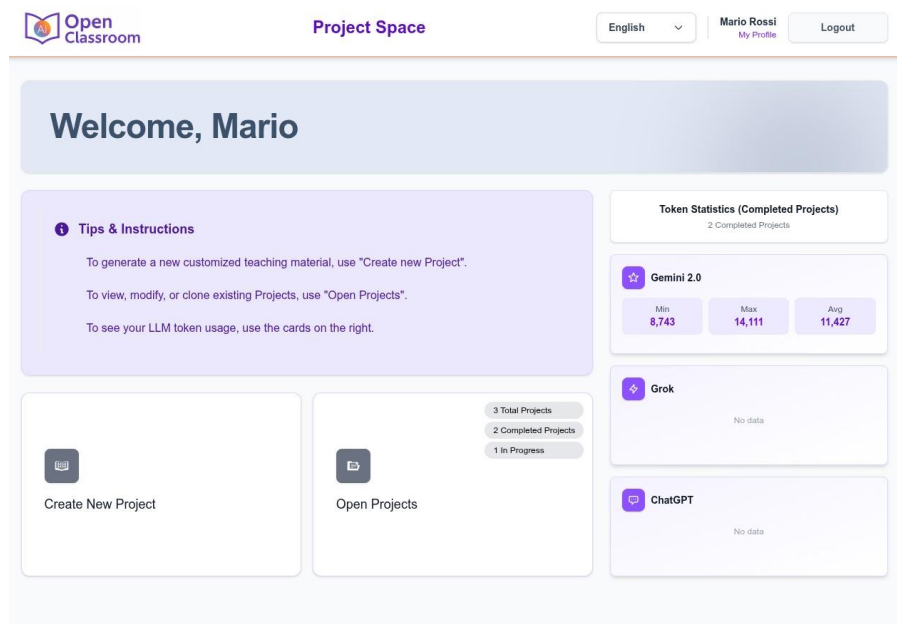


Figure 2: Landing page for the teacher.

by the selected profiles. The semantic-analysis step employs a different structure, guiding the model to identify key concepts, logical sections and lexical difficulties. The generation step uses even more detailed prompts, incorporating all profile-related parameters to produce personalized teaching content that is consistent and aligned with the teacher's intentions. Once the platform constructs these prompts, the AI models execute them sequentially. Each step produces text that serves as the input for the next stage. The output of the extraction step provides the basis for semantic interpretation; the results of semantic analysis, in turn, guide the generation of differentiated versions. At every stage, the teacher retains the ability to read, evaluate and modify the text produced by the AI, adding manual adjustments where necessary. The final personalized materials emerge from this interplay between teacher-defined parameters, automated prompt engineering and LLM execution. The system compiles the generated text into structured documents, optionally reinserting images extracted from the original media and supporting export in various formats suitable for distribution. By orchestrating the workflow in this way, the platform makes it possible to generate multiple tailored versions of a resource rapidly and with high internal consistency. In the following, we briefly describe each step of the personalization workflow.

4.1. Access to the project space

Figure 2 shows the landing page where the teacher can create a new project or access previously developed ones. The dashboard also displays the available LLMs, the number of tokens currently remaining for each model and the historical token consumption associated with completed projects. This information helps the teacher assess the resources required and estimate whether sufficient capacity is available to continue with further processing. At the top of the page, the teacher can select the language of the graphical interface as well as the language used for prompts and for the generated responses. Figure 3, in turn, shows the first step of the personalization workflow, where the teacher uploads the source material and selects the profiles to be used for personalization.

4.2. Creation of new projects and profiles

To start a new project, the teacher follows a guided creation page. They first import a source file (for example, a document, slide deck, or other teaching material). Then they select at least one student

Open Classroom Project Space

English Mario Rossi My Profile Logout

Media Import & Profile Selection Media to Text Text to Segmented Text Segmented Text to Teaching Material Export Final Materials

Project Name
Napoleon-Background_20251114_174325

Change file (optional)
Current file:
Napoleon-Background.pdf

Click to browse or drop your Media here

Select Student Profiles

Profile1_Age12_None	Profile1_Age12_Dyslexia
Profile1_Age10_None	Profile1_Age9_None
Profile1_Age8_None	Profile1_Age10_Dyslexia
Profile1_Age9_Dyslexia	Profile1_Age8_Dyslexia
Profile1_Age7_None	Profile1_Age7_Dyslexia
Profile1_Age6_None	Profile1_Age6_Dyslexia

2 selected

Next

Figure 3: First step of the personalization workflow.

profile, typically all profiles corresponding to their open class. The application proposes a default project name (derived from the media), which the teacher may modify before proceeding. Within the application, a profile is a structured description of a group of students who share similar learning characteristics. Profiles are stored as structured data and include several dimensions that influence how the AI adapts content. Among these dimensions are the age range or general developmental level of the group, which determines the complexity of vocabulary and depth of explanations appropriate for that profile. They also include the language of learning, which is particularly relevant in multilingual regions and affects both the linguistic register and the language in which materials are produced. Another key component is the indication of special educational needs. Profiles also specify the disciplinary area relevant to the students, helping the system tailor examples, terminology and conceptual framing. Additionally, profiles may record preferred presentation formats or instructional modalities, such as greater use of visual elements, orally oriented explanations, or text-based materials. This information influences the way content is organized, whether through bullet-point summaries, concept maps, reorganized explanations or more linear textual narratives. Teachers have full control over the creation and modification of profiles, allowing them to shape these descriptors in the way that best suits their instructional needs. Although profiles are designed to represent groups rather than individual students, the platform gives teachers the flexibility to adjust every component of a profile so that it reflects the real learning characteristics of the groups they work with. This means that teachers can define new profiles from scratch when their class composition changes, when they introduce new forms of grouping in open-class activities or when they need to target specific pedagogical goals. They can edit existing profiles by updating learning levels, linguistic information, preferred presentation formats or indications of special educational needs, ensuring that the personalization process always aligns with the most up-to-date understanding of their students. Because the platform stores profiles independently

Open Classroom Project Space English Mario Rossi My Profile Logout

Media Import & Profile Selection Media to Text **Text to Segmented Text** Segmented Text to Teaching Material Export Final Materials

Tips & Instructions
 Optionally add Supplementary Instructions for analysis (focus areas, exclusions, format, reading level).
 Select the AI Model.
 Click AI Generation to create the Extracted Key Concepts and Segmentation.
 Click Update to save Step 2.
 Click Next to go to Step 3.

Imported Media
 Napoleon-Background.pdf
 Imported Media

Selected Profiles
 Profile1_Age12_Dyslexia
 Profile1_Age6_None

Supplementary Instructions (Optional)
 Add additional Instructions for analysis, for example:
 - Focus on specific topics
 - Include particular details
 - Preferred output format

AI Model: Gemini 2.0 AI Generation

Extracted Key Concepts and Segmentation

CONCETTI CHIAVE

1. Rivoluzione Francese e Ancien Régime
2. Ascesa al potere di Napoleone Bonaparte
3. Cronologia degli eventi principali della vita di Napoleone (1769-1821)
4. Colpo di Stato del 18-19 Brumario
5. Caratteristiche fisiche e personalità di Napoleone
6. Matrimonio con Josephine de Beauharnais
7. Campagne militari in Italia ed Egitto
8. Napoleone Primo Console
9. Politica interna di Napoleone: centralizzazione del potere, corruzione e repressione
10. Politica estera di Napoleone: guerre e coalizioni europee
11. Espansione dell'impero Napoleonico
12. Invasione della Russia e declino dell'impero
13. Esilio all'Elba e i Cento Giorni
14. Sconfitta a Waterloo e secondo esilio a Sant'Elena
15. Morte a Sant'Elena e costruzione della leggenda napoleonica
16. Calendario rivoluzionario francese

SEGMENTAZIONE DEL CONTENUTO

Previous Next

Figure 4: Text segmentation phase.

from individual projects, any modification made by a teacher becomes immediately available for all future projects. The project then proceeds through a sequence of steps. The teacher can interrupt the work and later resume the work from the last saved step. They can also rerun a step or go back to a previous one to make changes, so the workflow is linear in structure but remains fully revisable.

4.3. Media-to-text extraction

In the first processing step, the system extracts text from the uploaded media. That text becomes the basis for all subsequent analysis and generation. At this point, the teacher can:

- Add or refine instructions in the prompt;
- Edit the extracted or generated text directly in the interface;

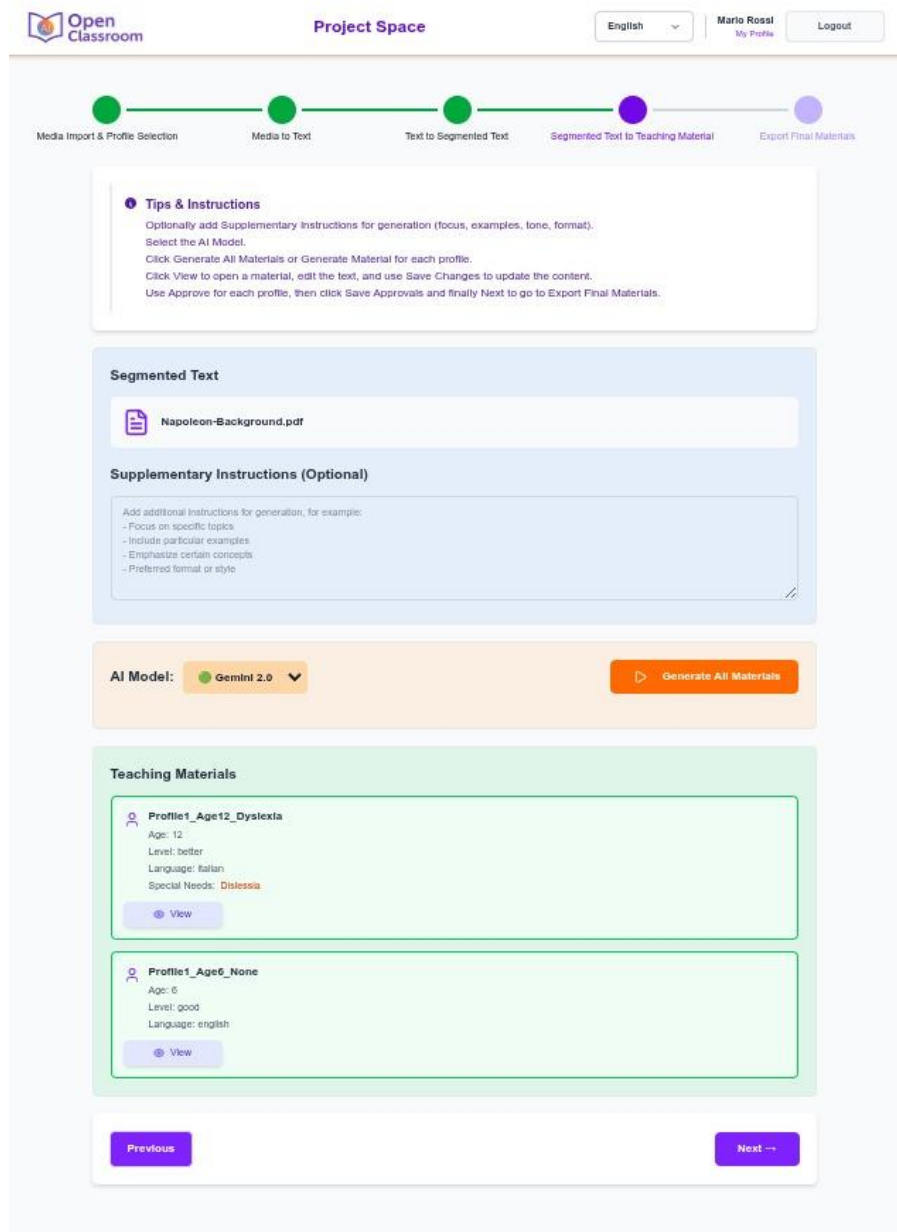


Figure 5: Personalized material generation.

- Choose which LLM engine to use.

4.4. Text analysis and segmentation

In the next step, shown in Figure 4, the application analyzes the text. The LLM receives a prompt tailored to identify key concepts, important terms and a logical segmentation of the content into sections or units that are pedagogically meaningful. Again, the teacher can add specific instructions to the prompt and select the preferred LLM. The output is a textual analysis that appears on screen, which the teacher can read and, if necessary, modify. This analyzed and segmented text provides the structure on which the personalized teaching materials will be built.

4.5. Generation of personalized teaching materials

In the following step (Figure 5), the teacher asks the system to generate the personalized teaching materials. Before launching generation, they can once more adjust the prompt and choose the LLM.

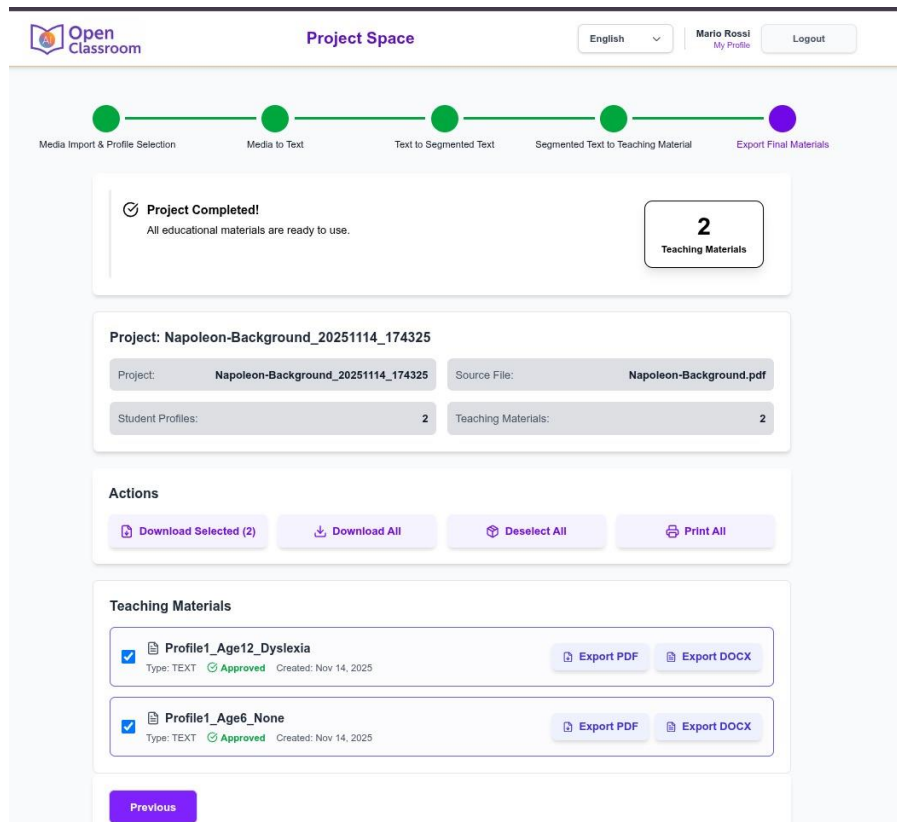


Figure 6: Final material export phase.

At this stage, the system makes full use of the specific information contained in the selected profiles. The LLM produces text versions tailored to each profile, for example, with simplified language, adapted structure or different depth of explanation. The teacher sees these versions in the interface, can compare them, edit the text, and iterate until satisfied.

4.6. Export and finalization

In the final step, shown in Figure 6, the personalized teaching material, so far managed as text, is transformed into distributable file formats. The system can generate .docx and .pdf versions and automatically reinsert images taken from the original media at the end of the document. The teacher can then download or store the exported materials. This completes the project workflow for that set of profiles and media.

5. Preliminary experimentation

Open Classroom is currently being evaluated through an exploratory field trial involving five teachers from primary and lower-secondary schools in the Aosta Valley. The purpose of this preliminary experimentation is to assess the platform's usability, its compatibility with teachers' everyday practices, and the perceived quality and relevance of the personalized teaching materials generated. At this stage, the evaluation is formative rather than comparative: feedback is being collected through periodic meetings with participating teachers and is being used to identify usability issues, refine the available personalization options, and prioritize subsequent development activities. This approach is consistent with the teacher-in-the-loop design described in the previous sections, in which educators remain responsible for reviewing and adapting AI-generated outputs throughout the workflow.

Initial feedback indicates that the learner-profile component is perceived as one of the platform's

most distinctive and valuable features. Teachers appreciated the possibility of describing groups through multiple characteristics and of using these profiles to generate materials that more closely reflect learners' actual linguistic, cognitive, and educational needs. The separation between reusable profiles and individual projects was also recognized as potentially useful for supporting repeated personalization activities. Moreover, some participants reported that using the platform collaboratively encouraged discussion among colleagues and promoted shared reflection on how teaching materials could be differentiated for heterogeneous groups. The generated materials were generally considered consistent with teachers' expectations, although the participants identified several areas in which the current prototype could be improved. From a usability perspective, the distinction between the profile-management space and the project space was sometimes perceived as cumbersome. Teachers also suggested simplifying the material-import process by removing the need to download and subsequently re-upload a document, and by allowing source text to be entered directly into the interface. Additional requests concerned the possibility of uploading multiple images, scans, or screenshots simultaneously and of generating an initial source text directly within the platform. The experimentation also highlighted opportunities to extend the learner-profile model. In particular, teachers proposed broadening the representation of special educational needs to include a wider range of specific learning disorders, behavioral difficulties, and the needs of newly arrived students. In the multilingual context of the Aosta Valley, participants also emphasized the importance of recording learners' first languages and using this information to generate translations or explanations of key terms and passages. Further suggestions concerned a more explicit personalization of problem-solving activities and improved control over the language used for comprehension questions, which were reported to be generated in Italian even when a different output language was expected. Finally, teachers suggested complementing the generation of personalized materials with assessment-related functionalities, such as the automatic production of evaluation rubrics aligned, where appropriate, with the Italian National Guidelines. These observations suggest that teachers perceive potential value not only in adapting instructional content, but also in supporting the broader cycle of planning, delivery, and assessment.

The current level of platform use remains limited, partly because the experimentation began near the end of the school year, when teachers have fewer opportunities to prepare new teaching materials. Consequently, the observations reported here should be interpreted as preliminary qualitative evidence rather than as a systematic evaluation of effectiveness or efficiency. The platform will remain available during the summer, while selected technical and functional improvements will also be implemented. A more structured phase of experimentation is planned for the beginning of the following school year, when participating teachers will be able to test the revised platform while preparing materials for the start of regular teaching activities. Future evaluation will combine qualitative feedback with usage indicators, including project completion, output revision, regeneration frequency, and the amount of teacher intervention required before materials are considered ready for classroom use.

6. Expected impact

From an organizational perspective, the platform is designed and expected to produce a significant and measurable impact on the management and daily functioning of open classes. Open-class settings require teachers to reorganize groups frequently, adapt materials to heterogeneous learners and collaborate across subjects or sections. These activities, while pedagogically valuable, create a substantial operational burden. The platform directly addresses this challenge by providing an integrated environment in which teachers can generate, modify and distribute personalized materials efficiently. By automating the most time-consuming phases of adaptation, such as text extraction, semantic analysis and personalization, the system streamlines the entire preparatory workflow, freeing teachers to focus on instructional design, monitoring of students and collaborative planning. In addition to simplifying material preparation, the platform introduces a data-driven layer to the management of open classes. By tracking resource usage, project frequency, iteration patterns and the level of personalization applied, the system can offer analytical insights into how teachers work, how often certain adaptations are re-

quired and where AI contributes most effectively to their productivity. These insights can help teachers, schools and administrators better understand the operational dynamics of open classes and plan support measures, training initiatives or teaching strategies accordingly. Moreover, by capturing the interaction between teacher-driven choices and AI-generated outputs, the platform helps illustrate how artificial intelligence can enhance not only efficiency but also the overall quality of teaching practices in flexible learning environments. Over time, the accumulated data can contribute to evidence-based evaluations of how AI tools improve material accessibility, enable more responsive grouping strategies and support multilingual or inclusive education. In this way, the Open Classroom platform is expected to act not only as a practical tool for teachers but also as a strategic organizational instrument for schools. It promotes an organizational culture that embraces technological innovation while maintaining strong human oversight, ultimately improving the sustainability, consistency and coherence of open-class models.

7. Limitations and future work

While the current platform prototype already provides a robust foundation for supporting open-class teaching, several limitations remain that point towards opportunities for future development. At present, the system focuses primarily on the generation of text-based materials. Although the workflow is capable of reinserting images from the original media, fully multimodal output, such as audio narration, AI-generated visual elements or interactive digital formats, has not yet been implemented. This limits the range of adaptations available for younger learners or students who benefit from more visual or multisensory instructional supports. From an evaluation standpoint, the system does not yet include built-in instruments for collecting student feedback on the personalized materials they receive. The future roadmap includes adding automatically generated evaluation forms to the final materials. These questionnaires would assess the appropriateness and effectiveness of the adaptations for each student profile. This represents a major step towards data-informed personalization. Regarding quantitative evaluation, future iterations will provide teachers with access to a comprehensive analytical dashboard, including metrics such as token usage, number of projects created, number of personalized documents produced, the frequency of modifications or regenerations, the volume of teacher-initiated edits, unresolved requests, time-to-completion of projects and longitudinal reuse trends. These data will help them better understand their workflow and will support schools in evaluating the organizational benefits of AI-assisted personalization. A fundamental element of future work will be more extensive field testing of the platform involving a larger and more diverse group of teachers and schools. Building on the preliminary experimentation described in Section 5, this phase will assess the platform's usability, pedagogical value, and impact on teachers' workload through a combination of qualitative feedback and quantitative usage indicators.

8. Conclusion

This paper presented Open Classroom, a teacher-in-the-loop platform designed to support the creation of personalized teaching materials in heterogeneous and multilingual learning environments. By combining reusable learner profiles, structured prompt engineering, and LLMs, the platform enables teachers to transform a single educational resource into differentiated materials while retaining control over each stage of the process. The preliminary experimentation with teachers in the Aosta Valley suggests that the profile-based approach and the quality of the generated materials are perceived positively, while also highlighting opportunities to improve usability, multilingual support, and the representation of special educational needs. These early findings confirm the value of involving teachers directly in the design and refinement of AI-assisted educational tools.

Open Classroom clearly illustrates how generative AI can be integrated into education as a support for professional judgment rather than as a replacement for it. Its contribution lies not only in automating content transformation, but also in enabling teachers to explore alternative ways of presenting the same

knowledge to learners with different needs. Within this perspective, the educational value of AI depends on the quality of the interaction between human expertise and computational capabilities. Teachers define pedagogical goals, interpret learners' needs, validate generated content, and remain responsible for final decisions, while AI provides speed, flexibility, and support in managing complexity. This human-centered approach is essential to ensure that personalization remains pedagogically meaningful, transparent, and responsive to the classroom context. More broadly, the platform suggests that the role of AI in education should be understood as *collaborative*: a tool that can expand teachers' capacity to design inclusive learning experiences while preserving human oversight, accountability, and educational intentionality.

Declaration on Generative AI

During the preparation of this work, the author(s) used ChatGPT-5.6 in order to: Paraphrase and reword, Improve writing style, Grammar and spelling check. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the publication's content.

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