

Professional Development Report:

AI and Project-Based Learning in Fundão, Portugal



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Introduction

Overview of the Partnership

The professional development program in Fundão has been a resounding success, with significant strides made in enhancing educators' capabilities in AI and PBL. In today's rapidly evolving educational landscape, the integration of AI and PBL is not just an enhancement but a necessity. These approaches equip educators with the skills to prepare students for a future where technological literacy and critical thinking will be paramount. By fostering a deeper understanding of AI and encouraging a hands-on, inquiry-based approach, educators in Fundão are now better positioned to cultivate the next generation of thinkers, problem-solvers, and innovators.

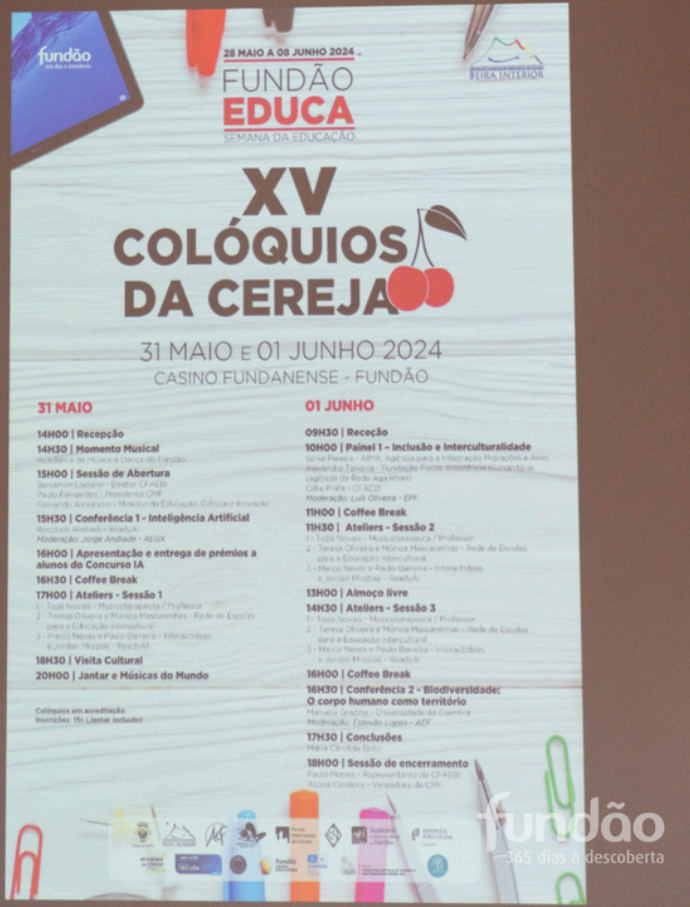
The outcomes for students this past year were nothing short of extraordinary. Armed with the knowledge and tools imparted by their teachers, students engaged in AI projects that pushed the boundaries of their creativity and technical skills. The presentations at the end of the academic year were phenomenal, showcasing the depth of understanding and enthusiasm students had developed. Whether it was through designing innovative AI solutions to real-world problems or exploring the ethical dimensions of AI technologies, the students demonstrated a level of engagement and mastery that exceeded expectations.

These achievements underscore the importance of this work. In a world increasingly shaped by AI, the ability to understand and leverage these technologies is critical. The success in Fundão not only highlights the effectiveness of the professional development program but also serves as a testament to the potential that lies within students when they are given the right tools and guidance. The work we have done here is more than just a curriculum enhancement—it is a crucial step towards ensuring that students are not just passive consumers of technology but active, informed participants in shaping the future.



Professional Development Design and Implementation

Innovative Training Approach



Our professional development program was meticulously designed to immerse educators in the core principles of AI and Project-Based Learning (PBL). Recognizing the transformative potential of AI in education, the program aimed to empower teachers with both the technical knowledge and pedagogical strategies necessary to effectively bring these concepts into the classroom. Through a series of thoughtfully structured workshops, hands-on activities, and collaborative discussions, educators delved into the fundamentals of AI. Key topics such as facial recognition, neural networks, and machine learning were not just presented as abstract concepts but were explored in depth, with practical applications that educators could immediately implement in their teaching.

The training placed a strong emphasis on inquiry-based learning, a student-centered approach that is crucial in today's educational landscape. This approach encourages educators to shift from traditional teaching methods to ones that foster curiosity, critical thinking, and active problem-solving among students. By embracing inquiry-based learning, educators were guided to create learning environments where students are encouraged to ask questions, explore diverse perspectives, and engage in deep, meaningful learning experiences. This not only helps students understand AI at a conceptual level but also enables them to apply their knowledge in real-world scenarios, thereby making learning more relevant and impactful.

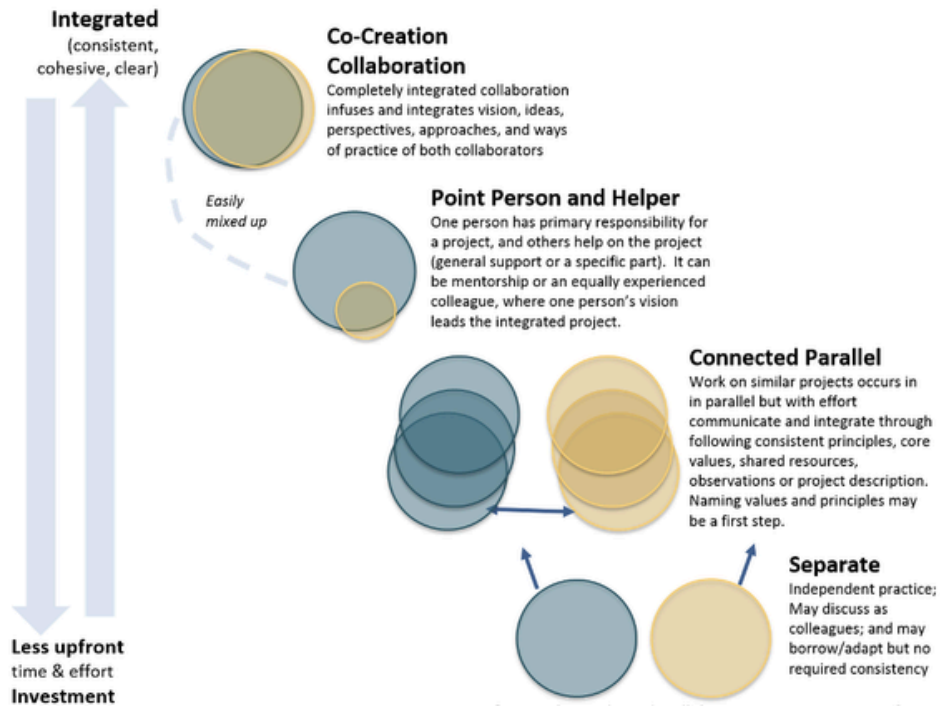
Moreover, the program highlighted the importance of integrating AI education across various subjects, breaking down the silos that often exist in traditional teaching. By doing so, educators were equipped to create interdisciplinary projects that not only enhanced students' understanding of AI but also strengthened their grasp of other subjects like mathematics, science, and ethics. This holistic approach ensures that students develop a well-rounded understanding of AI and its implications, preparing them to navigate and contribute to a world where AI is increasingly ubiquitous.

The success of this training was evident in the way educators embraced the new methodologies, enthusiastically integrating them into their classrooms. Teachers reported a significant shift in their students' engagement levels, with many students demonstrating a newfound excitement for learning, particularly in exploring AI concepts. The professional development program thus played a pivotal role in not only enhancing educators' skills but also in transforming the learning experiences of students in Fundão.



Collaborative Approach

Co-Design Methodology



The development of our professional development program was a deeply collaborative effort, rooted in the belief that effective educational innovation must be co-created with those who are directly engaged in the teaching and learning process. This partnership involved close and ongoing engagement with Fundão's educators, recognizing that their insights, experiences, and understanding of the local context were invaluable in shaping a program that would be truly impactful.

Through a series of co-design workshops, we worked hand-in-hand with educators to tailor the content specifically to the educational needs of Fundão. These workshops were not just opportunities for training but were spaces for dialogue, reflection, and mutual learning. Educators were invited to share their experiences, challenges, and aspirations, which in turn informed the design of the professional development program. This collaborative approach ensured that the training was not a one-size-fits-all model but rather a dynamic, responsive framework that could be adapted to the diverse needs of Fundão's teachers and students.

The process was intentionally iterative, allowing for continuous refinement of the training content. Feedback from educators was not only welcomed but actively sought out at every stage of development. This feedback loop was critical in ensuring that the program remained relevant and effective. As the workshops progressed, we were able to make adjustments and enhancements that aligned more closely with the real-world challenges and opportunities faced by educators in Fundão. This iterative process also fostered a sense of ownership among the educators, as they saw their contributions directly shaping the program.

Moreover, this collaborative approach was essential in building trust and a shared commitment to the success of the initiative. By engaging educators as co-creators rather than mere recipients of the training, we were able to cultivate a strong sense of partnership and mutual respect. This not only enhanced the effectiveness of the professional development program but also laid the foundation for ongoing collaboration and innovation in the future.

The result was a professional development program that was not only tailored to the unique educational environment of Fundão but also deeply resonated with the educators who participated. The collaborative nature of the development process ensured that the program was well-received and effectively met the needs of those it was designed to serve.



Capacity Building and Sustainability

A key focus of our work was on building the capacity of Fundão's educators to sustain and expand the integration of AI and PBL in their teaching practices. To achieve this, we provided resources, follow-up support, and access to a network of peers and experts. This approach was designed to empower teachers to take ownership of their professional growth and to continue exploring AI and PBL long after the formal training had concluded.



Sample Training Sessions and Outcomes

Detailed Training Examples

One of the standout sessions in our professional development program was centered around the use of Google's Teachable Machine, a user-friendly tool that allows anyone to create machine learning models without needing extensive coding knowledge. During this hands-on project, educators were guided through the process of using Teachable Machine to train models on various data sets, enabling them to understand the fundamentals of machine learning in a practical and accessible way.

The simplicity and intuitive design of Teachable Machine allowed educators to quickly grasp how machine learning algorithms can be applied to analyze data and make predictions. For example, teachers used the tool to create image classification models, training the machine to recognize different objects or patterns based on the data they provided. This interactive experience not only deepened their understanding of AI but also vividly demonstrated how these concepts could be brought to life in the classroom. Educators left the session with a clear vision of how to translate these AI concepts into engaging and educational projects for their students, such as building simple recognition systems or exploring the ethical implications of AI in real-world scenarios.

Another session built on this foundation by focusing on neural networks, where educators learned to create basic models that mimic the human brain's structure and function. Using Teachable Machine, they explored how neural networks process information and make decisions, discussing the potential applications of these models in solving real-world problems. This hands-on approach demystified complex AI concepts, making them accessible and relevant to educators of all backgrounds.

These sessions were particularly powerful in showing educators that they could integrate AI into their teaching practices in a way that is both approachable and impactful. By using tools like Google's Teachable Machine, teachers realized that they could inspire their students to explore AI creatively and critically, even at a young age. The feedback from educators was overwhelmingly positive, with many expressing excitement about bringing these tools and techniques into their classrooms to ignite their students' curiosity and engagement.

Educator Engagement and Feedback

The feedback from participants was overwhelmingly positive. Educators expressed a renewed enthusiasm for teaching and a greater confidence in their ability to introduce complex AI concepts to their students. Many noted that the hands-on, project-based approach made the learning process more engaging and accessible. This enthusiasm was reflected in the projects that educators began developing for their classrooms, showcasing a clear application of the training they received.



Educator Curriculum Scope

Title	Key Topics	Activities
Introduction to AI and the 7 Skills to Access	<ul style="list-style-type: none"> • What is AI? Overview and significance in education. • 7 Skills: Critical thinking, complex communication, quantitative literacy, global awareness, adaptability, initiative, decision-making, and habits of mind. • Discussion on how these skills connect to AI. 	<ul style="list-style-type: none"> • Group activities focused on collaboration and communication. • Scenario-based tasks to develop adaptability and decision-making.
The 5 Big Ideas in AI – Part 1	<ul style="list-style-type: none"> • Perception: How AI "sees" the world (e.g., cameras, sensors). • Representation & Reasoning: How AI makes decisions based on data and patterns. 	<ul style="list-style-type: none"> • Explore real-world AI examples (image and speech recognition). • Build small models using tools like Google's Teachable Machine to understand AI perception.
The 5 Big Ideas in AI – Part 2	<ul style="list-style-type: none"> • Machine Learning: Basic principles of how machines learn from data. • Human-AI Interaction: Exploring the symbiotic relationship between humans and AI. • Societal Impact: How AI shapes society and its ethical implications. 	<ul style="list-style-type: none"> • Hands-on experiments with simple machine learning models. • Class discussions on the ethical use of AI in different industries.
Six AI Applications – Part 1	<ul style="list-style-type: none"> • Object Recognition: How AI identifies and classifies objects. • Facial Recognition: Understanding AI's role in security, privacy, and everyday tech. 	<ul style="list-style-type: none"> • Use AI tools to classify images. • Engage in a debate about facial recognition and privacy concerns.

Title	Key Topics	Activities
Six AI Applications – Part 2	<ul style="list-style-type: none"> • Speech Recognition: How AI processes and transcribes spoken language. • Speech Generation: AI's ability to produce human-like responses and dialogue. 	<ul style="list-style-type: none"> • Develop a basic speech recognition system using AI tools.- Interactive session on AI voice assistants and ethical concerns surrounding AI speech.
Six AI Applications – Part 3	<ul style="list-style-type: none"> • Object Manipulation: How AI interacts with physical objects (robotics). • Landmark-based Navigation: AI's use in GPS systems and autonomous vehicles. 	<ul style="list-style-type: none"> • Simple robotics projects where AI is used to control movements. • Discuss the future of self-driving cars and AI in logistics.
Project-Based Learning (PBL) – Part 1	<ul style="list-style-type: none"> • Project Design: How to structure a PBL activity that incorporates AI. • Storytelling: Using narratives to engage learners in AI concepts. 	<ul style="list-style-type: none"> • Start brainstorming ideas for a final AI project. • Develop storyboards to guide the project narrative.
Project-Based Learning (PBL) – Part 2	<ul style="list-style-type: none"> • Time Management: Strategies for pacing PBL work. • Handcraft Skills: How to incorporate tangible elements into AI projects. 	<ul style="list-style-type: none"> • Set project milestones and timelines. • Workshop on combining coding with physical models for a more hands-on experience.
Focus: Collaboration, teamwork, and problem-solving	<ul style="list-style-type: none"> • Collaboration & Teamwork: Building effective project teams. • Problem-Solving: Using AI to solve real-world challenges. 	<ul style="list-style-type: none"> • Group collaboration on final projects. • Problem-solving exercises using AI tools.
Civic engagement and presenting PBL outcomes	<ul style="list-style-type: none"> • Presentation Skills: How to effectively communicate AI projects. • Civic & Citizenship: Understanding the societal role of AI and its implications for the future. 	<ul style="list-style-type: none"> • Final project presentations.

Five Big Ideas in Artificial Intelligence v.2

5. Societal Impact

AI can impact society in both positive and negative ways. AI technologies are changing the ways we work, travel, communicate, and care for each other. But we must be mindful of the harms that can potentially occur. For example, biases in the data used to train an AI system could lead to some people being less well served than others. Thus, it is important to discuss the impacts that AI is having on our society and develop criteria for the ethical design and deployment of AI-based systems.

4. Natural Interaction
Intelligent agents require many kinds of knowledge to collaborate and interact naturally with humans. Ideally, agents will converse with us using natural language, draw upon cultural knowledge to infer intentions from observed behavior, and respond appropriately to body language, facial expressions, and emotions. Advances in deep neural networks such as large language models and convolutional neural networks are making this possible.

1. Perception

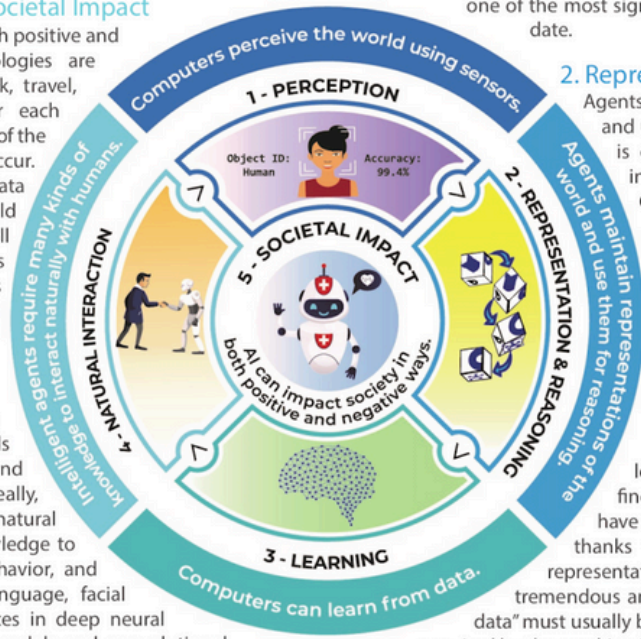
Computers perceive the world using sensors. Perception is the process of extracting meaning from sensory signals. Making computers “see” and “hear” well enough for practical use is one of the most significant achievements of AI to date.

2. Representation & Reasoning

Agents maintain representations of the world and use them for reasoning. Representation is one of the fundamental problems of intelligence, both natural and artificial. Computers construct representations using data structures, and these representations support reasoning algorithms that derive new information from what is already known. While AI agents can reason about very complex problems, they do not think the way a human does.

3. Learning

Computers can learn from data. Machine learning is a kind of statistical inference that finds patterns in data. Many areas of AI have progressed significantly in recent years thanks to learning algorithms that create new representations. For the approach to succeed, tremendous amounts of data are required. This “training data” must usually be supplied by people, but is sometimes acquired by the machine itself.



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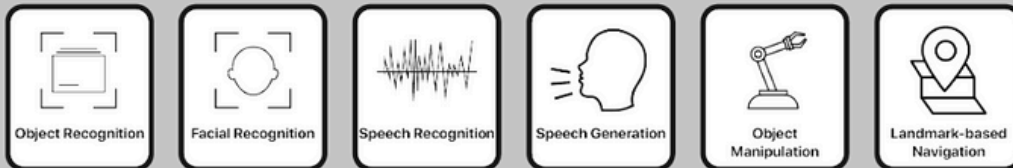
1 7 Skills to Access



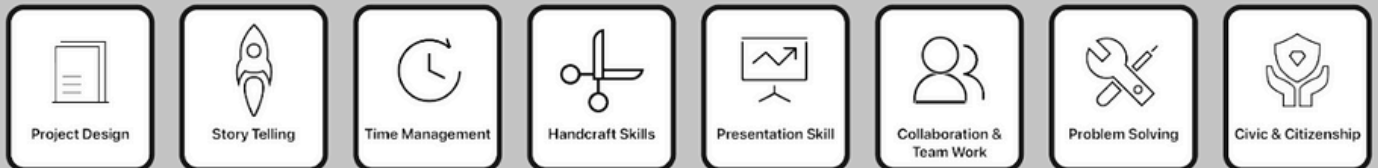
2 Five Big Ideas



3 Six AI Applications



4 PBL



7 Skills, 5 Big Ideas, 6 AI Applications, and PBL (Project Based Learning)

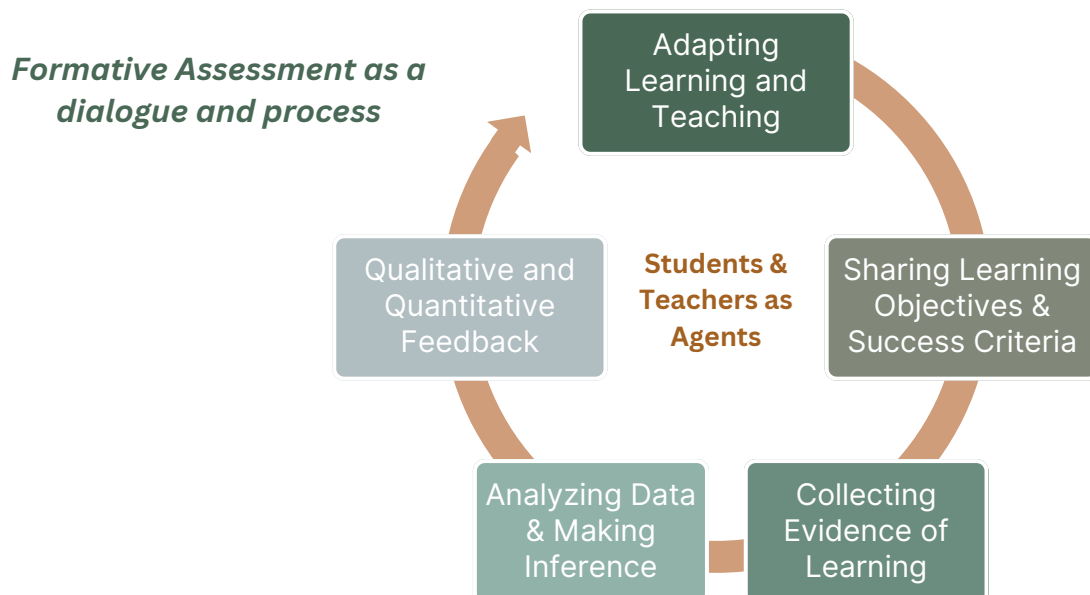
Assessment and Evaluation

Formative Assessment in Training

Throughout the professional development program, we employed a variety of formative assessment techniques to closely monitor participants' progress and ensure the training was meeting their evolving needs. These assessments were not just checkpoints but integral parts of the learning process, designed to foster continuous reflection and improvement. Regular check-ins allowed us to gauge educators' understanding of the material and their comfort with integrating AI and project-based learning (PBL) into their teaching. These check-ins often took the form of informal conversations, where educators could express any challenges they were facing or areas where they felt additional support was needed.

Reflective discussions were another key component of our formative assessment strategy. These sessions provided educators with the opportunity to share their learning experiences, discuss the application of AI concepts in their classrooms, and reflect on their growth throughout the program. By creating a space for open dialogue, we were able to tailor the training to address specific concerns and reinforce key concepts, ensuring that all participants felt supported and empowered.

Additionally, we incorporated opportunities for educators to actively demonstrate their learning, whether through mini-presentations, collaborative problem-solving activities, or practical applications of the tools and concepts introduced during the training. These hands-on assessments were crucial in identifying areas where further clarification or practice was needed, allowing us to adapt the sessions in real time to better serve the participants.



Summative Evaluation of Professional Development



At the conclusion of the program, we conducted a comprehensive summative evaluation to assess the overall effectiveness of the professional development. This evaluation included detailed surveys, feedback forms, and reflective essays, providing a broad spectrum of insights into the participants' experiences. The results were overwhelmingly positive, with the majority of educators reporting a significant increase in their confidence to teach AI concepts and integrate PBL into their curriculum. Many participants highlighted how the program had transformed their approach to teaching, enabling them to create more dynamic and engaging learning environments for their students.

The summative evaluation also underscored the success of the co-design approach. Educators praised the collaborative nature of the training, noting how their input was valued and incorporated into the program's design. This sense of ownership and partnership not only enhanced the effectiveness of the professional development but also fostered a deeper commitment to implementing the strategies learned. Participants expressed appreciation for the tailored support and the focus on practical, real-world applications of AI in the classroom, which they felt would have a lasting impact on their teaching practices.

The insights gained from this evaluation will guide future iterations of the professional development program, ensuring that it continues to meet the needs of educators and contribute to the advancement of AI and PBL in educational settings.

Conclusion

Reflecting on Success

The professional development program in Fundão has been a resounding success, with significant strides made in enhancing educators' capabilities in AI and PBL. The program has not only equipped teachers with the tools and knowledge to navigate the complexities of AI but has also fostered a culture of innovation and collaboration among educators. The positive outcomes and feedback demonstrate the lasting impact of this initiative.





Looking Ahead

As we look to the future, we remain committed to supporting Fundão's educators in their journey towards integrating AI and PBL into their teaching practices. Plans are already underway for follow-up workshops and additional resources to further deepen the impact of our work. Together, we will continue to build on the successes of this partnership, ensuring that students in Fundão are prepared to thrive in an AI-driven world.

Contact us for
further inquiries

<https://www.vv-ai.co/>
info@vv-ai.co



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