

Young Minds beyond AI

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Artificial intelligence (AI) is rapidly becoming part of the educational landscape. With tools such as ChatGPT, DeepSeek, Gemini, Perplexity or Claude, just to mention a few of them, students can get instant explanations, summarise texts, or check solutions with immediate feedback.



▲ FIG. 1: Workshops examples of YM sections of Messina and Porto.

As these tools become more and more powerful, the traditional way of teaching and learning, usually centred in contents and competences, is being further and further challenged. The sophistication of the AI models is now able to address physics problems, explain and reproduce mathematical demonstrations or write down scripts for specific tasks in almost any programming code. In this context, one could wonder how we can adapt our way of teaching and learning physics to go beyond what AI already offers.

For Young Minds (YM) members, AI is a great tool to have quick responses to doubts, obtaining fast orientation on problems or getting the job done when writing tedious code. These tasks facilitate the way in which contents can be addressed in a

lecture, which potentially would leave soon more time to develop other competences through further practical experimentation, peer-to-peer activities or service-learning. These different approaches to formal education are the keystone of the activities that the YM Programme has been performing in cities all around Europe and North Africa during the last sixteen years.

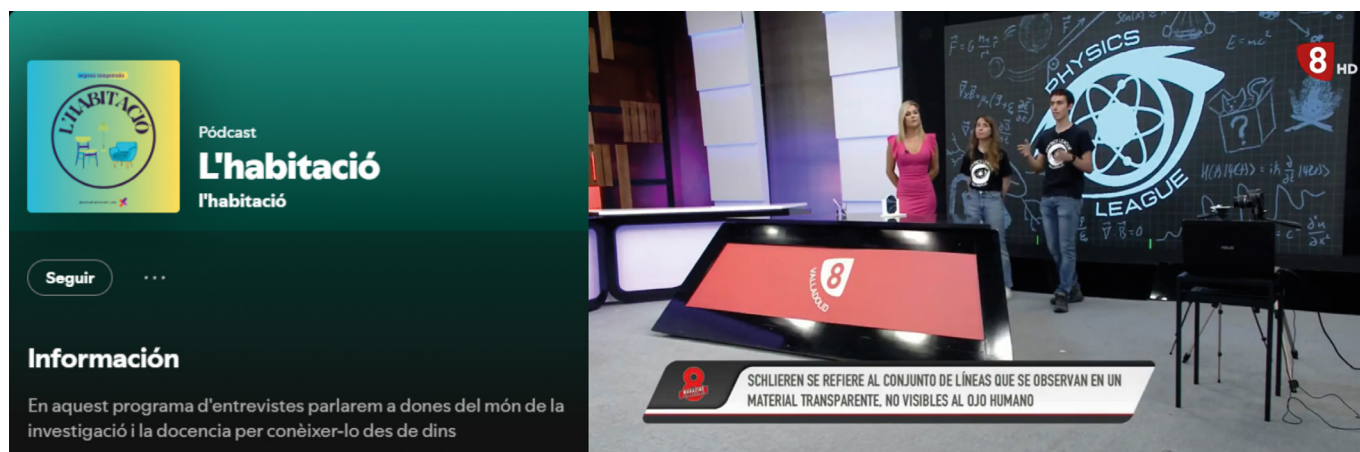
Take workshops, for example. They are one of the most repeated YM activities. Just as an example, in Figure 1 we can see some picture of the workshops “Light and new scientific frontiers: from theory to applications” (Messina) and “Quantum Day@PT” conference (Porto). These workshops

▼ FIG. 2: Novi Sad YM section outreach event.



bring together researchers, students and professionals creating a common ground for knowledge exchange, deep conversations and interdisciplinary learning. But what makes these workshops powerful is not just the content itself, it is the interaction. A mentor noticing confusion and rephrasing an explanation. A spontaneous discussion between participants. A moment of collective insight when something finally “clicks”. These are subtle, human dynamics that cannot be pre-programmed. Even if AI can simulate an experiment or explain a concept, it cannot read the room, adapt in real time to group energy nor create the shared excitement of discovery.

Other type of activity that YM sections regularly organise are public events as lectures, science cafés, and outreach events. These are not just about explaining the concepts, as a generative AI could do, but about creating dialogue between physicists and society, making science visible and approachable and inspiring curiosity in unexpected audiences. A live event has a unique atmosphere, with the unpredictability of audience questions, the charisma and personality of the speaker, and the collective experience of learning something new together. We can “feel” the atmosphere of these kind of outreach events just by looking at the pictures of Figure 2, where we



▲ FIG. 3: Image of the podcast “L’habitatció” from the YM section from the Autonomous University of Barcelona, and of the local TV of Valladolid where the YM section from Valladolid, “Physics League”, participated explaining different experiments.

can see the event Novi Sad YM section (Serbia) organized dedicated to the promotion of the aerospace engineering and space program. AI can provide answers, but it cannot recreate the atmosphere that makes these events memorable.

In addition, many YM groups produce podcasts and media content to communicate physics beyond academic environments, as the YM section from the Autonomous University of Barcelona does with their podcast “L’habitatció”, where they interview scientist and researchers in Catalan (which also adds value to their culture and gets to a different public). Some of them even appear in the local TV!! As the YM section from Valladolid, “Physics League”, who showed and explained different physics experiments to a very broad public. These two examples are included in Figure 3. What makes these formats compelling is not just the information, but the human voice behind the personal stories of researchers, their doubts, failures, and motivations, and the diversity of paths into

physics. Listeners connect not only with the content, but with the people behind it. An AI-generated explanation may be clear, but it lacks lived experience, authenticity and emotional nuance. These are precisely the elements that make science communication meaningful and relatable.

As we have seen from the previous examples, hands-on workshops, public events and social media content directed to either specific or general public are powerful types of strategies that form the core of Young Minds activities. They complement the quick and impersonal access to knowledge that AI offers by putting the focus on experimentation and real interaction with other people. Indeed, perhaps, the most important contribution of YM sections is creating community

▼ FIG. 4: Pictures of the YM groups of Caserta and Catania

by doing science. Through their activities, Young Minds Sections create spaces where students feel comfortable asking questions, early-career physicists share advice and individuals realise they are not alone in their struggles, as one can easily realize by taking a look to Figure 4. This sense of belonging is critical, especially in a field that can often feel abstract and demanding and high rate of mental health problems within the student and early researcher communities. AI can support learning, but it cannot mentor, empathise nor build lasting human relationships. And yet, these are often the factors that determine whether someone continues in the physics career or not. We are sure that AI becomes more present in education, it will certainly reshape how knowledge is accessed and processed. But it will not replace the need for human interaction, inspiration, and community. ■

