Submission Proposal

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Eugenides Foundation

The Archimedes Ecosystem

A Human-Centred Learning Ecosystem Connecting Ancient Greek Thought with Artificial Intelligence, Virtual Reality and 3D Printing

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Abstract

This paper presents *The Archimedes Ecosystem*, an innovative human-centred educational framework developed at the AI & VR Lab of Nea Paideia Schools in Athens, Greece.

At the core of the project lies a 3D-printed embodiment of Archimedes connected to a conversational AI chatbot designed to simulate the scientific thinking, philosophy, and pedagogical approach of the great Greek inventor and scientist. The physical presence of the model, combined with the capabilities of Generative Artificial Intelligence, creates a hybrid learning experience that bridges the physical and digital dimensions of education.

The ecosystem integrates:

- Generative AI,
- Virtual Reality,
- 3D Printing,
- digital museums,
- programming,
- project-based learning,
- and multimodal content creation.

Students are not positioned as passive users of technology but as creators of knowledge and experiences. Inspired by the “living” Archimedes, students designed immersive VR environments, created digital museums, produced

articles, songs, podcasts, STEM projects, and interactive educational scenarios.

The initiative aims to foster AI Literacy, critical thinking, creativity, collaboration, and responsible AI use. Its educational philosophy is summarized in the statement:

“AI after thinking — not instead of thinking.”

More than 400 students participated in the ecosystem’s activities, presenting their work in conferences, workshops, and educational events. Preliminary educational observations indicate increased student engagement, stronger motivation, enhanced collaboration, and deeper understanding of complex scientific concepts.

The project proposes a new model of experiential and participatory learning, where Greek scientific and cultural heritage is connected with emerging AI technologies.

1. Introduction

Artificial Intelligence is rapidly transforming education and creating the need for new learning models that move beyond the simple use of digital tools toward the cultivation of critical thinking, creativity, and responsible engagement with technology.

The Archimedes Ecosystem was developed as a student-centred educational approach combining:

- conversational AI,
- immersive VR experiences,
- 3D printing,
- digital museums,
- and project-based learning.

At the centre of the ecosystem is a 3D-printed representation of Archimedes connected to an AI chatbot that interacts with students through Socratic dialogue, inquiry, scientific exploration, and guided discovery.

The project transforms students into:

- creators,
- designers,
- researchers,
- storytellers,
- prompt engineers,
- and facilitators of knowledge.

2. Innovation of the Project

The originality of the project lies in the fusion of four interconnected dimensions within a unified learning ecosystem:

- a physical 3D-printed embodiment of Archimedes,
- conversational AI simulating his thinking and character,
- immersive VR environments and digital museums,
- and student-generated multimodal educational content.

Unlike conventional AI-in-education approaches where students mainly function as users of technological tools, the Archimedes Ecosystem places students in the role of:

- creators,
- researchers,
- designers,
- and presenters of knowledge.

The integration of Ancient Greek scientific thought with contemporary AI technologies creates a distinctive model of human-centred and experiential learning.

3. The Archimedes Ecosystem

The ecosystem operates as an interconnected network of learning experiences combining physical objects, digital technologies, and creative expression.

3.1 The 3D-Printed Embodiment of Archimedes

Students created a 3D-printed representation of Archimedes that functions as the physical anchor of the ecosystem. The model is connected to an AI chatbot simulating the scientist's thinking and personality, strengthening students' experiential connection with science, history, and philosophy.

3.2 Archimedes as an AI Conversational Partner

The conversational AI system:

- explains scientific concepts,
- guides experiments,
- encourages inquiry,
- applies Socratic questioning,
- and adapts its responses according to students' age and cognitive level.

Interaction with "Archimedes" transforms learning into an interactive dialogue.

3.3 Digital Museums and VR Experiences

Students designed immersive VR environments and digital museums allowing users to:

- explore ancient Syracuse,
- discover Archimedes' inventions,
- interact with scientific simulations,
- and experience knowledge through immersive educational scenarios.

These digital museums were used both as learning tools and as platforms for presenting student-created projects in conferences and educational events.

3.4 Student-Created Content

Using AI tools and the Archimedes framework as inspiration, students created:

- articles,
- songs,
- podcasts,
- videos,
- presentations,
- interactive activities,
- and STEM projects.

This process strengthened:

- creativity,
- scientific thinking,
- collaboration,
- communication,
- and multimodal expression.

4. Educational Methodology

The project is grounded in:

- Project-Based Learning,
- Inquiry-Based Learning,
- Human-Centred AI,
- Multimodal Learning,
- and Constructivism.

Students research, experiment, design, and publicly present their work through authentic learning experiences. The educational process extends beyond theoretical instruction and becomes an active process of creation.

A particularly innovative aspect of the project was students assuming the role of educators during workshops, festivals, and educational events, strengthening their confidence, communication skills, and metacognitive development.

5. AI Literacy and Responsible AI Use

The ecosystem places strong emphasis on:

- critical evaluation of information,
- recognition of hallucinations and bias,
- understanding deepfakes,
- source verification,
- and ethical AI use.

The framework promotes the idea that:

- human judgment remains essential,
- creativity cannot be replaced,
- and AI should function as a tool that enhances thinking rather than substitutes it.

The project aligns with the principles of the UNESCO AI Competency Framework for human-centred and responsible AI education.

6. Educational Outcomes

More than 400 students participated in the ecosystem's activities.

Preliminary educational observations and qualitative evaluations revealed:

- increased engagement in learning,
- stronger motivation,
- enhanced creativity and initiative,
- improved collaboration,
- and deeper understanding of complex STEM concepts.

Particularly significant was the increase in students' confidence while publicly presenting their projects in:

- conferences,
- workshops,
- educational events,
- and AI innovation festivals.

7. Conclusions

The Archimedes Ecosystem proposes a new educational model where AI functions as a catalyst for creativity, inquiry, and participatory learning.

The integration of Ancient Greek scientific thought with Generative AI, Virtual Reality, and 3D printing creates an educational environment that strengthens not only technological competencies but also the human dimension of learning.

The project demonstrates that students can become not merely users of technology but creators of knowledge, culture, and innovation.

The future of AI education is not only technological.
It is profoundly human.