aug MENTOR

Augmented Intelligence for Training and Education

The augMENTOR solution

Design, tools and guide to AI-augmented pedagogy

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Funded by the European Union

The augMENTOR project (GA No. 101061509) is funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. The European Union cannot be held responsible for them.

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Introduction

This document acts as the essential bridge and centralized document, bringing together all of the project's complex work into a compact, structured roadmap that facilitates the effective use and full deployment of the augMENTOR solution. It is a practical resource designed to explain the functionality and use of all elements within the augMENTOR solution. The content, design philosophy, technical requirements, and pedagogical recommendations contained herein are directly derived from the official augMENTOR project deliverables, including academic theory, experimental findings, and project specifications.

The document provides potential users with guidance on developing activities and using the augMENTOR platform. It outlines the theoretical foundations on which the augMENTOR solution is based and introduces the platform's key functionalities, offering a clear overview of its capabilities for both prospective and current users.

Target audiences

This guide is developed mainly for **educators and trainers** across all levels – both in formal and informal education – willing to utilise the augMENTOR solution in their own educational courses.

The guide also addresses **learners** who are involved in courses that use augMENTOR and wish to use it to collect feedback on their progress. Lastly, the guide also offers guidelines for **policy makers** to navigate the policy making section of the platform.

How to use

This document is a central resource for deploying and utilizing the augMENTOR solution end-to-end. It is structured to provide maximum clarity for every user role. The document is organized sequentially, moving from the foundational theory to practical platform functions but it can also be used in a modular way. Depending on their exact needs readers may skip certain sections or decide to dive into them at a later stage. Here are some reading paths:

Fast read mode

For all users, the critical starting point is the 'The augMENTOR solution' section, which explains the purpose and value of the entire solution. The guide then presents the pedagogical framework to establish the foundation on which augMENTOR courses are designed and most importantly the theoretical foundation on which the augMENTOR platform operates. On a 'fast-read mode' the reader can go through sub-section Core structure, key

outcomes and goals and come back to the more dedicated sections of the framework at a later stage. The reader can then refer to the 'What does the augMENTOR platform offer?' section and particularly on the subsection that best describes them (educator, learner or policy maker). These subsections will offer a quick and yet clear understanding of the augMENTOR solution.

Pedagogical design dive in

Again, readers are encouraged to begin with the 'The augMENTOR solution' section, which explains the purpose and value of the entire solution. Readers can then dive in 'The augMENTOR pedagogical framework' section. Annex A and Annex B offer additional information and details for the pedagogical framework and designing courses based on it.

Platform functionalities dive in

To focus on the platform, it is recommended that the reader starts from the 'What does the augMENTOR platform offer?' section and particularly the subsection that best describes them (educator, learner or policy maker). Depending on their role, readers can then move on to 'Navigating the augMENTOR platform' either the Educators-Learners or the Policy makers section.

Designing and setting up augMENTOR courses

For readers who already have a good understanding of the basic aspects of the augMENTOR solution and wish to deploy it, it is recommended to start by visiting (or re-visiting) the 'Micro level: Technology-augmented Educational Scenarios and e-Activities' of the augMENTOR pedagogical framework. Readers can then move on to section 'The augMENTOR Workflow: From Moodle design to AI insights'to read more about setting up augMENTOR courses.

Focus on policy recommendations

For policy makers in particular, it may be helpful to start with an overview of the augMENTOR solutionand the visit sub-section 'What can policy makers do?'. They can then move on to 'Navigating the augMENTOR platform (Policy makers)' Finally, they can move back to the 'The augMENTOR pedagogical framework' should they wish to dive deeper in the foundations of the augMENTOR solution.

The augMENTOR solution

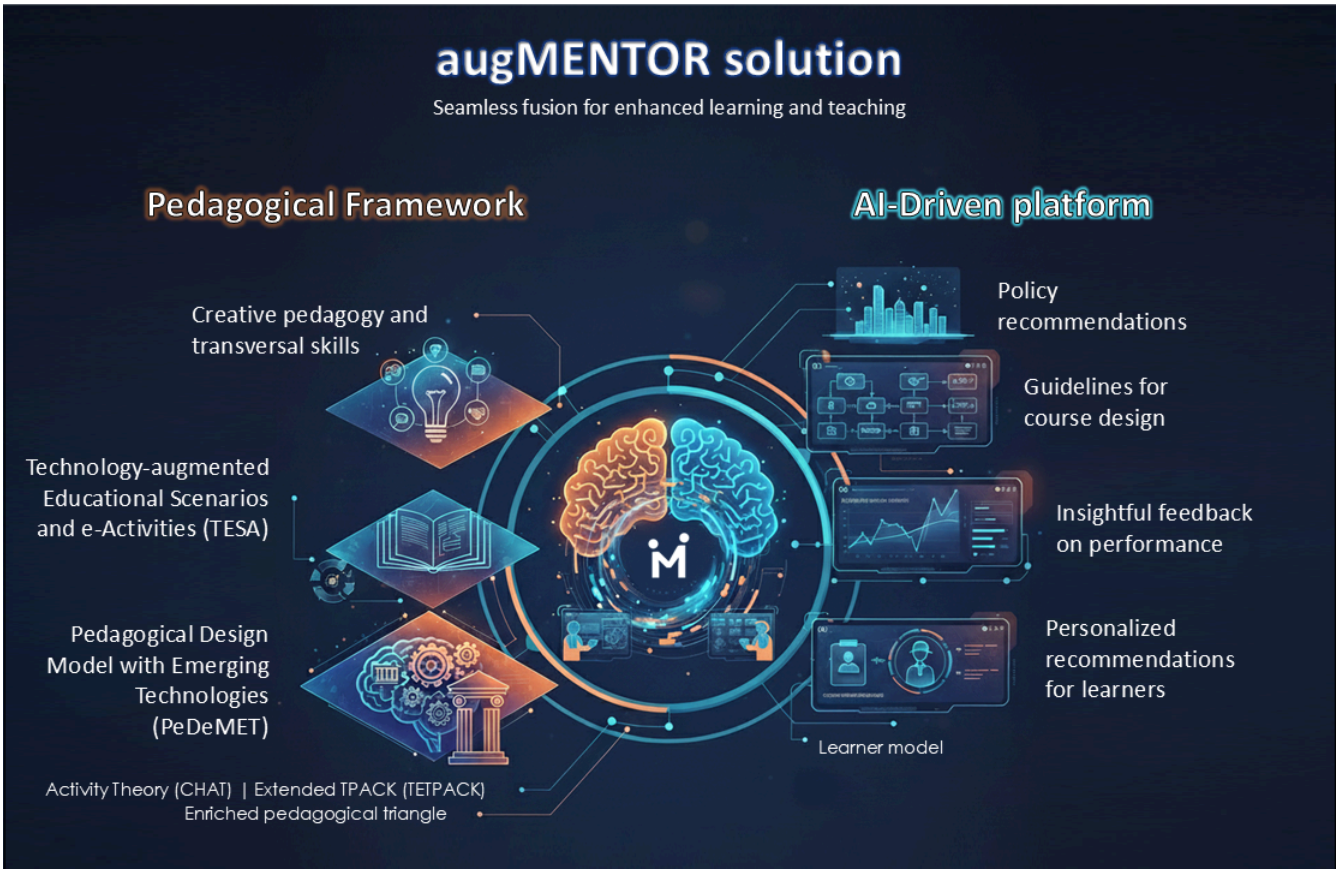


Figure 1. *An overview of the augMENTOR solution*

The augMENTOR solution aims to bring transformative change to education by seamlessly weaving modern technology into the way we teach and learn. It does so by offering a coherent model comprised of a state-of-the-art **pedagogical framework** and an **AI-boosted platform** that supports educators and learners throughout the learning process. By mixing new teaching methods with advanced artificial intelligence, augMENTOR helps educators design advanced courses and helps students maximize their potential.

The **augMENTOR Pedagogical Framework** focuses on the design of Technology-augmented Educational Scenarios and e-Activities (TESA), providing educators with a cohesive model for designing and implementing digitally enhanced, learner-centered instructional scenarios. It addresses the critical gap in existing literature where pedagogical models rarely support the systematic integration of Artificial Intelligence (AI). The framework is structured in two parts: PeDeMET (Pedagogical Design Model with Emerging Technologies) is the macro-level model that defines the fundamental components of pedagogical activity, while TESA is the micro-level model that provides the practical implementation guide for classroom activities. The framework places special emphasis on the longitudinal

development and assessment of 21st Century Skills, focusing primarily on the 4Cs: Creativity, Critical Thinking, Collaboration, and Communication. This attention to Creative Pedagogy ensures that AI is used as a supportive partner, not a substitute for evidence-based teaching.

The **augMENTOR AI-driven platform** is a powerful tool that supports the teaching and learning process by operationalizing the pedagogical framework through a dedicated, dynamic augMENTOR Learner Model (LM), which acts as the blueprint of the learner's characteristics and cognitive states. The LM works across three domains: it monitors the Cognitive Domain (e.g., attention and knowledge retention), tracks the Affective Domain (e.g., motivation and engagement using the Self-Determination Theory), and assesses the development of Transversal Skills (the 4Cs, primarily via rubrics and collaborative metrics).

The platform collects and analyzes multimodal data from augMENTOR courses (such as Moodle log files, quiz data, and forum discussions),processes this complex information and generates actionable outputs to support multiple stakeholders: it provides insightful feedback on student progress and individual learning paths; it offers tailored recommendations to learners and tutors, enabling personalized support; it generates insights for course design based on aggregated student data, assisting in continuous instructional improvement; and finally, based on course outcomes, it offers dedicated policy recommendations to policy makers and school leaders, guiding informed decision-making for the digital shift in education.

The augMENTOR pedagogical framework

The augMENTOR Pedagogical Framework is an innovative, two-level, theory-driven structure designed to integrate Artificial Intelligence (AI) and Emerging Technologies (ET) into educational practice. It was developed to address the lack of established pedagogical frameworks that adequately support AI integration in classroom teaching.

Core structure, key outcomes and goals

The framework consists of two main, interrelated levels:

Table 1. Structure of the augMENTOR pedagogical framework

Level	Model	Focus	Unit of Design
Macro	**PeDeMET** (Pedagogical Design Model with Emerging Technologies)	**'The Why and what'**: Conceptual design principles, encompassing the activity's main 7 components (e.g., learners, tutors, technologies, outcomes, strategies)	Pedagogical Activity
Micro	**TESA** (Technology-augmented Educational Scenarios and e-Activities)	**'The How'**: Operationalizes the design at the classroom level, guiding the concrete 8 phases of scenario and activity implementation.	Educational Scenario & e-Activities

and has a set of overarching goals and outcomes:

- **Development and assessment of 21st Century Competencies:** The framework prioritizes the development and assessment of 4Cs: Creativity, Critical Thinking, Collaboration, and Communication.
- **Evaluation:** Evaluation and assessment is an integral part of the framework. It is multifaceted, typically using rubrics (for the 4Cs) and AI-enhanced learning analytics (for real-time feedback and learner tracing).
- **Learner Model (LM):** The framework is operationalized through a dedicated learner model that is based on Cognitive (Attention, Encoding, Retrieval, Prior Knowledge) and Affective (Motivation, Engagement) domains, in addition to Transversal skills.

These elements are the foundational objectives and outputs that span *both* the macro-level **PeDeMET** design model and the micro-level **TESA** implementation model. They represent the ultimate goal of the entire system: to structurally foster, develop, and assess 21st-century skills in AI-enhanced learning environments.

Macro-level: Pedagogical design model with emerging technologies

The macro-level (PeDeMET) part of the framework draws on three theoretical cornerstones to achieve its holistic, human-centered approach:

1. **Cultural and Historical Activity Theory (CHAT):** Used as both an **analytical and design tool** where the overall human **activity** (not just the individual) is the fundamental unit of analysis. It models the system of interdependent elements (subjects, tools, rules, community, object, outcome).

PeDeMET is the blueprint of the entire activity. It harmonizes three core theories to define what must be taught and why, ensuring the entire system is conceptually sound and outcome-driven.

2. **Enriched Pedagogical Triangle:** Extends the traditional triangle (Learners, Tutors, Knowledge) by explicitly integrating Digital and Emerging Technologies (specifically AI-LMS) as tools that mediate all interactions.

3. **Extended TPACK (TETPACK):** Extends the Technological Pedagogical Content Knowledge framework to specifically account for Emerging Technologies (ET), ensuring effective integration of AI/LMS with subject matter and teaching strategies.

It organizes the pedagogical activity based on **seven main components** and their individual interactions:

1. **Outcome (Competences)** of activity.
2. **Course Content** (the object of activity).
3. **Learners**
4. **Tutors**
5. **Emerging Technologies** (particularly AI and a Learning Management System), which mediate the activity of learners and tutors.
6. **Learning Strategies** (including Creative Pedagogies), which organize and direct the pedagogical activity.
7. **Evaluation**, which concerns both learning outcomes and the development of the activity

Micro level: Technology-augmented educational scenarios and e-Activities

An augMENTOR educational scenario integrates emerging technologies to teach and learn key concepts of a subject within the existing curriculum, while also fostering high-level competencies, such as 21st-century skills.

TESA specifies the application of PeDeMET's general principles at the classroom level, detailing the design of educational scenarios and pedagogical e-Activities. It is the product and process of applying the PeDeMET model in real-world settings and ensures that the seven conceptual components of PeDeMET are addressed in a logical sequence for scenario development and evaluation.

Educational scenarios designed using TESA differ from conventional 'lesson plans', emphasising and including diverse constructivist and collaborative strategies for teaching and learning, considering cognitive difficulties and alternative representations with learners at their epicentre. They are considered effective pedagogical tools that support educators in their instructional practice (Komis, 2019). An augMENTOR Educational Scenario for designing teaching and learning activities with emerging technologies involves engaging tutors and learners, and employing suitable learning strategies, aiming to achieve specific learning outcomes using appropriate technologies (such as Artificial Intelligence and Learning Management Systems). This process is designed to facilitate the teaching and learning of specific content or 21st-century competencies like the 4Cs. Therefore, in a modern teaching context, an augMENTOR educational scenario integrates emerging technologies to teach and learn key concepts of a subject within the existing curriculum, while also fostering high-level competencies, such as 21st-century skills.

An educational scenario includes:

a. teacher instructions
b. the theoretical framework supporting the approach
c. essential materials for implementation
d. 'activity sheets' for learners, and
e. additional resources considered valuable (e.g. printed materials, software files etc).

It represents a comprehensive teaching intervention with a defined purpose, objectives, challenges, an implementation process with appropriate activities and teaching strategies, as well as an evaluation process.

TESA, augMENTOR's Emerging Technologies educational scenario design model can be applied to all levels of education. It follows seven phases, describing the rationale on which a scenario should be based (Phases A, B & C) and the way in which classroom activities are designed (Phases D & E) and how the scenario is implemented and evaluated (Phases F & G).
In its final form, an eighth phase can be added to document the scenario after at least one full cycle of planning, implementation and evaluation. The template below is based on the comprehensive structure of the TESA model, guiding educators through the aforementioned key phases of planning, development, implementation, and evaluation of a technology-augmented lesson.

Table 2. The TESA educational design template

TESA Phase	Design Component (What to Define)	Core Questions to Answer (PeDeMET Alignment)	Data to Collect (AI/LMS Logs/Rubrics)
A. Teaching analysis of the subject matter	Scenario Subject, Theme, & Audience (Content Knowledge)	- What is the specific subject and topic? - Which curriculum objectives are being addressed?	- Demographic data - Initial knowledge assessments
B. Cognitive analysis (Learners' representations of the subject matter and possible difficulties in their thinking)	Learners' Prior Knowledge & Misconceptions (Pedagogical Content Knowledge)	- What do learners already know? - What are common misconceptions that the scenario needs to address?	- Pre-knowledge test results - Prior assignment grades
C. Purpose and objectives (Purpose, objectives and learning outcomes of the educational scenario)	Learning Outcomes & Goals (Outcome/ Object)	- What specific Knowledge/Skills/Attitudes will be achieved? - How will the scenario foster the 4Cs?	- Learning Outcomes mastery indicators - 4Cs rubric scores.

D. Development - selection of materials and Tools (ICT Tools & Tools Selection Phase Emerging Technologies and materials development)	Emerging Technologies & Teaching Materials (Tools)	- Which AI/LMS tools (e.g., Moodle quiz, ChatGPT) will be used? - How will they add value over traditional methods?	- Learning Management System features used (e.g., Moodle quiz, Moodle forum) - Frequency of tool use.
E. Development of learning activities (Design and development phase of learning activities)	In-Class e-Activities (In-situ & Online) (Learning Strategies)	- What is the sequence of activities (psychological prep, teaching, consolidation)? - Which activities are collaborative or problem-based?	- Logged actions (clicks, views) - Time on task - Completion rates
F. Application in the classroom (Classroom implementation and evaluation phases)	Implementation Plan (Rules/ Division of Labor)	- How are learner/educator roles organized? - What are the specific instructions for tutors and e-sheets for learners?	- Tutor observation logs - Reflective journals - Communication patterns.
G. Assessment - review (student and scenario) and possible extensions of the scenario	Assessment & Feedback (Evaluation)	- How will formative (ongoing) and summative (final) assessment be carried out? - Which 4Cs rubric will be applied?	- Learner performance - Summative grades - Post-survey data - Formative feedback responses.
H. Documentation	Scenario Documentation & Reflection (Institutional Context)	- What were the key learnings? - What are the guidelines for other educators to reuse this scenario?	- Tutor reflection reports - Pefinement proposals.

Creative pedagogy and 21st century skills

Creative Pedagogy is the fundamental human-centered strategy woven throughout the framework. It combines creative teaching, teaching for creativity, and creative learning to foster the 4Cs ensuring AI augments human potential rather than replacing it.

The 4Cs, namely Creativity, Critical thinking, Collaboration and Communication, represent essential 21st century competencies that equip learners to navigate a rapidly evolving world shaped by digitalization, complexity, and innovation. In educational settings, particularly in the context of AI-enhanced learning environments, these competencies form the foundation of creative pedagogy and support the development of adaptable, socially aware, and problem-solving individuals.

Creativity is understood as the capacity to produce novel and utilitarian ideas or solutions. In education, creativity expands beyond artistic abilities to include problem-solving, adaptability, and innovation.

Critical Thinking involves systematic, analytical thinking that supports careful inquiry and decision-making. This skill is essential for distinguishing facts from misinformation, evaluating evidence, and making informed judgements in a world full of data. It is characterised by a rigorous approach and is a key competence for better problem-solving, adaptability, and overall learning performance.

Collaboration emphasises the importance of working together with others in a positive and productive way. Effective collaboration involves coordinating efforts to support teamwork, including building mutual trust, maintaining clear communication, and developing shared understanding. A key part of meaningful collaboration is interacting with others and working as a team towards a common goal.

Communication at its core is the process of sharing information to influence how others perceive us. It includes both verbal and non-verbal elements. Effective communication involves using communication tools wisely and applying social skills based on an understanding of societal norms. It also requires the ability to build meaningful connections, interpret others' intentions, and engage with different perspectives – highlighting its central role in a wider set of skills. The other three Cs also rely on strong communication, emphasising its importance for the future of education and work.

The 4Cs are foundational to the augMENTOR pedagogical framework, which integrates creative pedagogy with AI-supported learning to develop these essential 21st-century competencies. Recognising the growing importance of creative thinking, strong emphasis is

placed on fostering creativity as well as its interconnected counterparts: critical thinking, communication, and collaboration.

The solution is underpinned by an instructional design model, which enables the structured, iterative development of learning experiences, namely ADDIE (Analysis, Design, Development, Implementation, and Evaluation) Each phase is infused with creative pedagogy principles, supported by the 'Understanding by Design framework', to ensure that learning goals align with what learners should know, value, understand, and do. Creative Pedagogy, is a tripartite approach that should be intentionally woven into the course design.

Table 3. Integrating Creative Pedagogy

Creative Pedagogy Component	Educator's Focus	Implementation in AI-Context
Creative Teaching	**How you teach** Design and deliver content in imaginative, responsive, and flexible ways.	Use AI-assisted tools (like generative content or adaptive technologies) to personalize instruction and scaffold learning.
Teaching for Creativity	**Fostering learner capacity** Focus on strategies that encourage students to generate novel ideas and engage in divergent thinking.	Encourage students to design AI-driven narratives or participate in collaborative problem-solving scenarios.
Creative Learning	**The learners' experience** Center on open-ended, active, autonomous, and imaginative tasks.	Support inquiry and experimentation in environments that promote reflection and metacognitive awareness.

Skills assessment

In augMENTOR rubrics are used as the primary methodology for assessing the 4Cs, as they increase transparency, guide learners, and support self-assessment. For consistency, each competency is broken down into three generic components. For each course, educators need to tailor the criteria in the rubric cells to the course's specific subject matter and context. Each component has four scoring levels, Level 1 (Novice: 0.25), Level 2 (Limited: 0.5), Level 3 (Good: 0.75), Level 4 (Excellent: 1.0).

Table 4. augMENTOR subject agnostic rubrics

Creativity	1. Novelty (Newness/Uniqueness of idea/solution) The capacity to develop novel ideas for the task.

	2. Effectiveness (Functionality/Value within context) The capacity to develop an effective strategy.
	3. Implementability (Feasibility/Resources available) The potential for the implementability of ideas.
Critical Thinking	1. Identification of components (Recognizing the problem/central concepts) The capacity to grasp the different components of the problem.
	2. Exploration (Analysis of different ideas/perspectives) The capacity to explore different perspectives.
	3. Critical Perspective (Forming a well-reasoned judgment/opinion) The capacity to develop a critical opinion.
Collaboration	1. Sharing understanding and objectives (Team representation of the problem) The capacity to establish and maintain shared understanding and objectives.
	2. Taking appropriate action (Identifying/applying solutions, monitoring progress) The capacity to take appropriate action to solve the problem.
	3. Team organization (Defining roles and distributing tasks) The capacity to establish and maintain team organization.
Communication	1. Adaptability (Using communication for a range of purposes) The use of communication for supporting the program.
	2. Media effectiveness (Utilizing multiple media effectively) The capacity to utilize multiple media according to their effectiveness.
	3. Context effectiveness (Communicating effectively in diverse environments) The capacity to communicate effectively in diverse environments.

This structured approach allows the assessment to be both holistic (covering the full 4Cs) and precise (evaluating specific components within the context of your learning objectives).

What does the augMENTOR platform offer?

augMENTOR's added value is giving you a data-driven "superpower"— the ability to easily diagnose the subtle needs of every learner and receive immediate, actionable advice on how to improve your course and their performance.

The augMENTOR platform acts as an Intelligent Pedagogical Partner, offering a distinct advantage by transforming raw course data into actionable teaching and learning insights. Its core value lies in making the complex work of personalized and creative learning manageable and data-driven.

All features of the platform are powered by advanced AI models and a Learner Model (LM), grounded directly in the Pedagogical Framework (PF). This means the system performs the role of an intelligent partner, going beyond simple data display to provide true pedagogical analysis. The actionable steps for course design or personalized learning are generated by the AI based on its analysis of a learner's gaps against the optimal path defined by the TESA framework.

What can educators do?

Educators can perform structured queries related to their course, view the progress of their learners in the course and access dedicated augMENTOR profiles for their learners.

Queries can address a group or an individual learner or the course itself. When a query is submitted , the AI instantly delivers customized outputs for intervention and refinement. When making a query, the educator receives:

- **Feedback:** Depending on the query, the AI provides the requested input. This may include scores and qualitative explanations for learner performance related to 21st century skills as well as analytics (like actions performed, resources not accessed, time spent on activities and more). This eliminates the burden of manually collecting information from several sections in Moodle.
- **Targeted guidelines for personalized learning**: Based on its analysis of gaps and strengths, the AI generates highly specific guidelines for course design (for generalized improvement) or for individual student needs. It also generates recommendations, addressing the learner based on TESA principles,that facilitate differentiated learning and personalized learning pathways. Critically, educators maintain control. They have the final option to review and edit the AI-generated

recommendations before sharing them with their learners, ensuring the final guidance aligns with their professional judgment.

- **augMENTOR Profiles & Targeted Grouping:**augMENTOR creates detailed learner profiles by looking at more than just academic performance. It also considers a learners' engagement and in-course activities. The system gathers a wide range of information from surveys, grades, and in-course behavioral metrics to create these profiles. This process uses advanced machine learning to group learners with similar characteristics, forming the basis for the predefined augMENTOR profiles. Once the profiles are established, augMENTOR assigns individual learners to them. A key feature is the system's ability to explain why a learner was assigned a specific profile. It uses an explainability module to show which characteristics most influenced the decision. This transparency helps educators and learners understand the reasoning behind the assignments, making augMENTOR a valuable resource for creating personalized and effective learning strategies.

  Educators have **access to these profiles**, a **detailed description** for each, and the **overall performance** of the learners within that profile. They can see which learners belong to which group and a summary/explanation of why the AI made that assignment. Educators even have the agency to re-assign a learner profile if they deem it necessary, provided they give a professional explanation for the change.

What can learners do?

The augMENTOR platform functions as a dedicated, data-driven learning navigator for learners, providing targeted feedback based solely on *their* individual performance and engagement. Learners can also make queries, but exclusively for themselves and receive dedicated feedback and recommendations.

- **Feedback:** Learners can instantly query the system about their own progress and receive detailed Feedback. This transparent feedback enhances their ability to self-assess and regulate their learning.

- **Requesting personalized, human-vetted recommendations:** Learners have the ability to explicitly request recommendations aimed at improving your performance, focusing on specific skill gaps or weaknesses identified in your profile. When recommendations are requested, the AI drafts specific, actionable recommendations tailored to them. However, to ensure the guidance is pedagogically sound and contextually relevant, this request is filtered through the human-in-the-Loop process:
  - Theeducator is informed of the request.
  - The educator reviews and may edit the AI-generated recommendations.

- The guidance is only sent to the learnerafter the educator provides final approval.

In short, augMENTOR gives learners a clear understanding of their progress and provides a direct pathway to request personalized, expert-vetted support for achieving your learning goals.

What can policy makers do?

The augMENTOR platform provides policy makers, school leaders, and course providers with the data-driven validation and strategic foresight necessary to navigate the digital shift in education. The platform generates tailored educational policy recommendations and actionable guidance by performing a strategic analysis of learning outcomes and instructional effectiveness.

Recommendations are designed by aggregating performance data, the augMENTOR profiling framework, and course descriptions. This process ensures that all insights are evidence-based, pedagogically sound, and directly linked to real data captured through the TESA (Technology-augmented Educational Scenarios and e-Activities) framework. Using these dimensions, augMENTOR aligns policies across diverse educational contexts, emphasizing transparency and practical applicability.

Policy makers receive dedicated policy recommendations per course, structured to provide a comprehensive strategic view of the learning activity:

- **General Feedback:** Provides a high-level overview of the course's effectiveness and student engagement.
- **Discussion about Learners' Profiles:** Offers insights derived from the augMENTOR profiles framework, detailing the distribution of learners across predefined groups.
- **Insights about Performance:** Delivers a focused analysis of student outcomes, highlighting key findings related to cognitive performance and the development of **21st-Century Skills (the 4Cs)**.
- **Policy Recommendations for Supporting Learners:** Suggests strategic interventions aimed at improving student outcomes, engagement, and access to resources.
- **Policy Recommendations for Supporting Educators and Course Providers:** Offers actionable guidance for professional development, curriculum refinement, and institutional support necessary to enhance teaching strategies and optimize course delivery.

By utilizing augMENTOR, policy makers gain an evidence-based strategic compass to design effective interventions, strengthen educational outcomes, and foster learners' 21st-century skills at an institutional level.

The augMENTOR Workflow: From Moodle design to AI insights

This section is a hands-on roadmap, designed to help educators connect the conceptual augMENTOR Pedagogical Framework (PF) to their digital classroom in Moodle. To harness the platform's AI-driven insights, two critical steps are necessary: first, designing activities according to the TESA model, and second, establishing the secure link between your Moodle course and the augMENTOR platform. Successfully completing this workflow ensures every interaction in your course feeds the Learner Model, activating the full suite of diagnostic tools and personalized support.

Building augMENTOR courses in Moodle

To ensure a course is fully integrated with the augMENTOR AI-Driven Platform, educators must design learning activities within Moodle using the structure of the TESA (Technology-augmented Educational Scenarios and e-Activities) framework. This process ensures the data collected aligns perfectly with the system's underlying Learner Model and the knowledge graph used by augMENTOR's AI models. More information and pedagogical guidance is available in section 'Micro level: Technology-augmented Educational Scenarios and e-Activities'. To set up a course in Moodle a set of basic guidelines also need to be followed.

1. Activities selection

While Moodle offers numerous activity types, augMENTOR has selected a specific subset of activities and resources based on the needs of the project's pilots. Courses should only include the following types of content and activities (also linked to TESA phase D):

- Resources (links, texts, videos)
- Assignments (ASSIGN)
- Forum
- Quiz
- SCORM

Educators may include any combination of these resources and activities as many times as they find useful.

2. Setup: Pre-Post assessment and mental effort

For the AI to establish an initial learner profile and monitor cognitive factors over time, two specific elements must be included in the course design:

- **Pre-Post questionnaires:** The course must start and end with an identical questionnaire. This pre-post questionnaire (also linked to TASA phase B) is used to assess the learners' current level (both cognitive and the 4Cs). These questionnaires must use ORDINAL answers (e.g., Very Low – Low – Average – High – Very High). Slight changes in the wording of the questions can be made (but not to the answers).
- **Mental effort question:** At the end of each module, a single question that measures the perceived mental effort expended to complete the thematic section needs to be included, using the following scale:

Table 5. Mental effort scale

Effort Level	Value	Text
Extremely Low	1	Extremely low mental/intellectual effort
Very Low	2	Very low mental/intellectual effort
Low	3	Low mental/intellectual effort
Relatively Low	4	Relatively low mental/intellectual effort
Neutral	5	Neither low nor high mental/intellectual effort
Relatively High	6	Relatively high mental/intellectual effort
High	7	High mental/intellectual effort
Very High	8	Very high mental/intellectual effort
Extremely High	9	Extremely high mental/intellectual effort

3. Implementing the 4Cs assessment (Creative Pedagogy)

To ensure the system can assess the 4Cs, rubrics (advanced grading) need to be enabled for at least one activity in each module (also linked to TESA phase G). This aligns the scenario's learning strategy directly with the required AI metrics. More information, is available in section 'Creative pedagogy and 21st century skills'

The guidelines below need to be followed when constructing rubrics:

- **Skill tagging:** Each section of the rubric must include the name of the corresponding skill written in English and enclosed in parenthesis in the title, e.g., (critical thinking). This is very important for the AI model to correctly map the data.
- **Skills breakdown:** Skills may be broken downinto multiple sub-sections in the title to enable more granular feedback (e.g., (critical thinking) Discerning between fact and opinions).
- **Rich and diverse descriptors:** Rubrics ideally need to be diverse and rich in descriptions to avoid repetition of the same basic text across different levels. Rich rubrics provide the AI with better data to offer rich recommendations.
- **Scoring system:** Use the standardized scoring system: Novice: 0.25, Limited: 0.5, Good: 0.75, Excellent: 1.0.

By adhering to this structure, a Moodle course will seamlessly feed the augMENTOR knowledge graph with clean data, activating the full suite of diagnostic tools and pedagogical insights.

4. Roles assignment

Close attention needs to be paid to the establishment of roles. The Tutors and Learners roles are two of the seven core components of the PeDeMET model. You must ensure that all educators are assigned the Teacher role and all students are assigned the Learner role within the Moodle course, as this role information is the foundational data used by augMENTOR to map relationships and attributes.

Integrating a Moodle course in the augMENTOR platform

This process links your course data securely to the augMENTOR platform. This connection is a one-time setup that unlocks all of the platform's features, allowing you to retrieve feedback on course and learner performance, run queries, and access tailored recommendations to share with your students.

Who needs to do what?

As the augMENTOR platform is currently in the late-stage testing phase and has only been deployed in a few pilot sites so far, direct assistance from the core augMENTOR team is required to establish a secure link.

1. **Educator/Institution Action:** Your primary responsibility is to initiate contact with the augMENTOR contact team.
2. **Technical Support:** Once contacted, the team will require specific connection credentials to establish a database link.
    - If your institution has an IT administrator, they should provide the necessary details (such as the database server address, username, password, and database name). Notice that your IT team should also confirm that these credentials can be shared externally and that any necessary firewall permissions are in place to allow secure connections from the augMENTOR servers.
    - If you are the primary technical contact, the augMENTOR team will guide you on how to safely retrieve these connection parameters to share with them.
3. **Connection and Maintenance:** The augMENTOR technical support team performs the technical setup and verifies the connection is stable and secure. After this initial one-time connection, the team handles all subsequent data updates without requiring any further action from you or your IT administrator. Once established, the platform periodically retrieves updated course data automatically. Your IT administrator may need to ensure that the database access remains active and that any security credentials stay valid over time.

What happens during the connection?

During this setup, the augMENTOR team establishes a secure and reliable protocol to extract educational data from your Moodle course's database infrastructure. The platform connects directly to your Moodle database to retrieve information such as student activity logs, assignment submissions, grades, and course structure. They confirm that the connection is stable and that the database is correctly configured for retrieval. This methodical approach ensures that your course data is transferred with high standards of security and reliability, forming the foundation for the platform's Learner Model to begin generating insights.

Navigating the augMENTOR platform (Educators - Learners)

The following sections offer an overview of the platform's functionalities for educators and learners. Variations in the learners user experience are mentioned explicitly per section. Print screens are labeled with: Light blue boxes to indicate a description of a section, light yellow boxes to indicate numbered steps, light grey boxes offering additional information. The augMENTOR platform is available only to users included in courses with an established connection as explained above using the following link: https://augmentor-app.eu-dev.novelcore.org/

As augMENTOR is linked to a Moodle course, logging in to the platform is done through Moodle once the correct organization is selected.

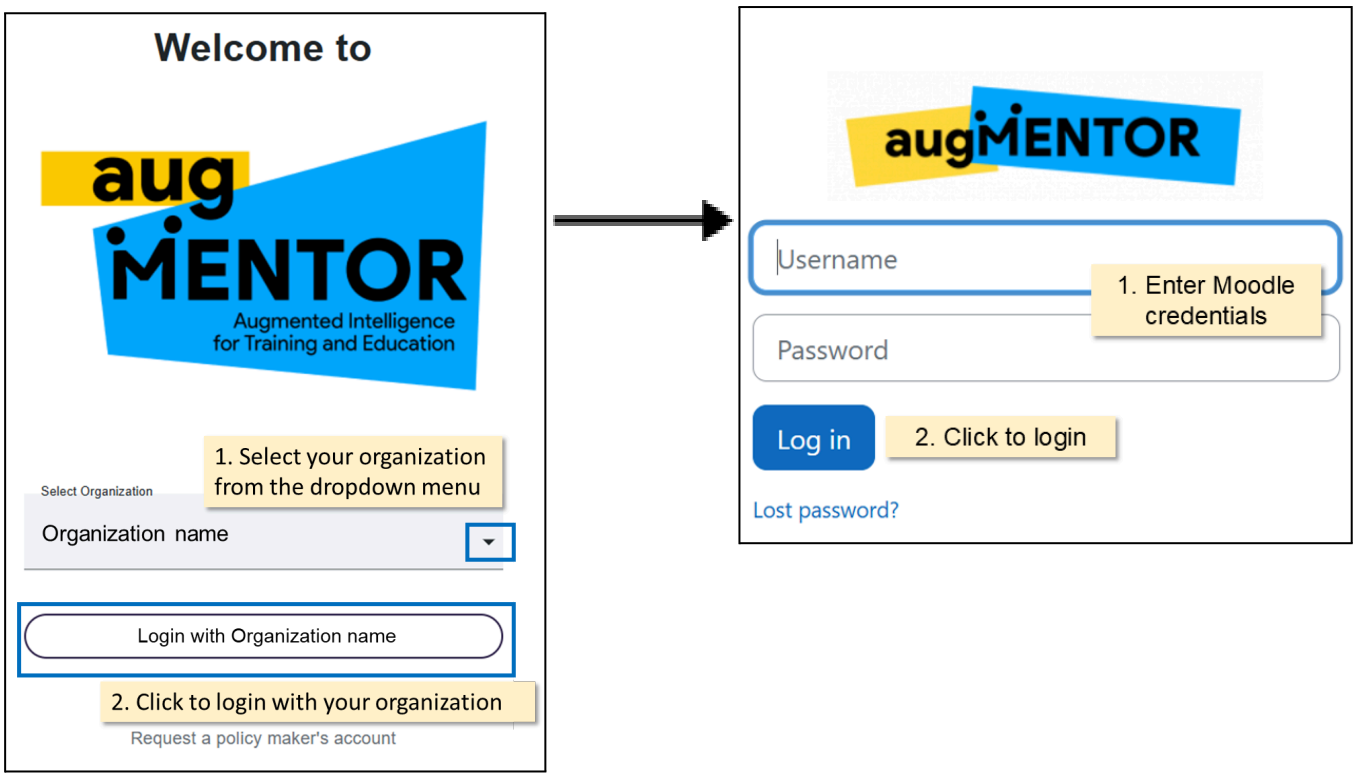


Figure 2. *augMENTOR platform Login page*

When contacting the augMENTOR team for the first time to establish a connection, along with the integration of your first course, a new organization will be created for your school/educational institution.

Home page

After login, users land on the main page of the platform. The menu is always available on the left side for easy navigation. To get started, the user should select a course.

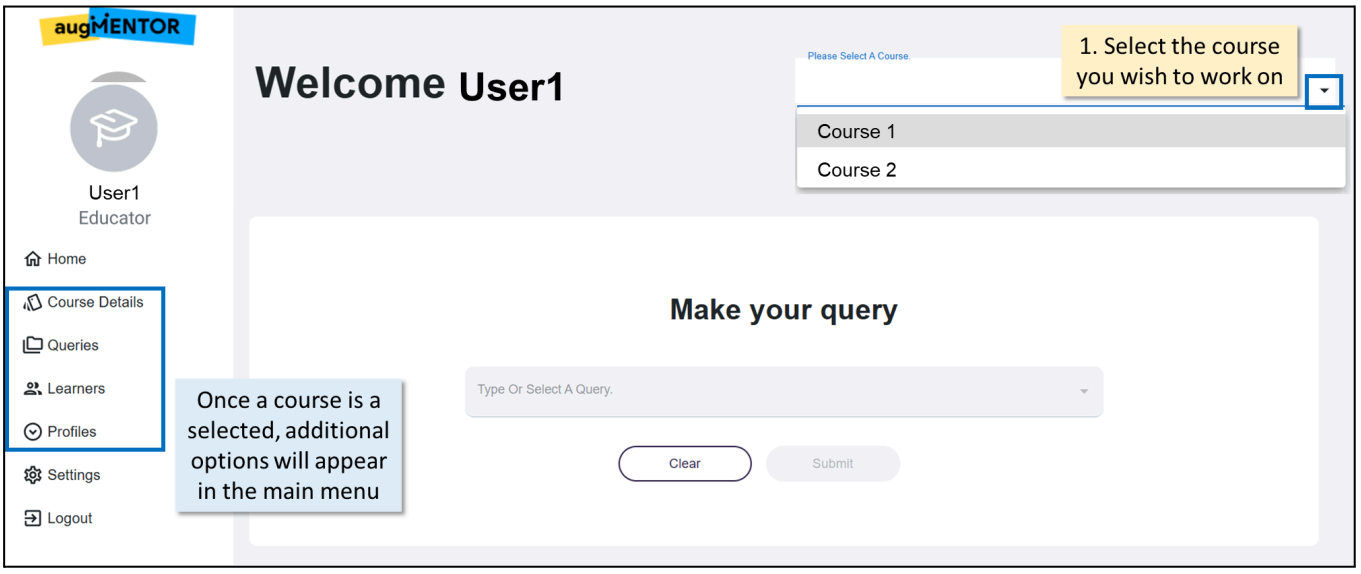


Figure 3. *Home page - Select a course*

Once a course is selected, the main menu is enriched with additional options and a list with the latest queries appears below the 'Make your query' section.

Learner variation: Unlike educators who can see all queries in a course. Learners can only see the queries they made and any queries made by the educator for which the educator has sent recommendations to them.

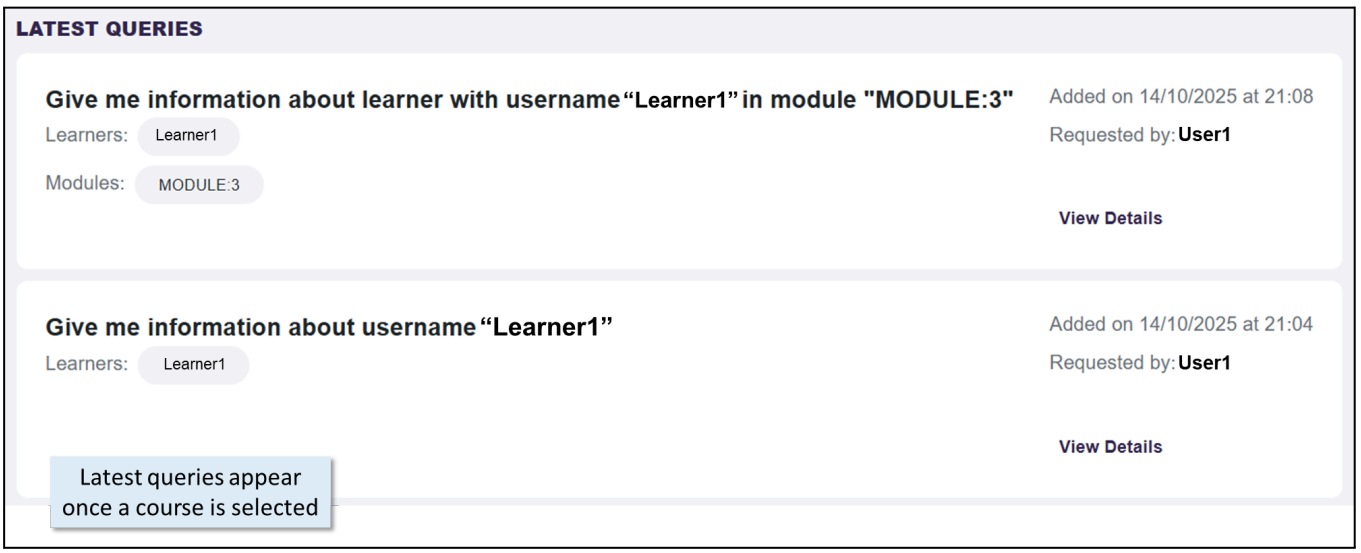


Figure 4. *Home page - Latest queries section*

To get started the user can go to the make your query section and make a query using either the list of pre-defined queries, or typing a custom query.

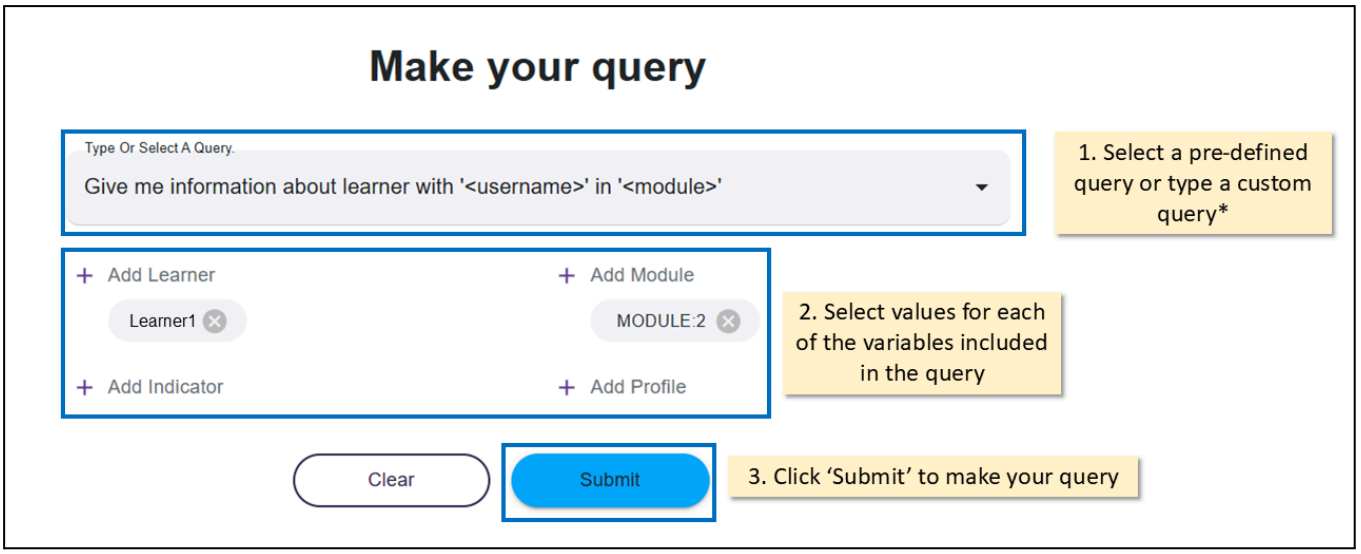


Figure 5. *Home page - Making a query section*

The variables that can be included in a query are:

- Learner -A list of all learners included in the course.
- Indicator - The learning aspects studied based on the pedagogical framework; namely: Knowledge, Creativity, Critical Thinking, Collaboration, Communication.
- Module - The list of module titles as retrieved from Moodle.
- Profile - The list of augMENTOR profiles as generated by the system.

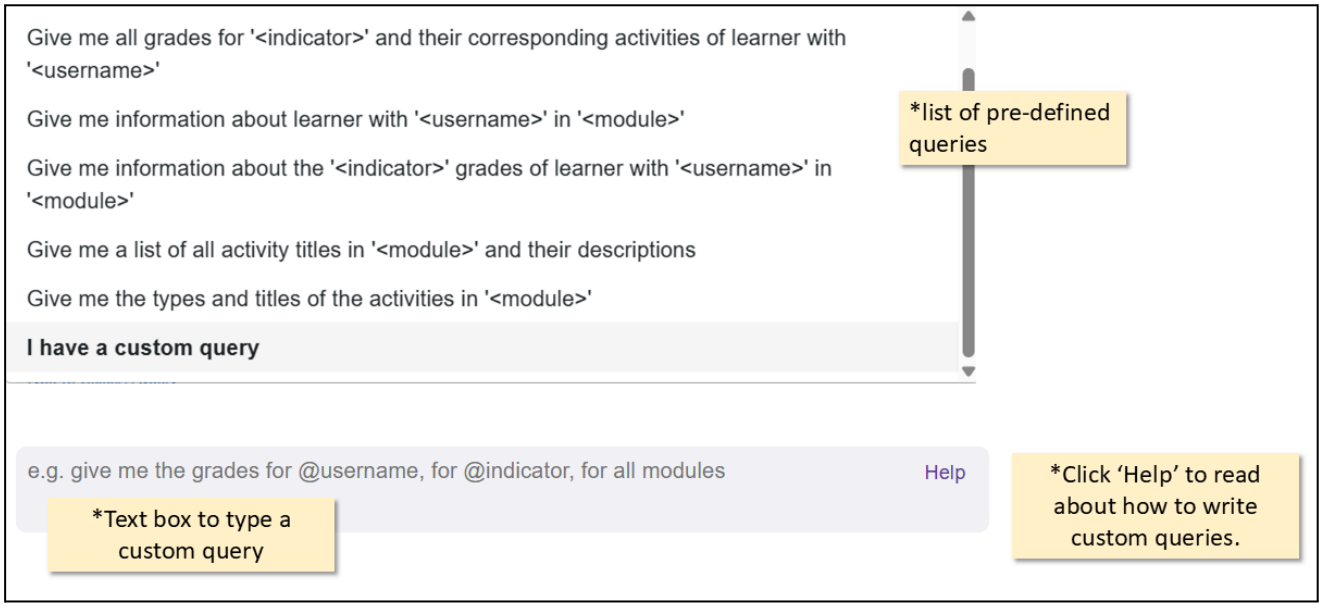


Figure 6. *Home page - Options for making a query*

In custom queries when you wish to select a Learner, Module and/or Indicator please type **@**. A short menu will then appear in your screen, from which you can select **'username'**, **'module'** or **'indicator'**.
Once selected, the corresponding variable will appear highlighted in blue in your text box (e.g. @username). You can then select to add the respective **'username'**, **'module'** or **'indicator'** from the options below.
If you wish to remove a variable inserted, please remove it from both, your query text, as well as, the options below

augMENTOR is specifically designed to respond to educational needs following a dedicated pedagogical framework and based on data retrieved from a dedicated course. It will not generate feedback based on assumptions or by synthesising data on its own. This ensures that users only receive feedback that is based on robust real evidence coming from the designated augMENTOR course.
Likewise, recommendations and course guidelines are not based on assumptions or generic pedagogical guidelines; they are generated based on the information retrieved according to the query made and the augMENTOR pedagogical framework.
Thus it is possible that some queries may not generate feedback. This can happen either because no related data is available for the model to process or because the model did not quite catch your question. For a better experience, when making queries, avoid long narrative questions and use terms you are sure the model will understand (eg. 'learner' or 'students' instead of grades, activity, title, course). Make sure your queriestarget to retrieve course related information. Recommendations and guidelines are generated based on this information. For example:

❌ Give me recommendation for learner with username 'Learner 1' for indicator 'Collaboration' in module 'MODULE:1'

✅ Give me information for learner with username 'Learner 1' for indicator 'Collaboration' in 'Module 1'

Learner variation: Unlike educators who can make queries about all learners in a course, learners are only able to make queries about themselves.

Query details page

Once a query is submitted, the user is directed to the query details page which has four (4)sections: Feedback, Guidelines for course design, Recommendations and Notes.

Feedback can vary depending on the query; it includes information and analytics based on the course data.

Figure 7. *Query details - Feedback section*

This section offers guidelines for learner personalized learning paths following the TESA framework. It includes an assessment of the learner's performance, any limitations identified, recommendations for the educator to personalize the learning experience for the learner supported by explanations.

Learner variation: As this section is related to course design it is not available for learners.

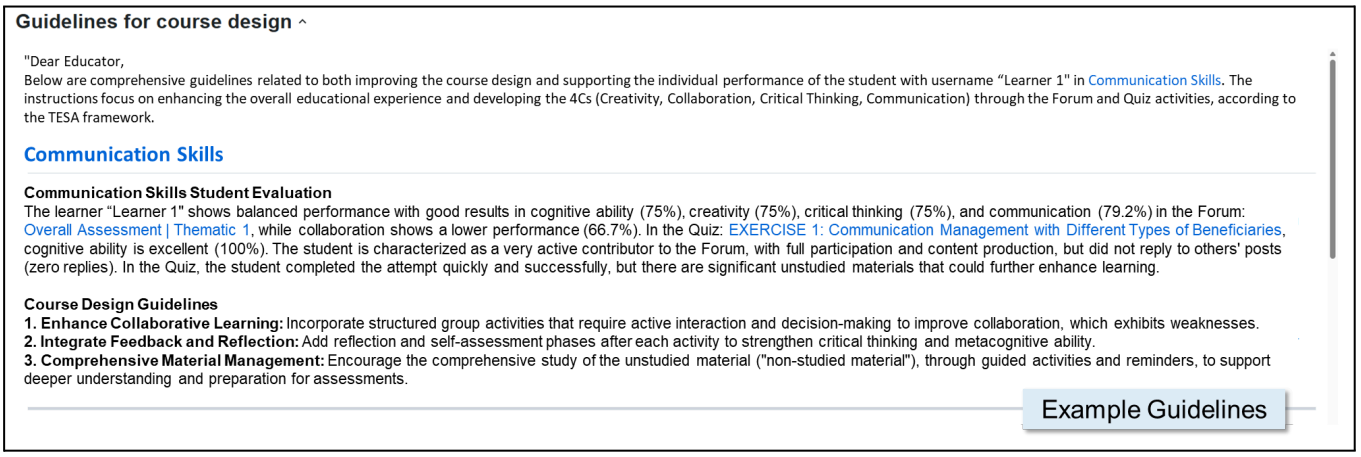


Figure 8. *Query detailspage - Guidelines for course design section*

The course design section is only **available to educators**.

As this section is designed to guide the educator to personalize the learner's learning path, guidelines are generated **only when the query refers to a specific learner**.

To generate guidelines for general course design or specific parts of it, an educator should make a dedicated query and request recommendations.

After reviewing the Feedback and Guidelines (if available) generated, users can request and receive recommendations. Recommendation includes learner(s) performance assessment, limitations identified, recommendations based on the query supported by explanations.

When the query is about a learner in particular, recommendations are designed to address the learner. An educator requesting recommendations for their learner has the option to edit the recommendations (thus ensuring the final recommendations align with the educator's professional judgment) and then proceed to sending the recommendations. If the original query is about the course in general, recommendations address the educator and include recommendations about course design based on the TESA framework.

Learner variation: When learners request recommendations, the AI drafts specific, actionable recommendations tailored to them. However, to ensure the guidance is pedagogically sound and contextually relevant, the request is filtered through the

Human-in-the-Loop process by the educator: The educator is **informed of the request**. - The educator **reviews and may edit** the AI-generated recommendations. - The recommendations are **only sent to the learner** after the educator provides final approval. Learners cannot edit recommendations.

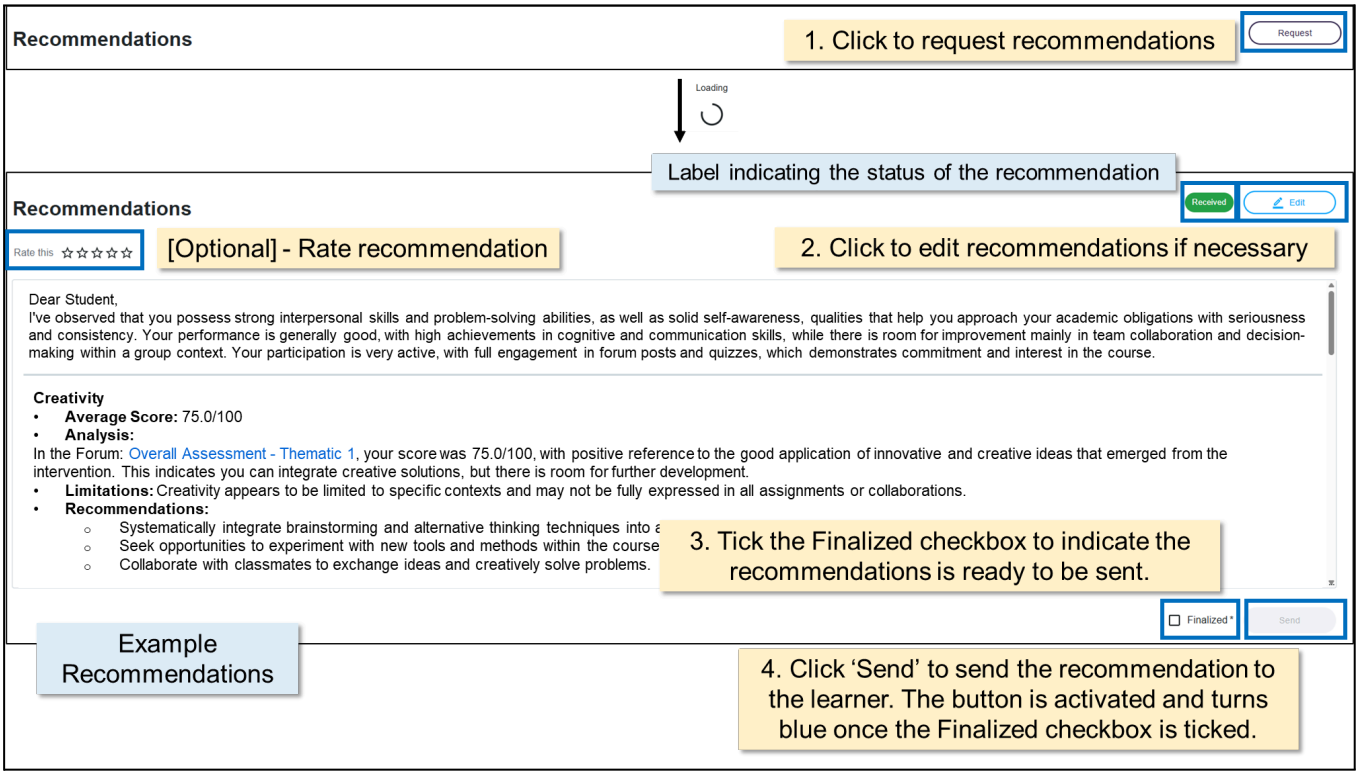


Figure 9. *Query detailspage - Recommendations section*

Finally, the 'Query details' section includes a Notes section designed to enable educators whocollaborate on a course to communicate asynchronously and exchange information and thoughts on queries' information. Notes are visible to all educators included in the specific course.

Learner variation: The Notes section is not available to learners as it is designed to enable educators collaboration.

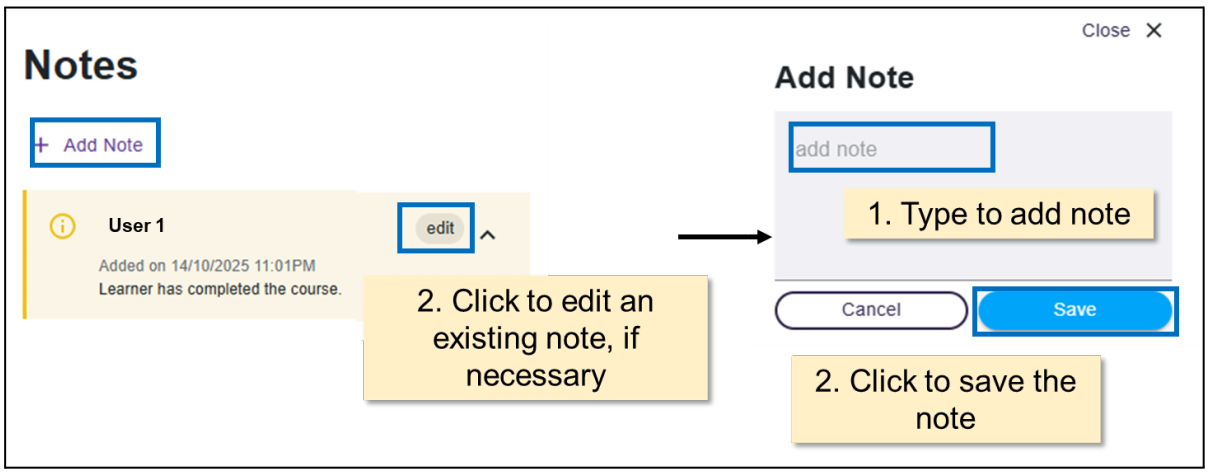


Figure 10. *Query detailspage - Notes section*

Queries page

The Queries section of the main menu serves as a central point where all queries or the course are collected.Users have the option to add (and remove) queries to their favorites, or delete queries they made but they wish to have them discarded. Educators are able to view all queries in a course but can only edit recommendations in the queries made by them. For each query additional information includes:

- Author name
- Type of query (pre-defined or custom)
- Status of the recommendation (Labels: Requested by Learners, Received, Edited, Sent to learner. No label indicates a recommendations is not requested)
-

Learner variation: Unlike educators, learners in a course can only view the queries they made and the queries for which an educator has sent them recommendations.

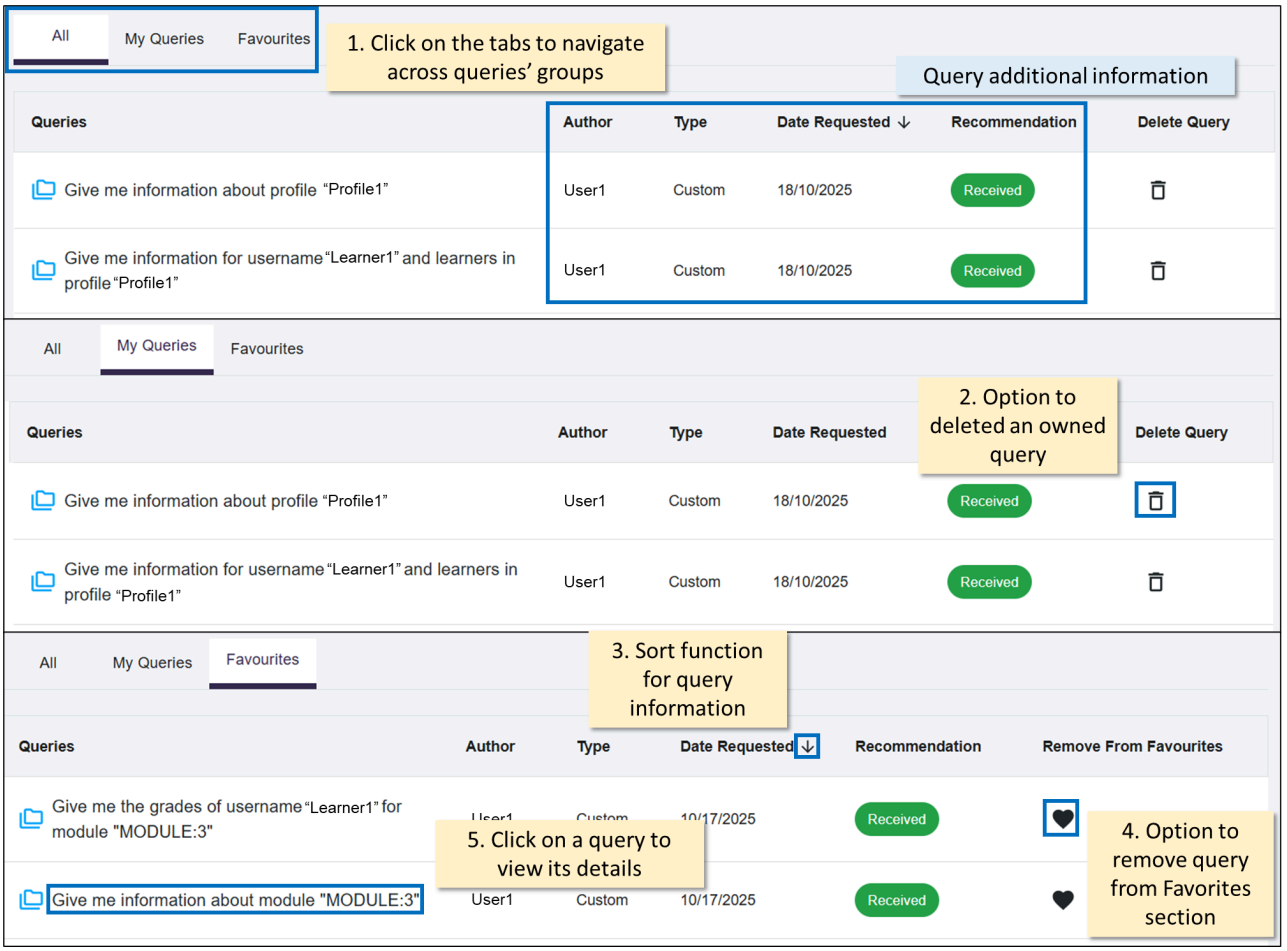


Figure 11. *Queries page - 'All', 'My Queries' and 'Favorites' tabs*

Course details

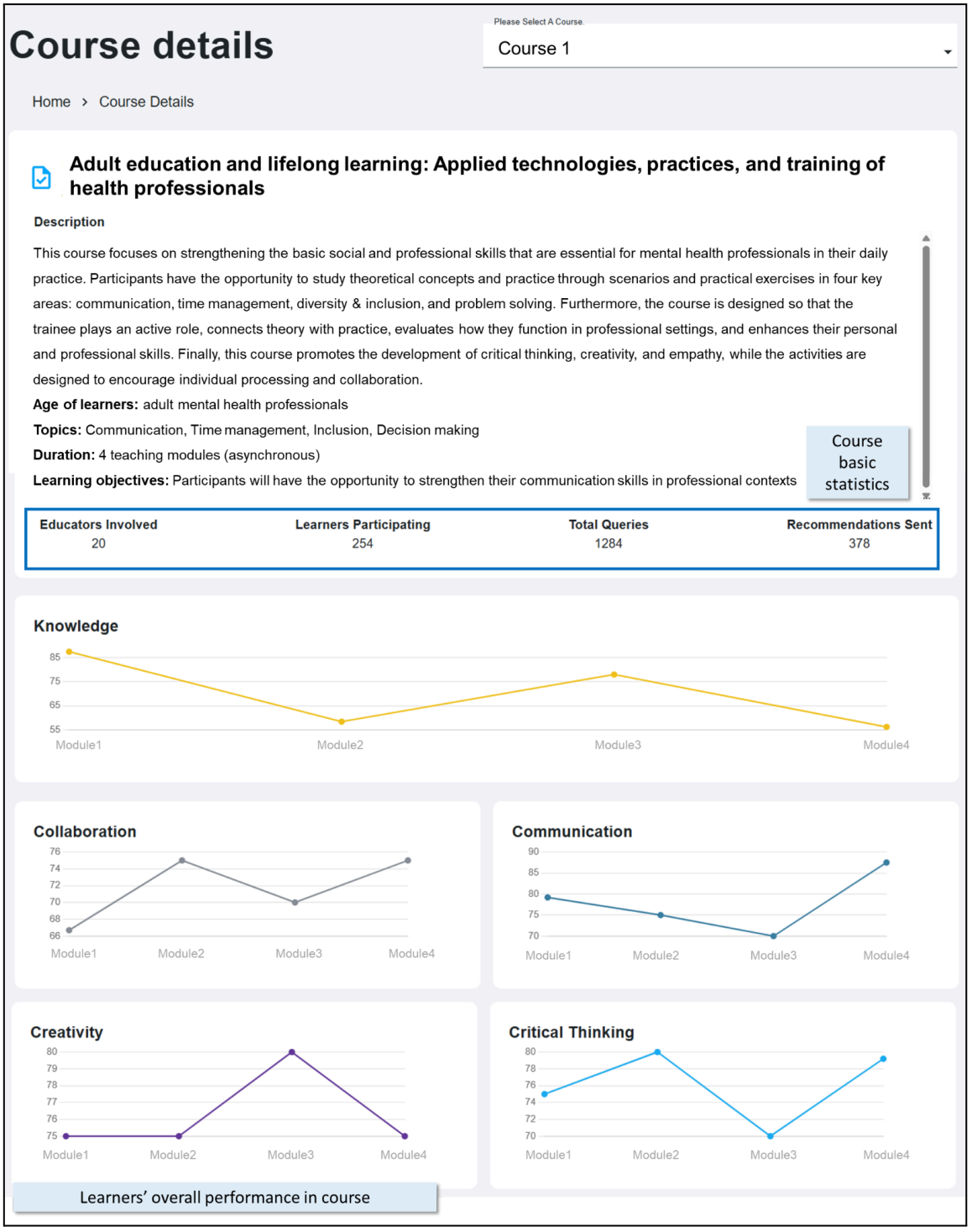


Figure 12. *Course details page*

The course details section includes the basic information of the course. More specifically, it includes:

- Course title and description
- Basic statistics (number of educators involved, number of learners participating, Total number of queries made, number of recommendations sent to learners)
- Learners performance throughout the course's modules for each of the indicators; knowledge and the 4Cs.

Learners

The learners page includes a complete list of the learners participating in the course.

Learners variation: Learners do not have access to the information of their peers, only to their own.

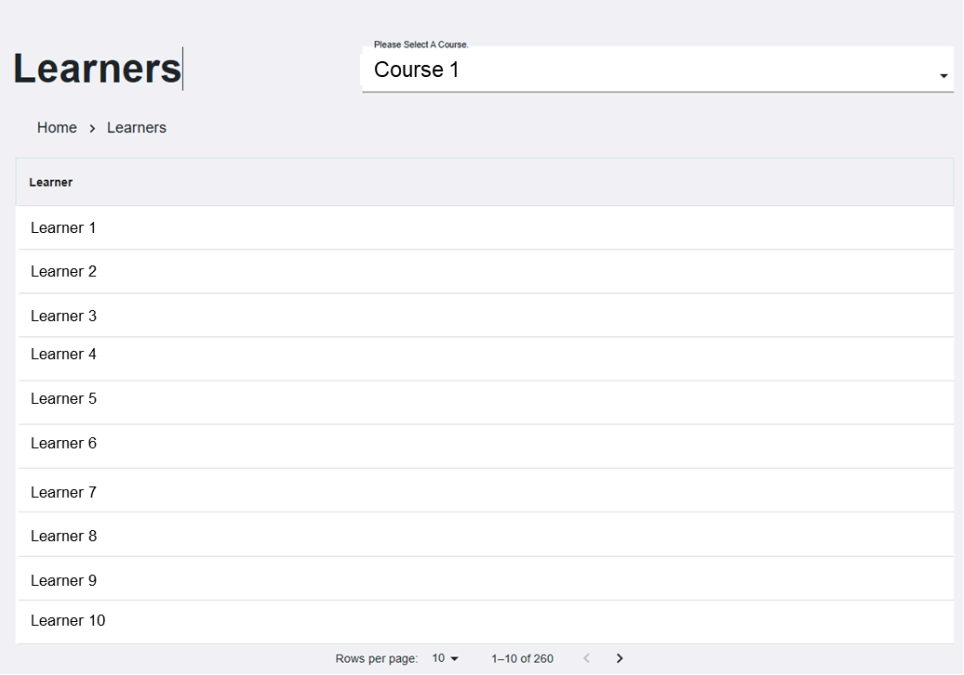


Figure 13. *Learners details page - profile assignment section*

Learner details

The learners details page makes available all information collected for each learned. It presents the following sections:

- Profile information including detailed explanation, a summary and history of changes
- The progress of the learner in the course per course and indicator
- A table of related queries made for the learner
- A table of learners' grade pre activity and per indicator

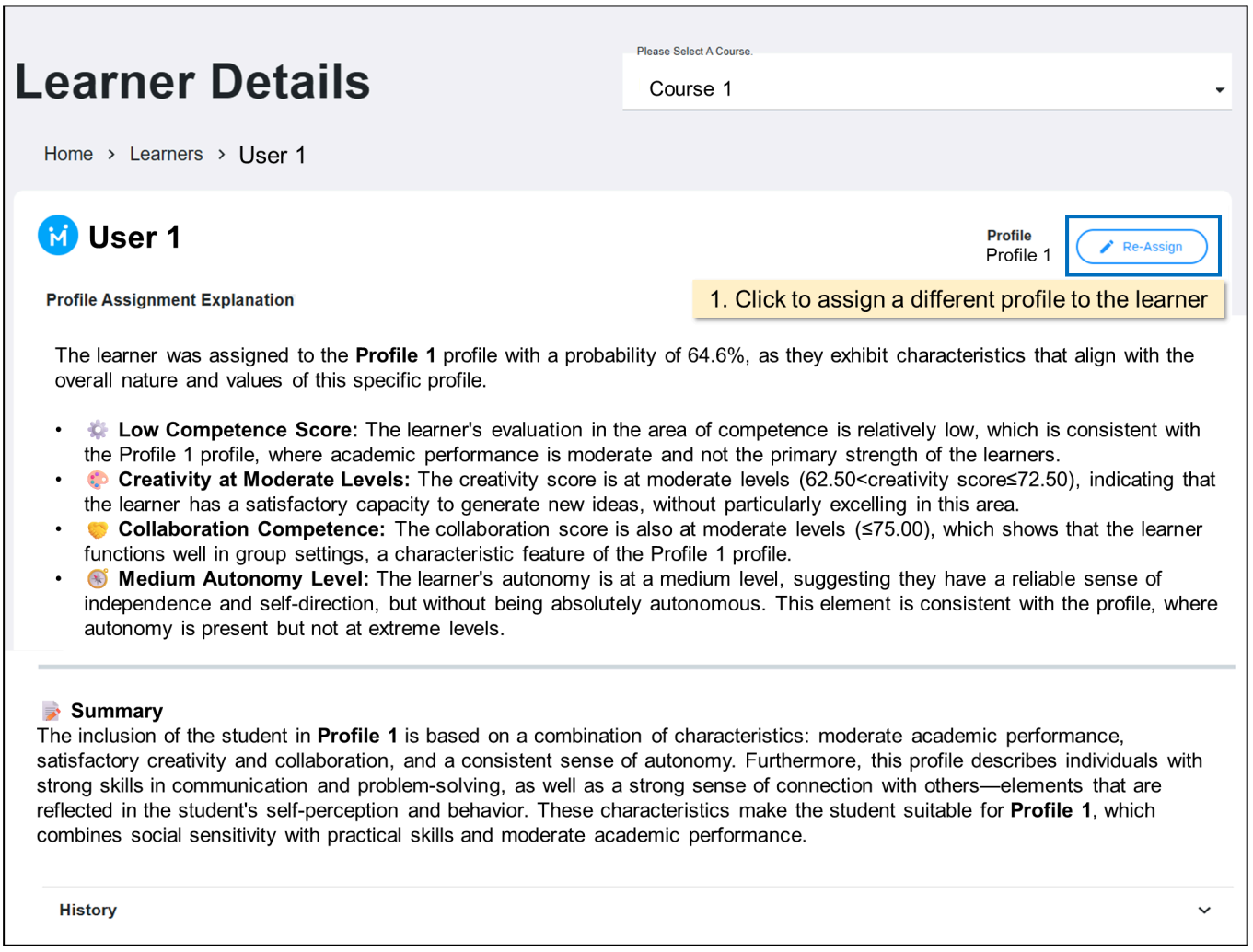


Figure 14. *Learner details page - profile assignment section*

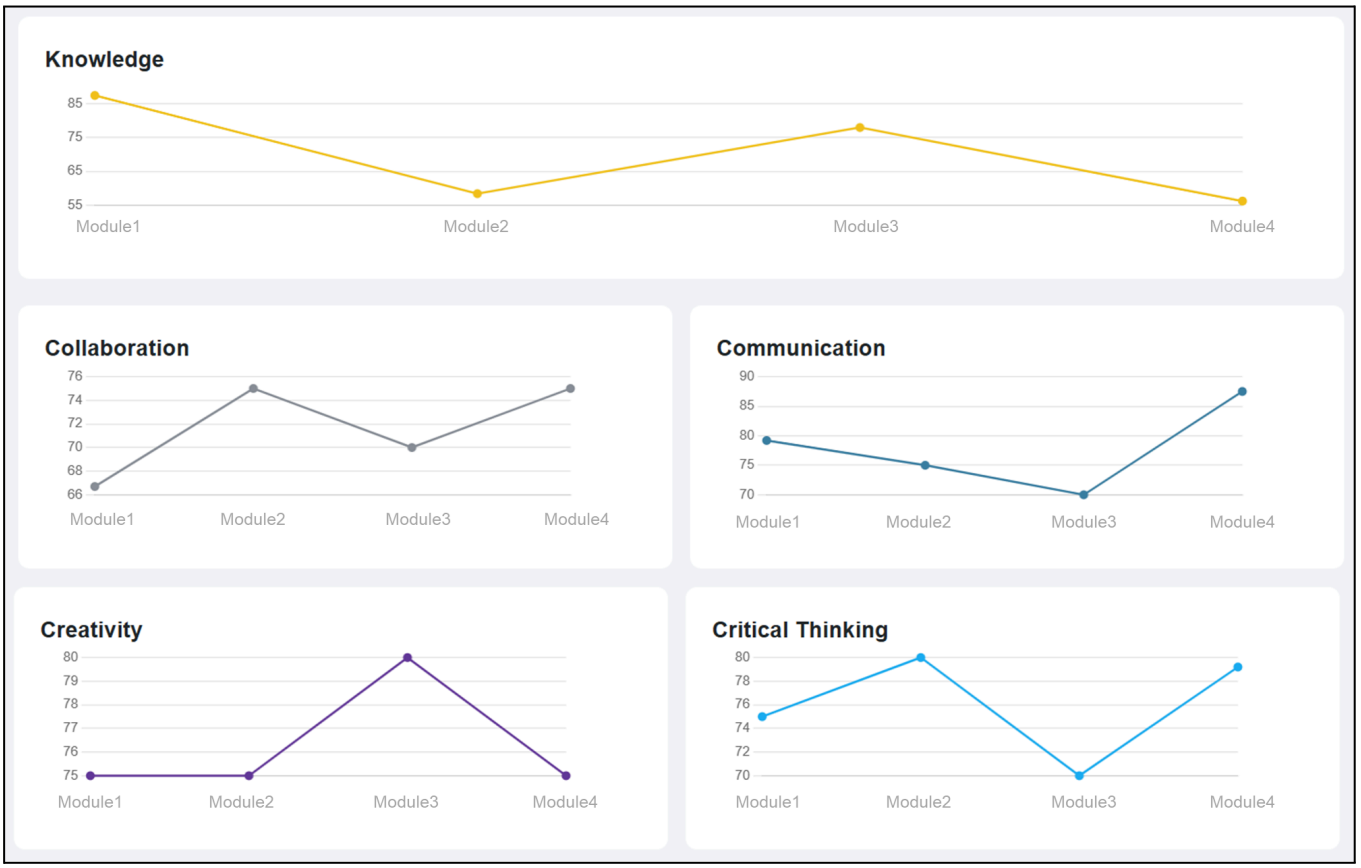


Figure 15. *Learner details page - Performance section*

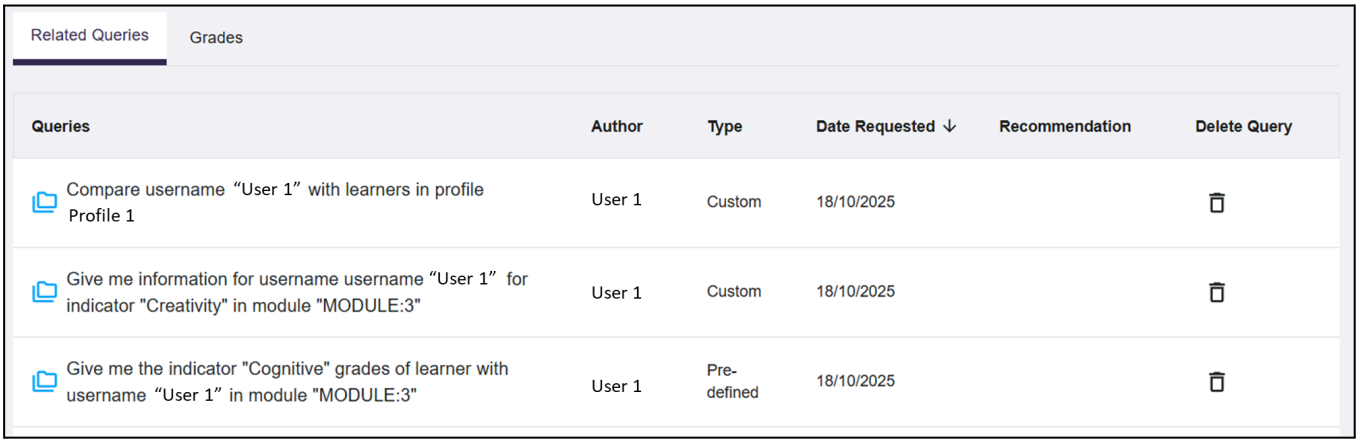


Figure 16. *Learners details page - Related queries section*

Related Queries | Grades

Module	Activity	Knowledge	Collaboration	Creativity	Communication	Critical Thinking
Module 1	Activity 1	75	66.7	79.2	75	75
Module 1	Activity 2	100	0	0	0	0

Figure 17. *Learner details page - Grades section*

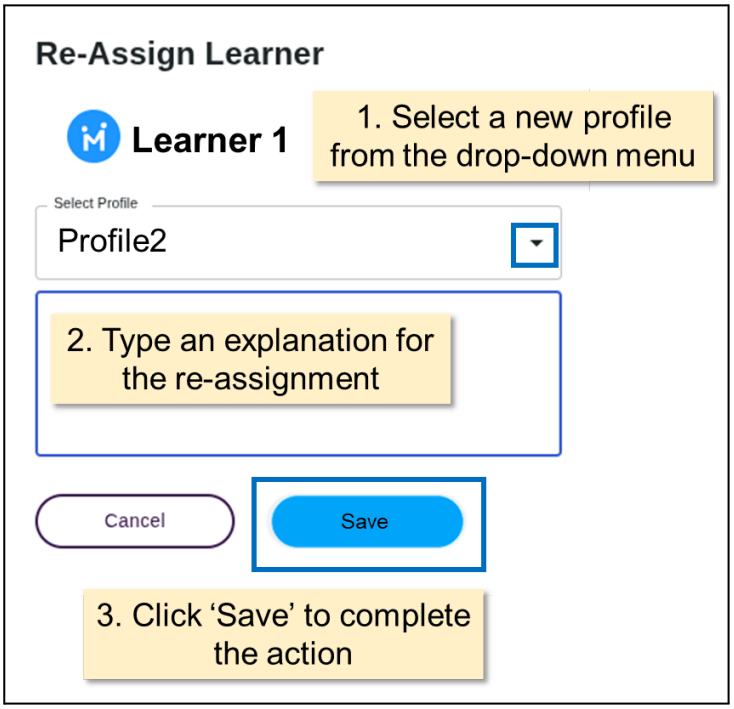
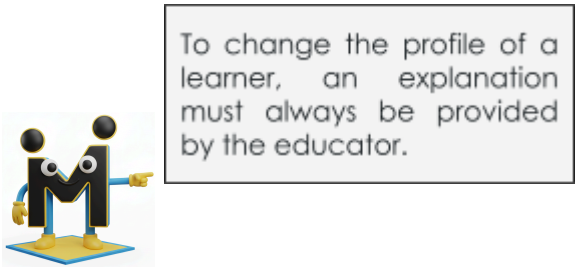


Figure 18. *Learner details page - Re-assign profile option*



Profiles

As mentioned above augMENTOR creates detailed learner profiles by looking at a wide range of information like surveys, grades, and in-course behavioral metrics. In the profiles page, the educator can see the progress of the profiles per indicator as well as the list of profiles generated by the model. By clicking on Profile the educator can view details about that profile. **Learner variation:** Learners do not have access to the profiles page.

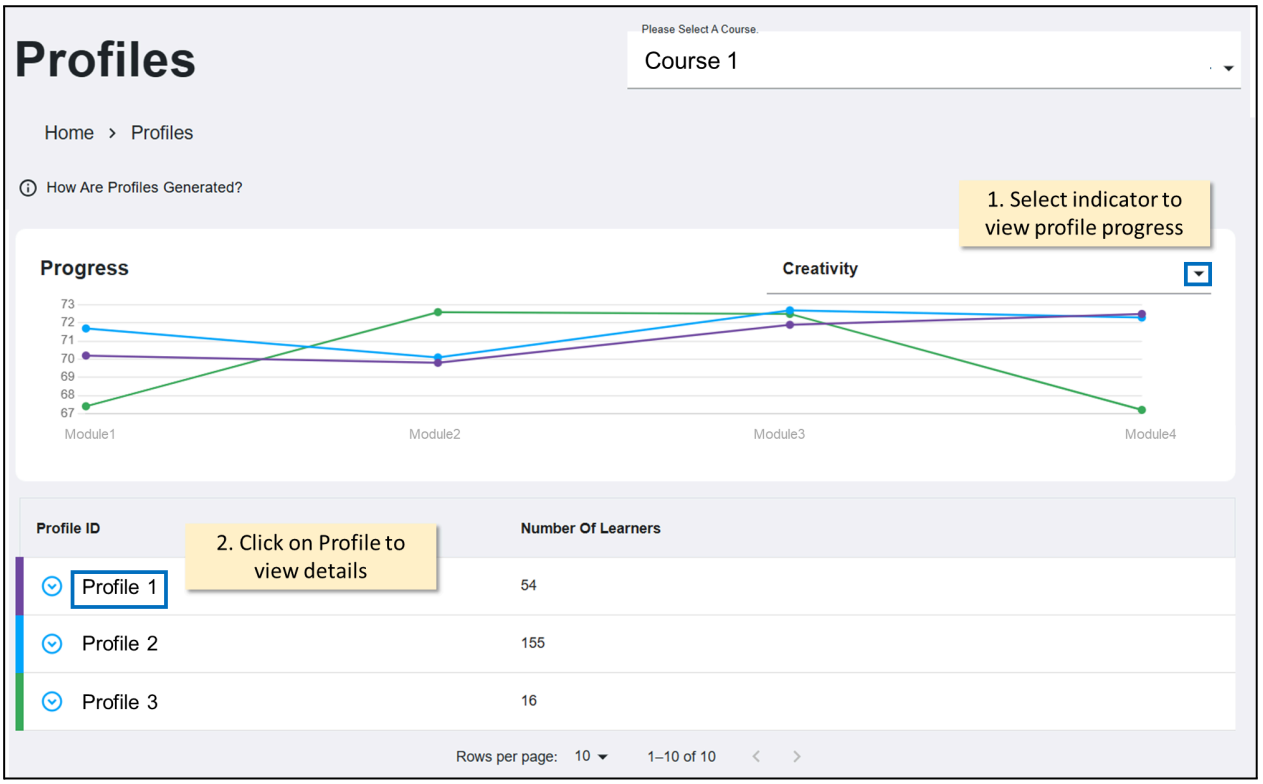


Figure 19. *Profiles page*

Profile details

The Profile details section presents all the information of an augMENTOR profile. It presents a description of the profile, the overall performance of learners in the profile as well as the list of learners that belong to the profile. By clicking on the usernames of learners, the educator can navigate to the learner's details page.

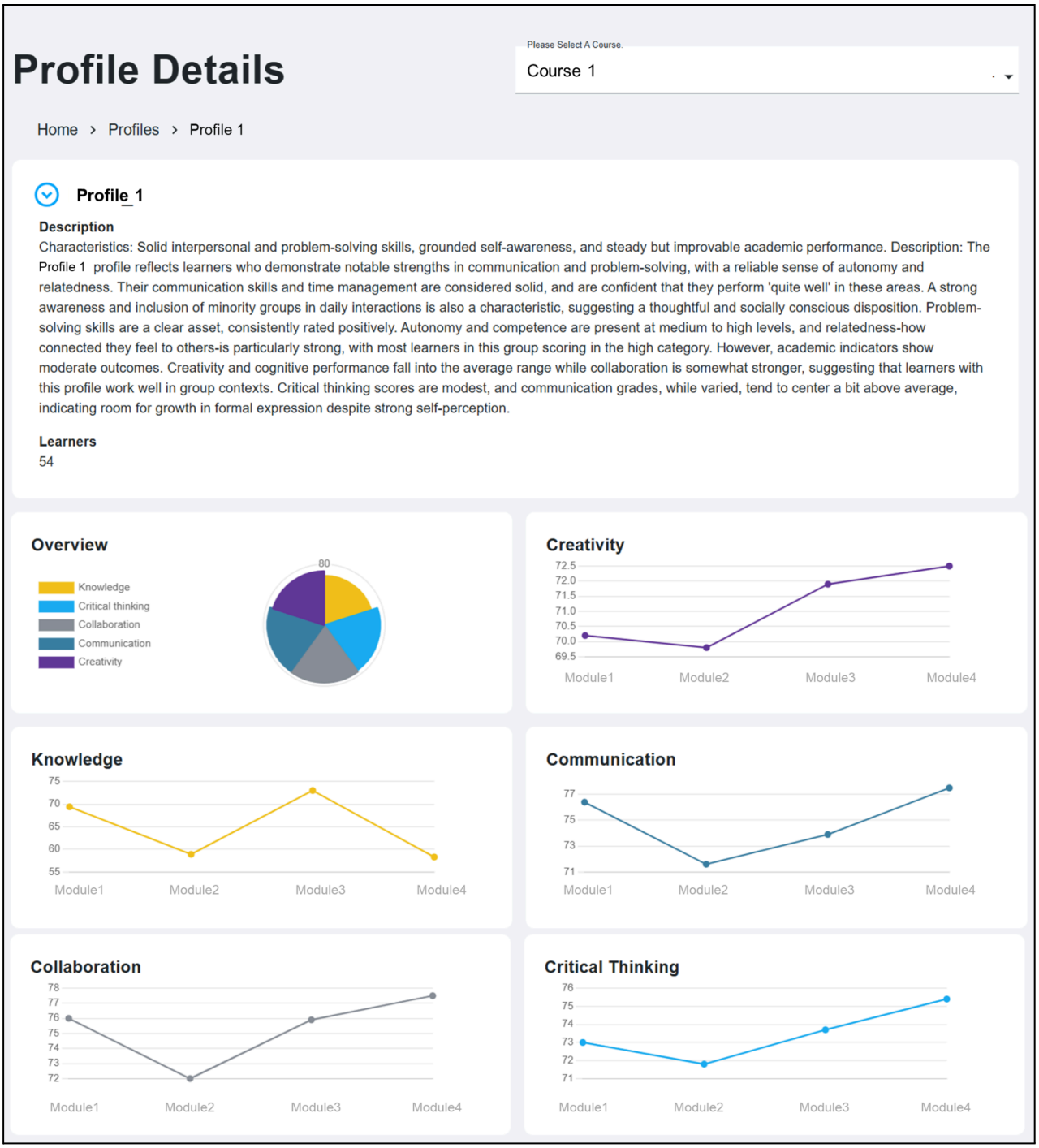


Figure 20. *Profile details page - Description and performance sections*

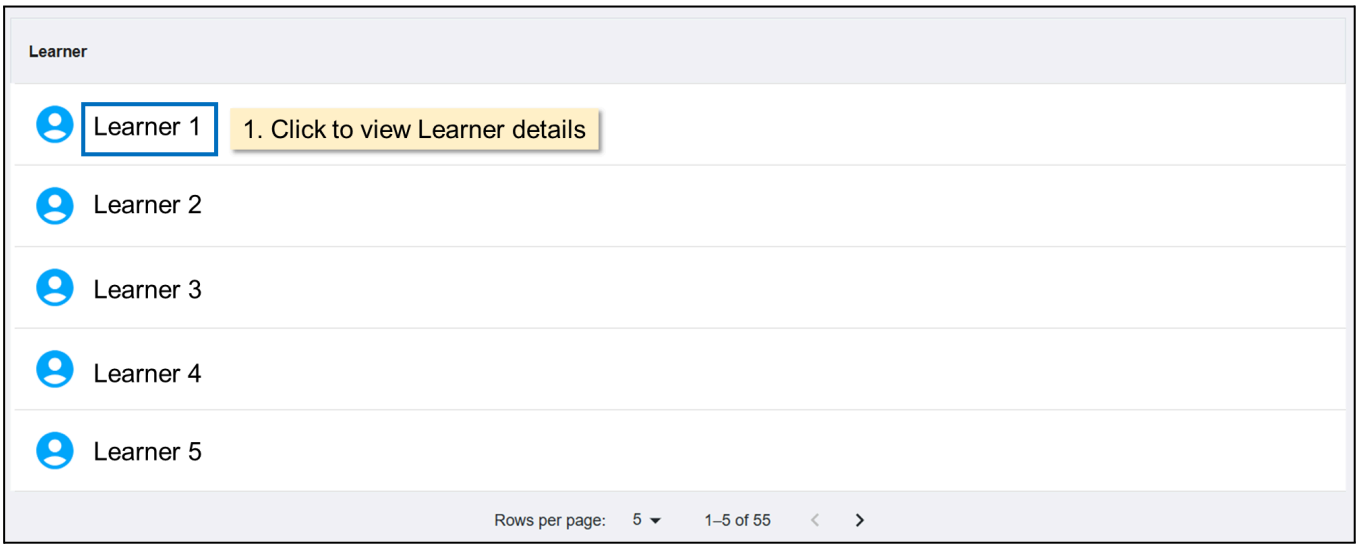


Figure 21. *Profile details page - Profile Learners section*

augMENTOR is a data-informed system that creates detailed learner profiles by **looking at more than just academic performance**. It also considers a learner's engagement and in-course activities. It gathers **a wide range of information** from surveys, grades, and in-course behavioral metrics to create these profiles. This process uses advanced machine learning to group learners with similar characteristics, forming the basis for the predefined augMENTOR profiles.

Settings

In the settings page, users can:

- Click to logout (also available in the main menu)
- Click to edit their profile by being redirected to the Moodle account page
- Contact the technical team

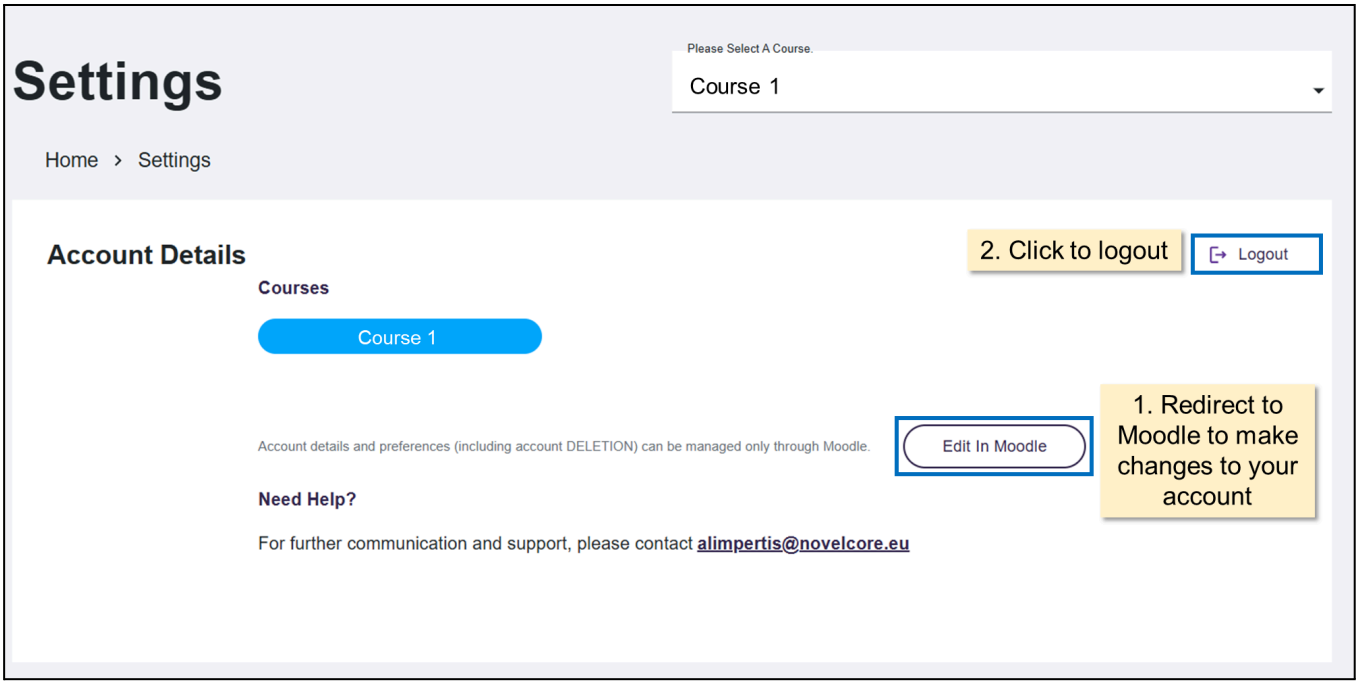


Figure 22. *Settings page*

Navigating the augMENTOR platform (Policy makers)

The following sections offer an overview of the platform's functionalities for policy makers. Print screens are labeled with: Light blue boxes to indicate a description of a section, light yellow boxes to indicate numbered steps, light grey boxes offering additional information. The augMENTOR platform is available following this link (only to users who have requested an account): https://augmentor-app.eu-dev.novelcore.org/ .

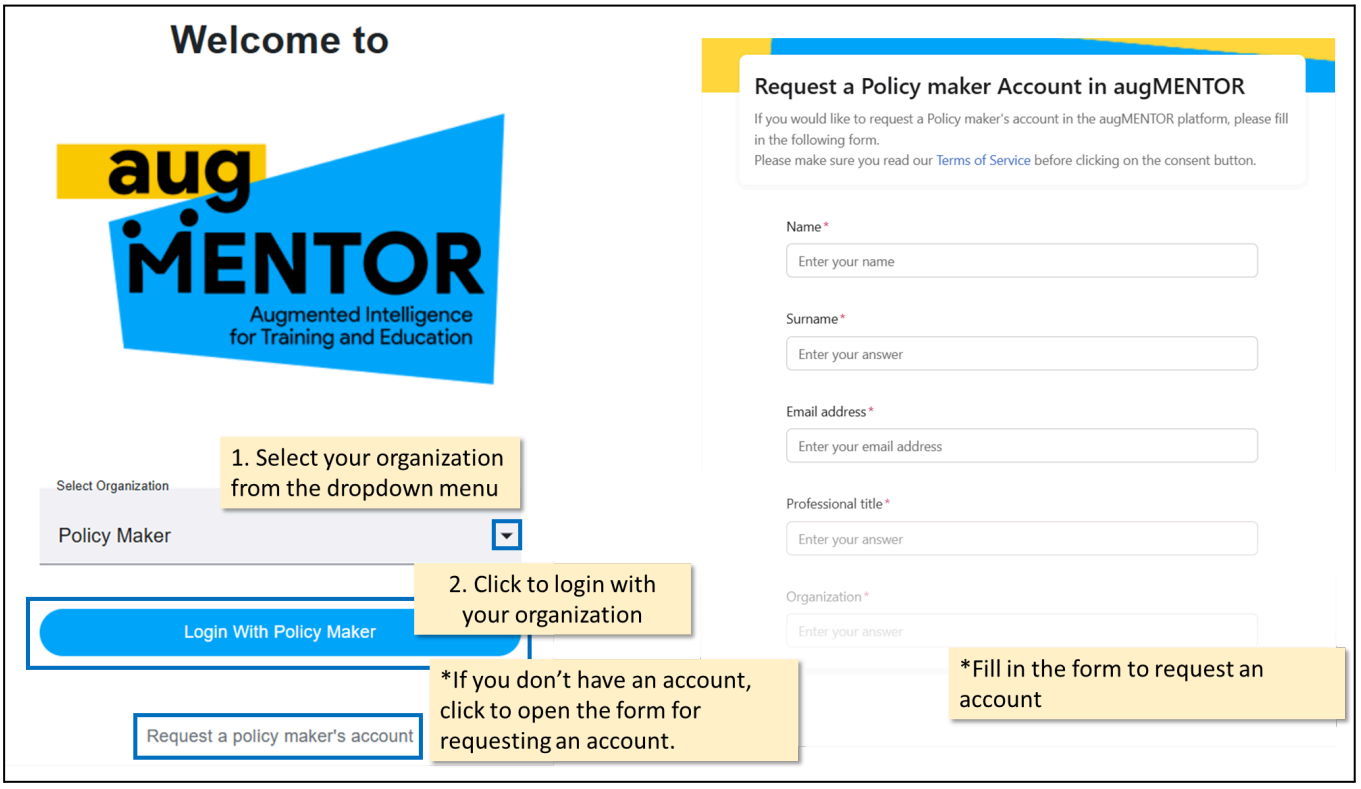


Figure 23. *augMENTOR platform login pageand form for requesting an account*

If you are interested in augMENTOR's policy recommendations functionalities you will first need to request a policy maker's account through the dedicated form. The augMENTOR technical team will then contact you to share your account's credentials once the account is created.

After an account is created, users enter the platform using their account credentials.

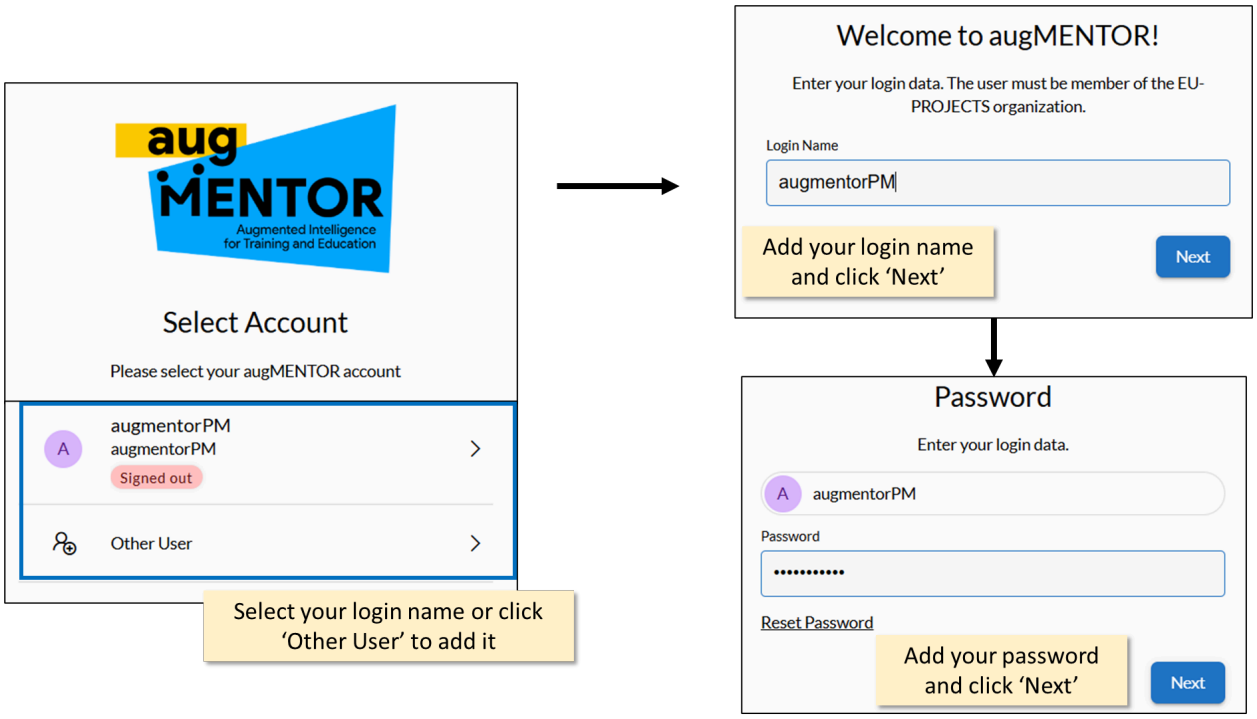


Figure 24. *Entering the augMENTOR platform as a policy maker*

Once entering the platform, the users can see all the courses, for which the system has available recommendations. A course must be selected to proceed.

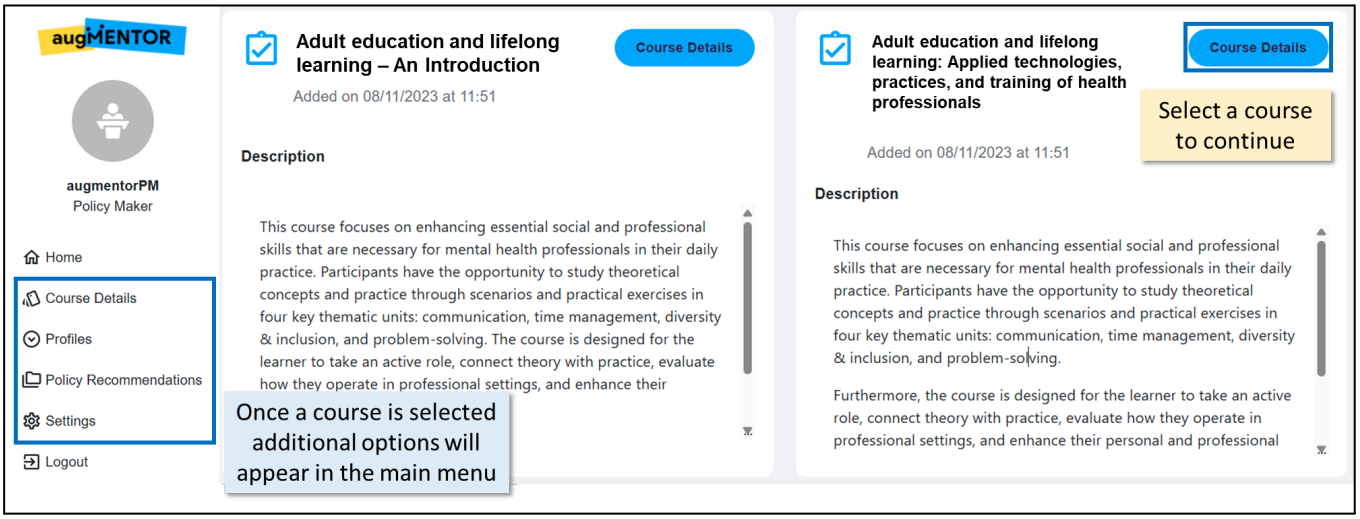


Figure 25. *Home page - Course selection*

Course details

Once a course has been selected, the user is directed in the course details section. The course details section includes the basic information of the course. More specifically, it includes:

- Course title and description
- Basic statistics (number of educators involved, number of learners participating, Total number of queries made, number of recommendations sent to learners)
- Learners performance throughout the course's modules for each of the indicators; knowledge and the 4Cs.

Figure 26. *Course details page*

Figure 27. *Course details page*

Profiles

augMENTOR creates detailed learner profiles by looking at a wide range of information like surveys, grades, and in-course behavioral metrics. In the profiles page, the policy maker can see the progress of the profiles per indicator as well as the list of profiles generated by the model. By clicking on Profile the policy maker can view details about that profile.

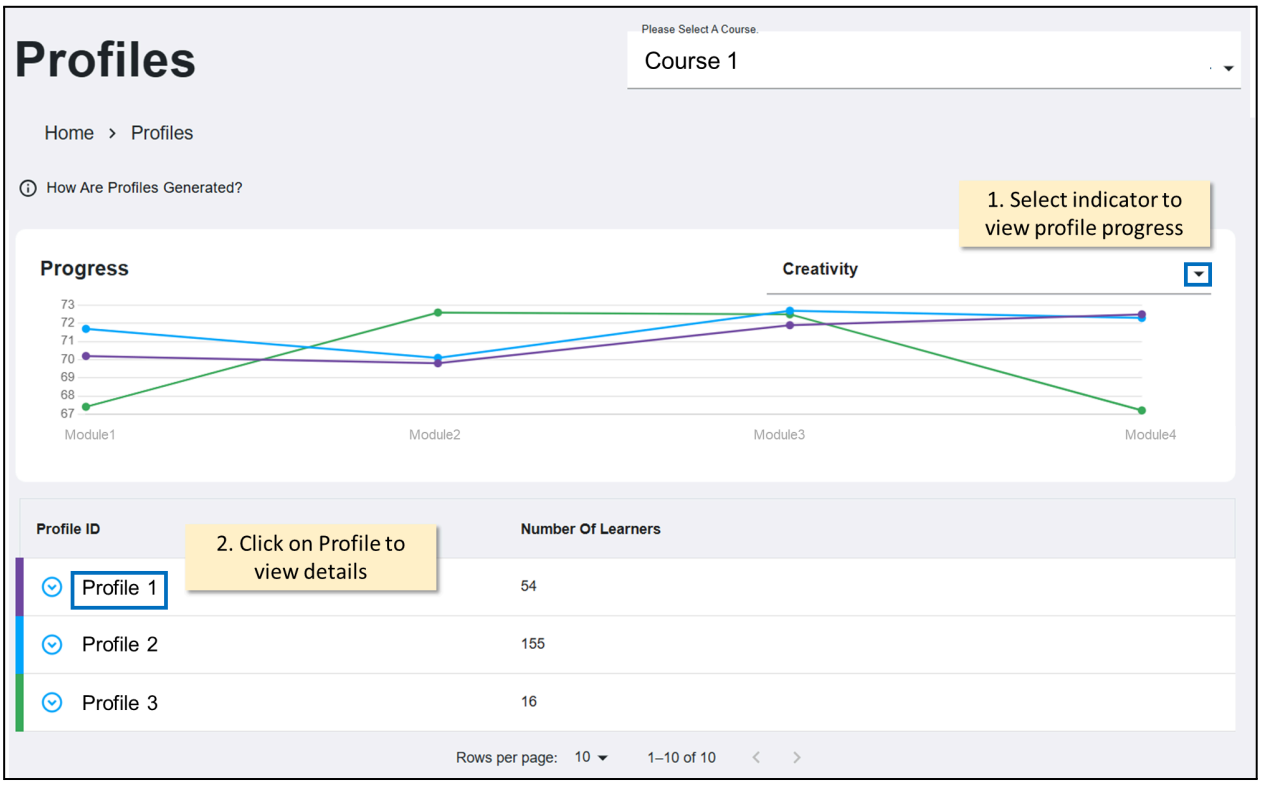


Figure 28. *Profiles page*

augMENTOR is a data-informed system that creates detailed learner profiles by **looking at more than just academic performance**. It also considers a learner's engagement and in-course activities.
It gathers **a wide range of information** from surveys, grades, and in-course behavioral metrics to create these profiles. This process uses advanced machine learning to group learners with similar characteristics, forming the basis for the predefined augMENTOR profiles.

Profile details

The Profile details section presents information about an augMENTOR profile. It presents a description of the profile and the overall performance of learners in the profile.

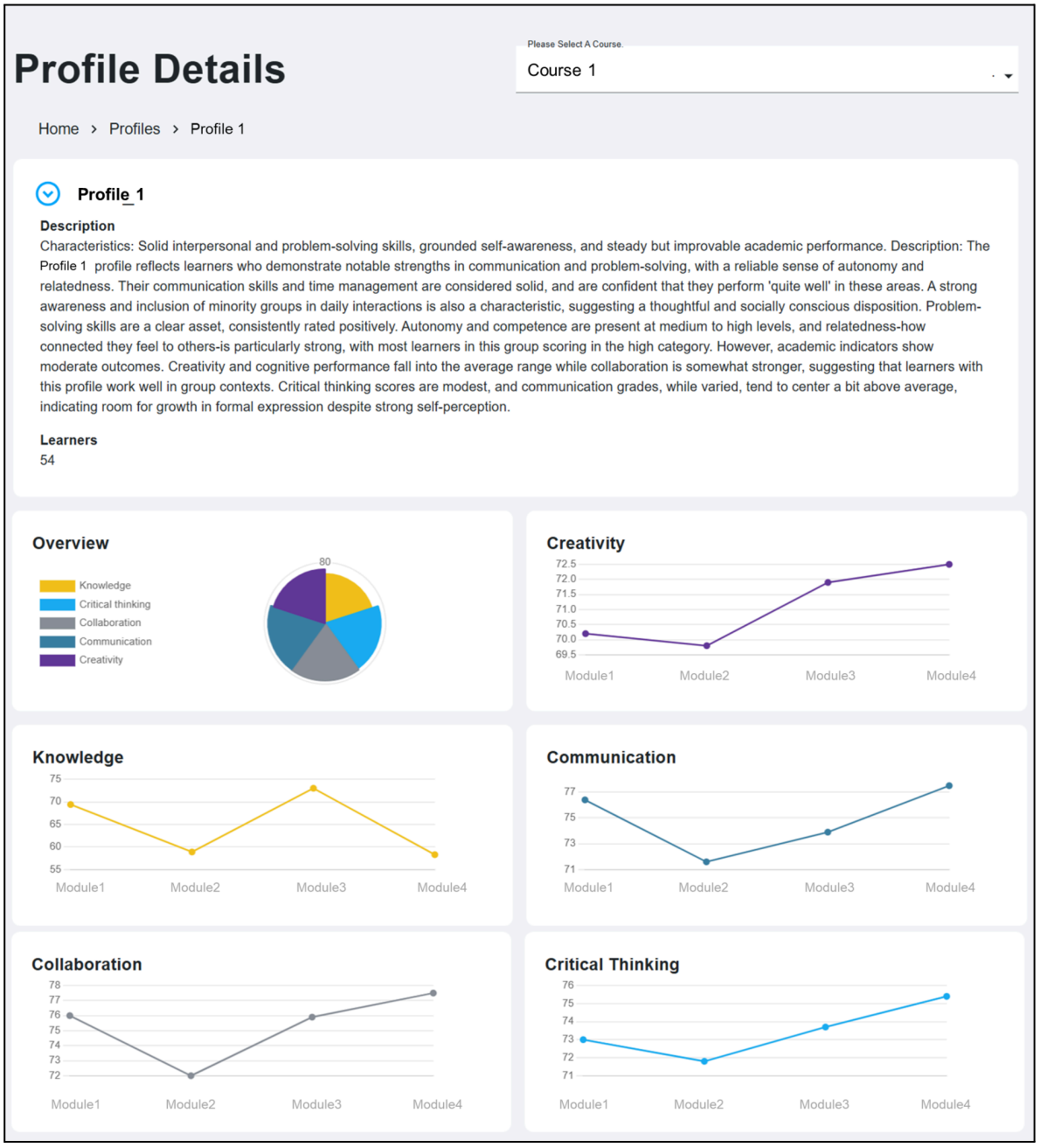


Figure 29. *Profile details page*

Policy Recommendations

In this section, policy makers can see the insights and the policy recommendations derived by the system for the chosen course. This section has all insights organised in separated expandable sections, namely:

- General feedback - Giving a summary for the course and how where policies formed
- Discussion about learners' profiles - Giving an analysis of their characteristics
- Insights about performance - Offering analysis and key observations for each profile
- Policy recommendations for supporting learners - Also including guidelines per profile
- Policy recommendations for supporting educators and course providers - Also including guidelines per profile.

Users have the option to rate the information in each section.

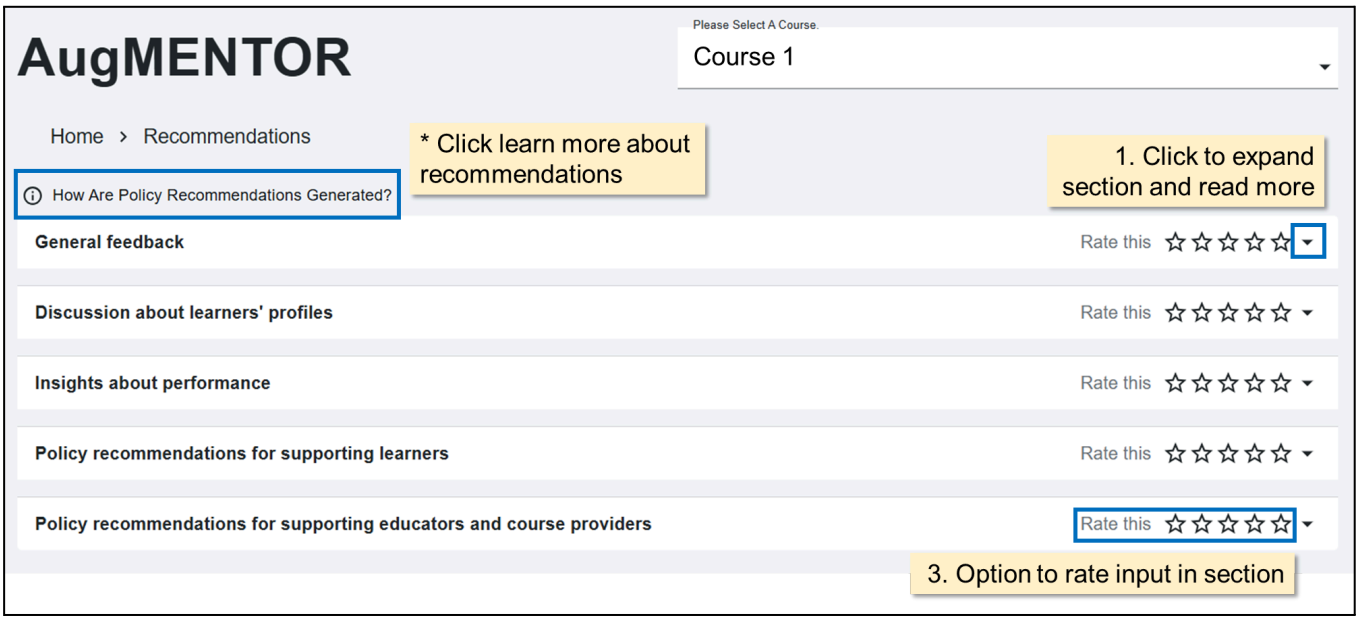


Figure 30. *Policy recommendations section*

Recommendations are designed by aggregating performance data, the augMENTOR profe framework, and course descriptions, while all insights are evidence-based and aligned with the TESA (Technology Enhanced Student Assessment) framework produced by the project. Using all these dimensions, augMENTOR ensures that policies range across diverse educational contexts while being pedagogically sound, transparent and directly linked to real data.

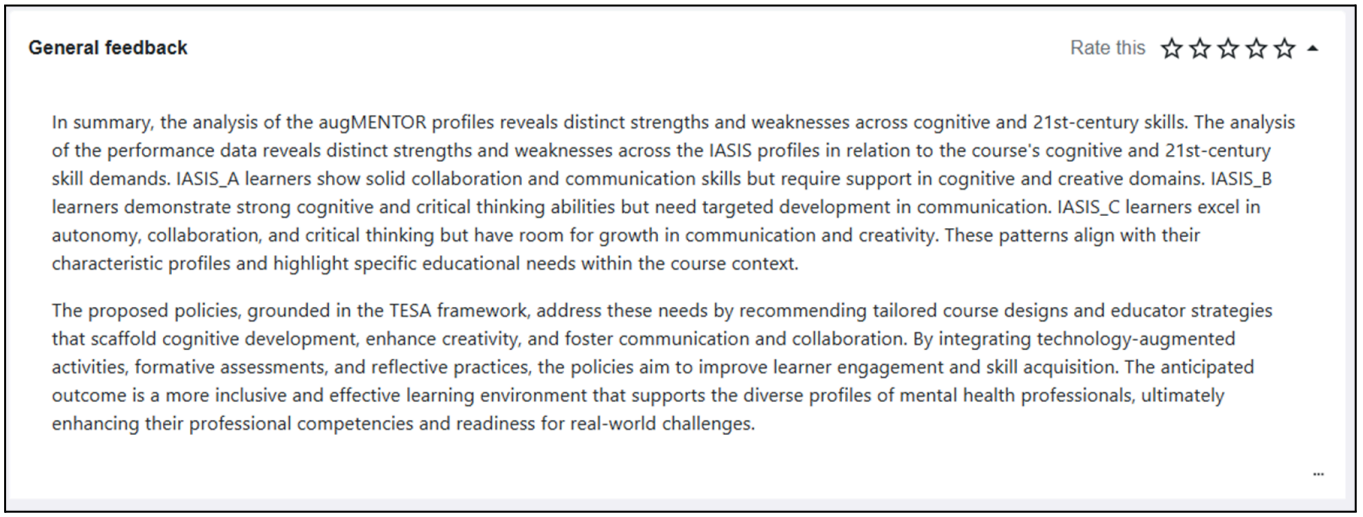


Figure 31. *Policy recommendations - Expanded section*

Settings

In the settings page, users can:

- Click to logout (also available in the main menu)
- Click to edit their profile (change email and/or password, delete their account)
- Contact the technical team

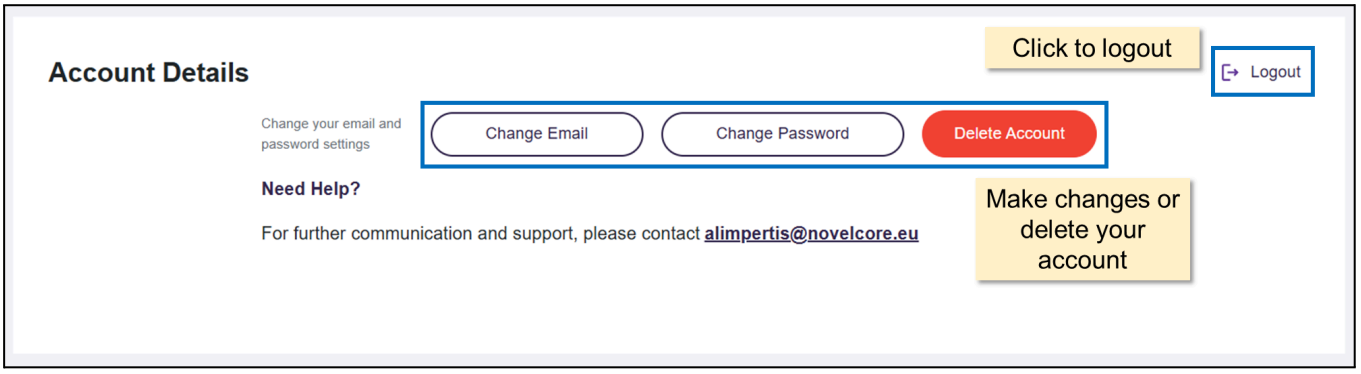


Figure 32. *Settings page*

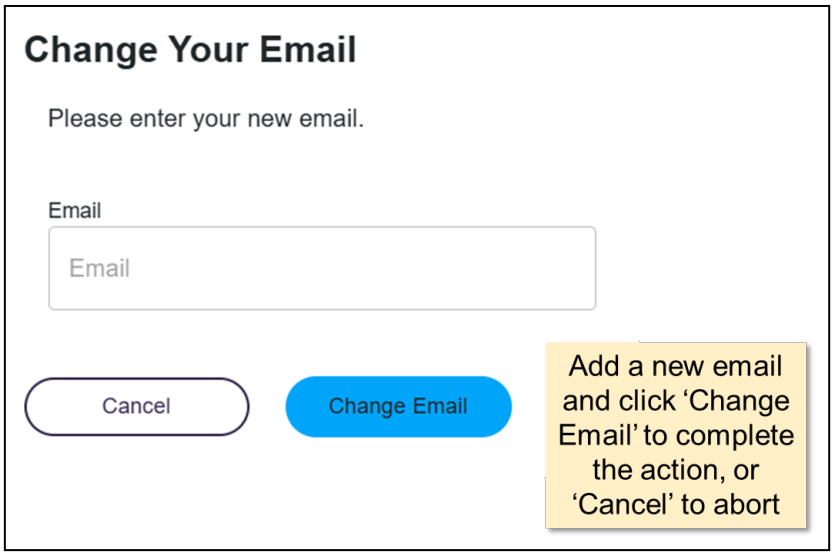


Figure 33. *Change email option*

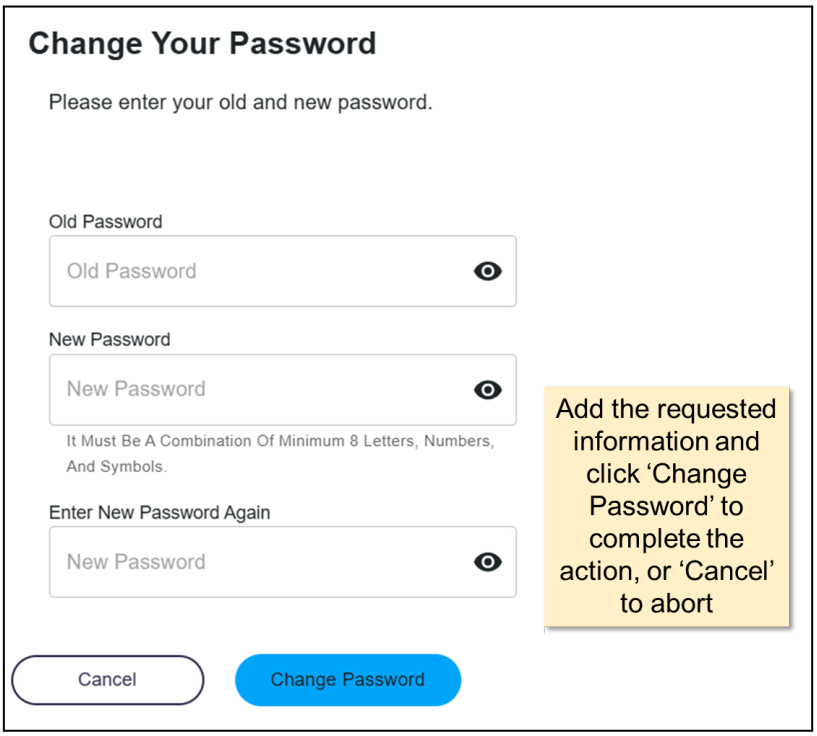


Figure 34. *Change password option*

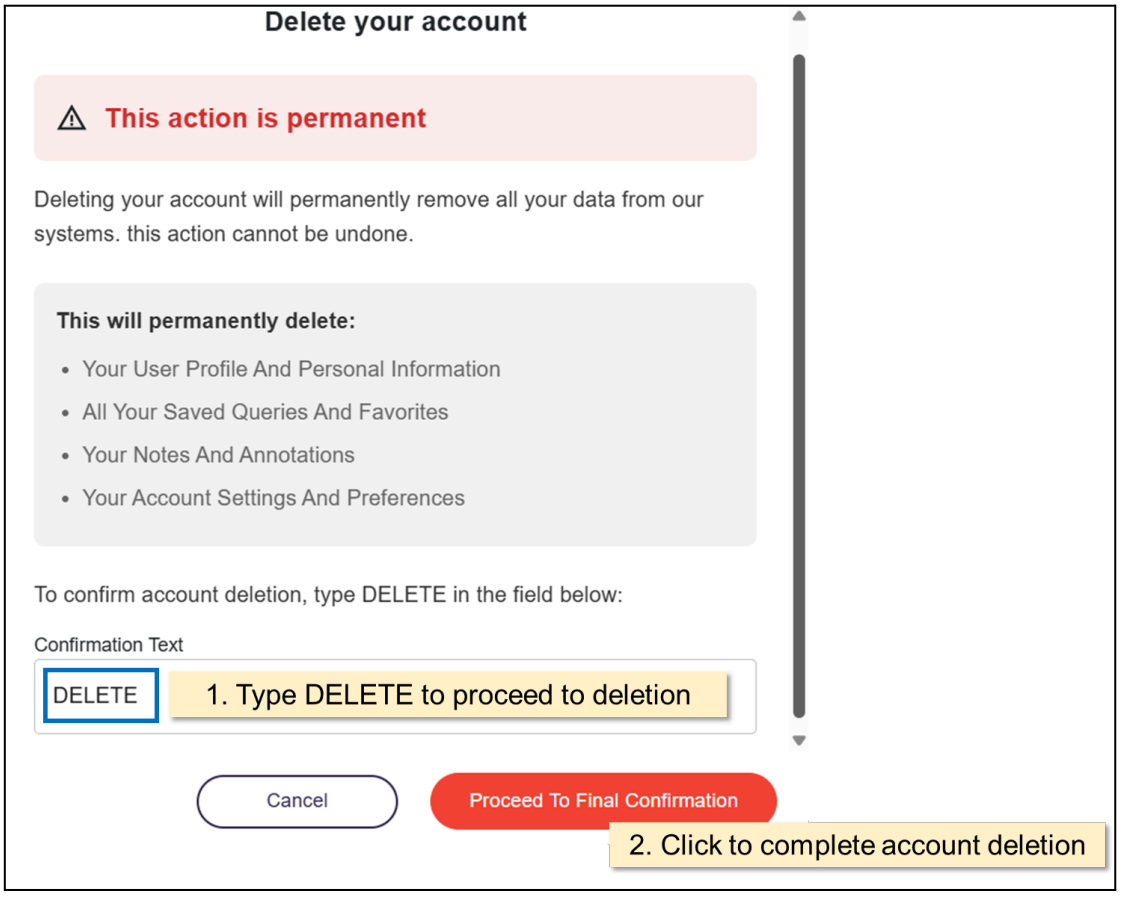


Figure 35. *Delete account option*

References

[1] augMENTOR Deliverable: D3.1 The augMENTOR Pedagogical Framework Interim

[2] augMENTOR Deliverable: D3.2 The augMENTOR Pedagogical Framework Final Primary

[3] augMENTOR Deliverable: D3.3 The AugMENTOR Learner Profile Primary Project Source

[4] augMENTOR Deliverable: D4.1 Creative Pedagogy in the AUGMENTOR solution Interim

[5] augMENTOR Deliverable: D4.2 Creative Pedagogy in the augMENTOR solution Final

[6] augMENTOR Deliverable: D4.3 Methods and tools for the assessment of 21st century competencies

[7] augMENTOR Deliverable: D5.1 Data Mapping, Fusion and Orchestration Toolbox

[8] Komis, V. (2019). Introduction to educational applications of information and communication technologies (V. I. Komis, Preface). New Technologies Publications.

[9] Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. Teachers College Record, 108(6), 1017–1054.

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Annex A - TESA: Phases of development of augMENTOR educational scenario

The different phases of educational scenarios' development

As mentioned adobe, TESA follows seven phases, either describing both the rationale on which a scenario using Emerging Technologies should be based (Phases A, B & C) and the way in which classroom activities are designed (Phases D & E) and how the scenario is implemented and evaluated (Phases F & G). In its final form, an eighth phase can be added to document the scenario after at least one full cycle of planning, implementation and evaluation. These phases can be seen in the figure below.

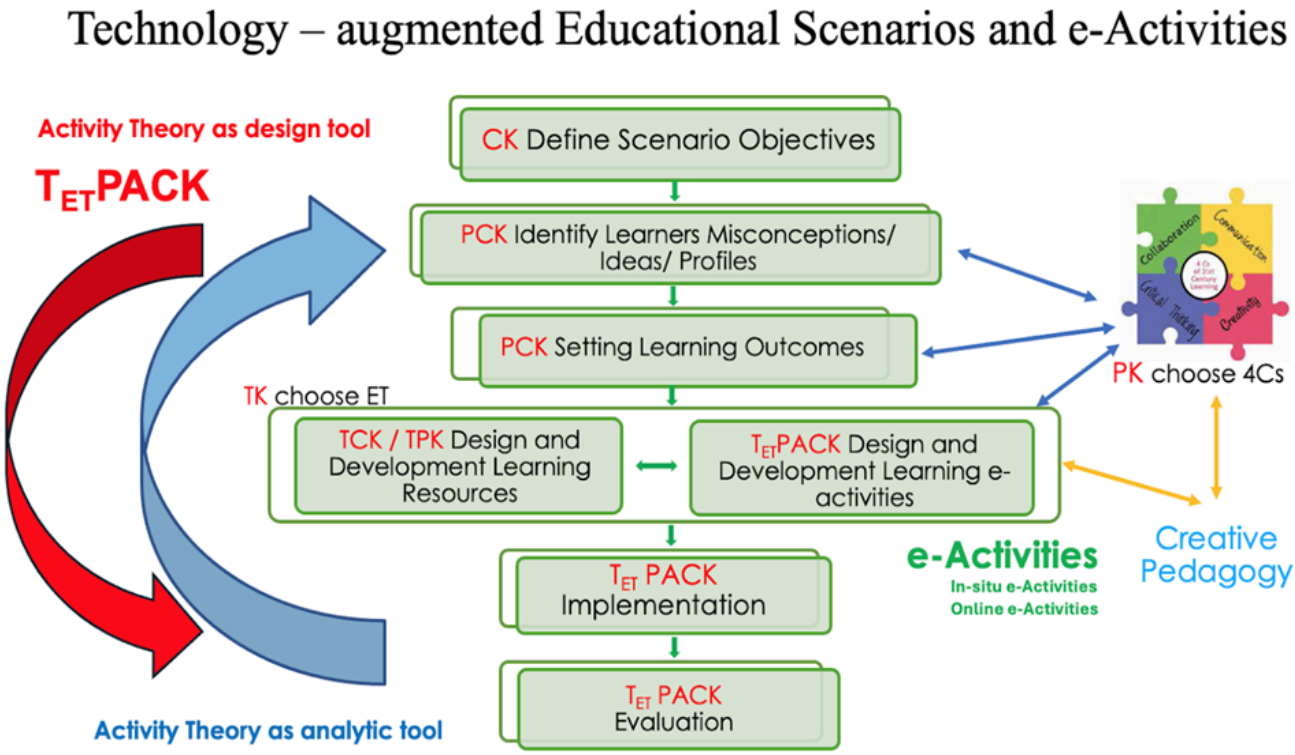


Figure 36. *TESA: Phases of development of augMENTOR educational scenario*

Phase A: The teaching object of the educational scenario

The educator-focused initial stage of educational scenario design that establishes the foundational elements for a coherent and effective learning experience. It involves defining the what (content and core concepts), who (target learners), and why (rationale and addressed teaching problems) of the learning experience before student interaction. Educators specify the scenario's subject, align it with the curriculum, estimate its duration, and consider the prerequisite and prior knowledge of the learners, justifying the scenario's

suitability for their level. If technology is involved, necessary cognitive prerequisites are also defined.

Phase B: Learners' representations of the subject matter and possible difficulties in their thinking

This phase is about understanding potential student learning roadblocks. Educators research common misconceptions and difficulties students face with the topic, drawing on educational literature and their own experience. This understanding of learners' representations and difficulties directly informs the scenario design and forms the basis for later phases.

Phase C: Purpose, objectives and learning outcomes of the educational scenario

This third phase focuses on setting clear learning objectives or outcomes for the scenario in terms of both subject matter and the use of Emerging Technologies. Subject-related objectives are informed by learning difficulties identified in Phase B and guide the design of learning activities, teaching materials, and the integration of technology. Technology-related objectives emphasise leveraging the unique capabilities of the chosen technologies to enhance teaching practices and achieve the subject-related objectives.

Phase D: Design and Development of Learning Resources

Phase D details the teaching materials needed for the implementation of the scenario. This includes existing resources (e.g. printed materials, software) and any new materials to be created, often emphasising simple, accessible items. Worksheets and educational software (with usage instructions) are considered. The phase also specifies the necessary logistical infrastructure (computers, projectors etc) and how all materials will be used by learners during classroom activities.

Phase E: Design and Development of Learning e-Activities

This phase is at the core of the scenario, outlining the classroom procedures for both educators and learners to achieve the scenario's objectives, emphasising technology integration. It details the theoretical and methodological approach, including learning theories and teaching strategies related to emerging technologies and materials. The scenario unfolds through a sequence of in-class activities: preparation, subject teaching, consolidation, evaluation, and metacognitive abilities. This sequence mirrors standard lesson planning. The phase also specifies where and why technology is used in the educational scenario.

Phase F: Implementation of the educational scenario

The implementation stage details the enactment of the educational scenario in the classroom, guided by the principles of pedagogical activity. This concept extends beyond learning activity to encompass the roles and interactions of both educators and learners in achieving learning outcomes. A pedagogical activity comprises the learning context, the teaching and learning strategies employed, and the specific processes involved, including activity types, techniques, tools, actor roles, and potential evaluation. This phase is crucial as it is the practical application of the resources and procedures developed in all previous phases and unfolds through a chronological sequence of five pedagogical activity categories:

- Psychological and cognitive preparation to engage learners, assess prior knowledge, and identify difficulties.
- Subject teaching to introduce new knowledge and skills.
- Consolidation to promote understanding and application of new knowledge.
- Assessment to evaluate learning outcomes and the learning process itself.
- Metacognitive activities to encourage reflection on learning and comparison with initial ideas.

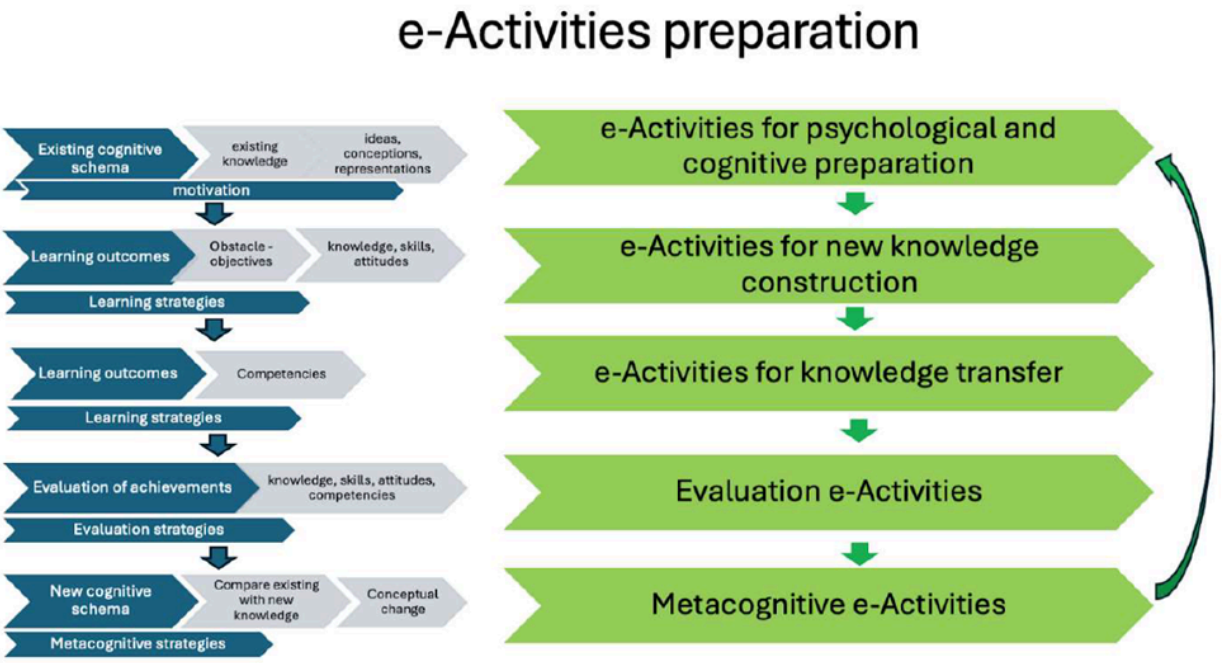


Figure 37. *Modelling the e-Activities preparation*

Phase G: The evaluation of the educational scenario

To gauge the impact of the educational scenario, this last evaluation phase puts emphasis on assessment of the scenario from two main perspectives: the student learning and the scenario's overall effectiveness. The scenario includes assessment activities to gauge progress and the success of teaching.

Annex B - Tips for assessing the 4Cs

FIVE TIPS FOR ASSESSING THE 4CS

CREATIVITY, COLLABORATION, CRITICAL THINKING, COMMUNICATION

1 PREPARATION

Ensure students are familiar with project-based or inquiry-based learning methods before assessing transversal skills. Introduce smaller tasks that scaffold their understanding.

2 DEVELOPED OVER TIME

Understand that transversal skills grow gradually, and you may not see immediate progress in every assessment. Be patient and focus on long-term growth.

3 USE SELF ASSESSMENT

Use rubrics that define the criteria for each skill then share with students so they understand expectations and can self-monitor.

4 TIED TO ACTIVITIES, NOT CONTENT:

Transversal skills, like the 4Cs, are developed through teaching strategies rather than specific content. These skills can be integrated into any subject, making them versatile across various disciplines.

5 BALANCE STRUCTURE AND CHOICE

Provide enough structure in activities to guide students, but allow for student choice to foster creativity and critical thinking. Too much structure can stifle creativity, while too little can lead to confusion.

6 WAYS TO INTEGRATE CREATIVITY

1 Divergent vs Convergent

Teach students the different goals and strategies of divergent and convergent thinking.

Scaffold: Allow learners to create divergent solutions to popular problems and then use convergent thinking to identify the most appropriate solution.

2 Create Safe Spaces

Learners need safe spaces before they will feel comfortable enough to offer truly innovative solutions.

Scaffold: Establish ground rules, model behaviours and normalise failure so that learners feel comfortable enough to think outside of the box.

3 Career Role Playing

Having learners take specific roles when addressing a problem can help promote divergent and convergent thinking.

Scaffold: Students will adopt a role (engineer, teacher) and provide solutions from that prospective

4 Reverse Engineering

Allow learners to find alternative uses for common, household items.

Scaffold: Have students break an object into its parts and then find alternative uses for those parts. Time the activity and count the number of uses to introduce gamification.

5 Foster a Growth Mindset

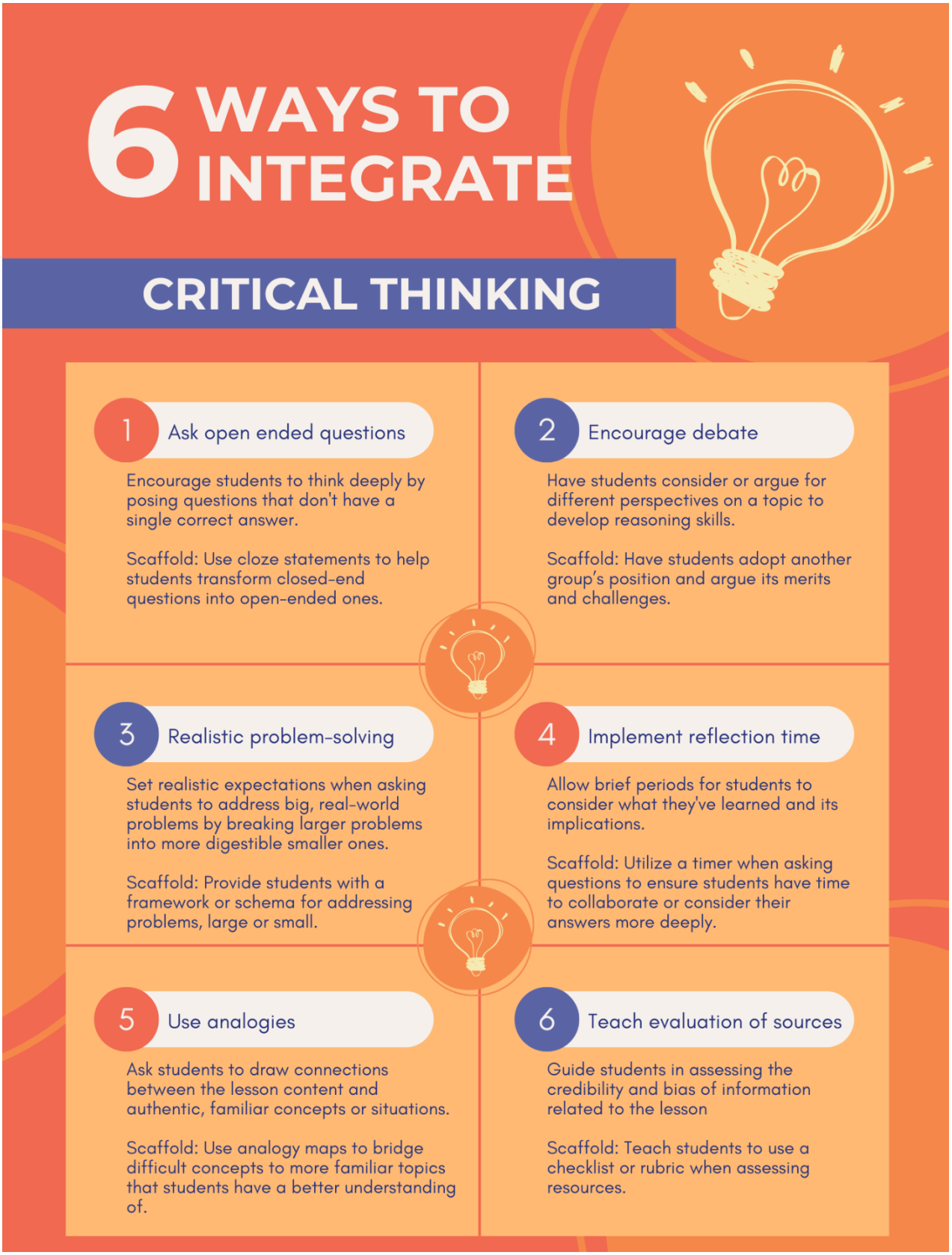
Teach learners that intelligence and creativity are malleable skills requiring practice, hard work, and iteration.

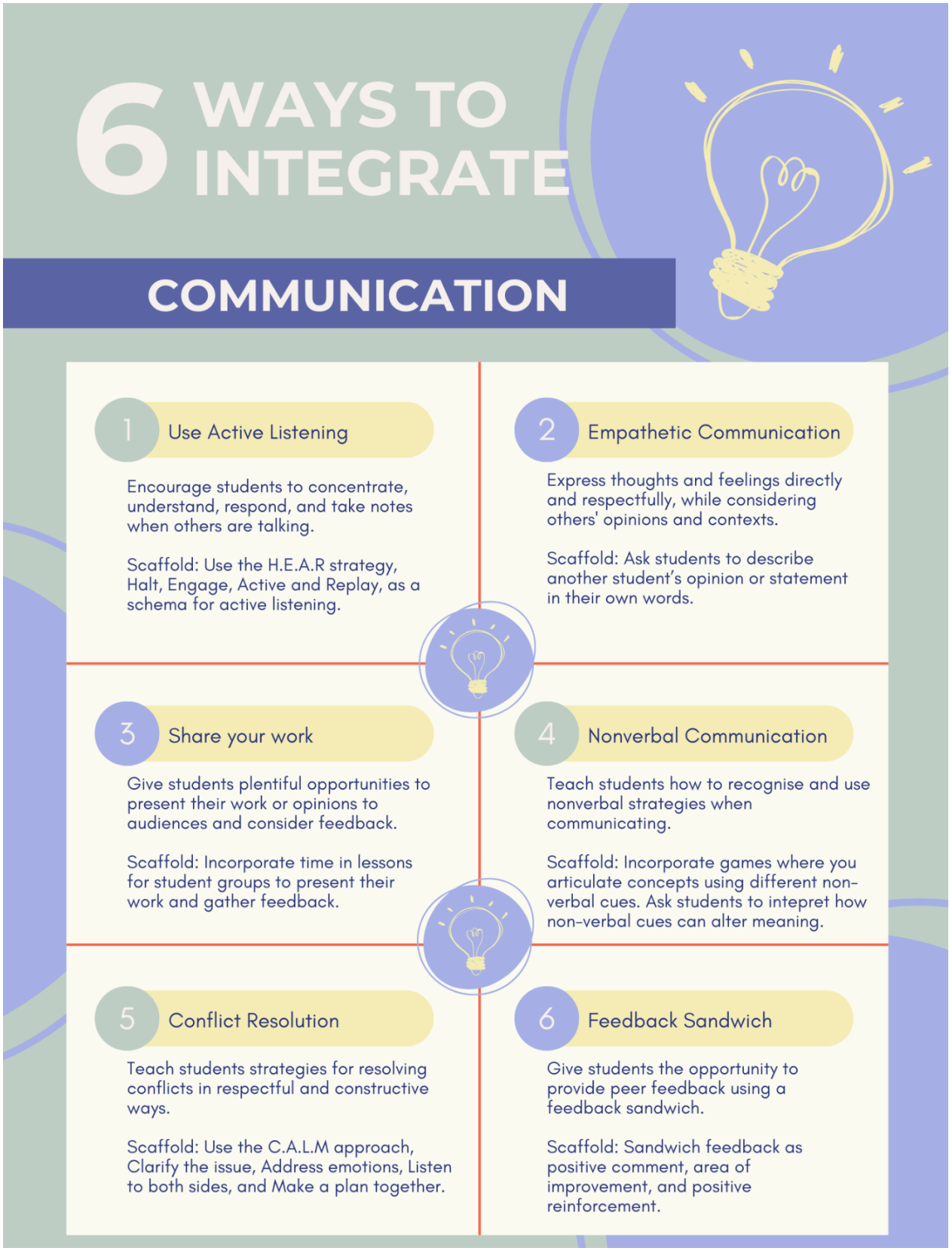
Scaffold: Praise learner effort and persistence over outcomes while encouraging longitudinal skills evaluation.

6 Encourage Choice

Learners will feel more empowered when they are given choices and the autonomy to see those choices through.

Scaffold: Allow learners to make non-critical decisions and give them the autonomy to pursue or reevaluate them.


6 WAYS TO INTEGRATE
CRITICAL THINKING
1 Ask open ended questions
Encourage students to think deeply by posing questions that don't have a single correct answer.
Scaffold: Use cloze statements to help students transform closed-end questions into open-ended ones.
2 Encourage debate
Have students consider or argue for different perspectives on a topic to develop reasoning skills.
Scaffold: Have students adopt another group's position and argue its merits and challenges.
3 Realistic problem-solving
Set realistic expectations when asking students to address big, real-world problems by breaking larger problems into more digestible smaller ones.
Scaffold: Provide students with a framework or schema for addressing problems, large or small.
4 Implement reflection time
Allow brief periods for students to consider what they've learned and its implications.
Scaffold: Utilize a timer when asking questions to ensure students have time to collaborate or consider their answers more deeply.
5 Use analogies
Ask students to draw connections between the lesson content and authentic, familiar concepts or situations.
Scaffold: Use analogy maps to bridge difficult concepts to more familiar topics that students have a better understanding of.
6 Teach evaluation of sources
Guide students in assessing the credibility and bias of information related to the lesson
Scaffold: Teach students to use a checklist or rubric when assessing resources.


6 WAYS TO INTEGRATE
COMMUNICATION
1 Use Active Listening
Encourage students to concentrate, understand, respond, and take notes when others are talking.
Scaffold: Use the H.E.A.R strategy, Halt, Engage, Active and Replay, as a schema for active listening.
2 Empathetic Communication
Express thoughts and feelings directly and respectfully, while considering others' opinions and contexts.
Scaffold: Ask students to describe another student's opinion or statement in their own words.
3 Share your work
Give students plentiful opportunities to present their work or opinions to audiences and consider feedback.
Scaffold: Incorporate time in lessons for student groups to present their work and gather feedback.
4 Nonverbal Communication
Teach students how to recognise and use nonverbal strategies when communicating.
Scaffold: Incorporate games where you articulate concepts using different non-verbal cues. Ask students to intepret how non-verbal cues can alter meaning.
5 Conflict Resolution
Teach students strategies for resolving conflicts in respectful and constructive ways.
Scaffold: Use the C.A.L.M approach, Clarify the issue, Address emotions, Listen to both sides, and Make a plan together.
6 Feedback Sandwich
Give students the opportunity to provide peer feedback using a feedback sandwich.
Scaffold: Sandwich feedback as positive comment, area of improvement, and positive reinforcement.


6 WAYS TO INTEGRATE
COLLABORATION
1 Incorporate Group Work
Incorporate group work into your lessons to encourage collaboration and divergent thinking.
Scaffold: Use think-pair-share activities to stimulate collaboration, .
2 Interdependence Strategy
Structuring tasks so that team members need each other to succeed.
Scaffold: Jigsaw activities so that each group member becomes an expert in one part of the project and must work together to succeed.
3 Social Skills Development
Teaching and practicing interpersonal and small group skills through a variety of group activities.
Scaffold: Use activities like Peer-Feedback and Round-Robin Brainstorming to form the foundation for effective communication skills.
4 Design Thinking Principals
Teach kids design thinking principals which focuses on empathy and collaboration through a variety of strategies.
Scaffold: IDEO and Stanford's d.school have free resources online for introducing design thinking.
5 Use Case Studies
Find engaging, authentic examples of collaboration to serve as models then give students the opportunity to dissect the case studies and pull-out strategies.
Scaffold: Give students the opportunity to research case studies and present them to their peers.
6 Evaluate Group Work
Allow groups to self-evaluate and reflect on their collaborative work by identifying strengths and opportunities.
Scaffold: Supply groups with rubrics or checklists to guide their self-evaluation and identify growth levers.