Πανελλήνιο Συνέδριο της Διδακτικής των Φυσικών Επιστημών και Νέων Τεχνολογιών στην Εκπαίδευση

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Μια Ολοκληρωμένη Προσέγγιση της ΤΝ, της Διδακτικής Φυσικών Επιστημών και των Γραμματισμών: Το Ελληνικό Chatbot Talos

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Περίληψη

Στην εργασία παρουσιάζουμε την ανάπτυξη του Talos ενός κατάλληλα προσαρμοσμένου chatbot Τεχνητής Νοημοσύνης που χρησιμοποιεί το plugin AI Power επάνω σε μια εκπαιδευτική πλατφόρμα, για να υποστηρίξει μαθητές/τριες της βασικής εκπαίδευσης στη συγγραφή κειμένων στις Φυσικές Επιστήμες. Η προσαρμογή αφορά την απλοποίηση της γλώσσας, το φιλικό προς τους χρήστες ύφος και την παροχή κειμένων κατάλληλων για την ηλικία των μαθητών. Το Talos λειτουργεί ως εκπαιδευτικό εργαλείο, ως διαμεσολαβητής και ως φίλος, σε μια στοχευμένη προσπάθεια ανάπτυξης του επιστημονικού γραμματισμού με εξατομικευμένο τρόπο. Η έμφαση δίνεται στη συζήτηση των ευκαιριών και των προκλήσεων που αναδύονται κατά τη φάση δοκιμών του Talos.

Λέξεις κλειδιά: τεχνητή νοημοσύνη, διδακτική φυσικών επιστημών, επιστημονικός γραμματισμός, διαλογικός πράκτορας, παραγωγή γραπτού λόγου.

AI-Integrated Science Education & Literacies: The Greek Chatbot Talos

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Abstract

In this paper, we present the development of Talos, a customised chatbot using the AI Power plugin, on an educational platform to support students in basic education in writing scientific texts. The customisation involves simplifying the language, providing a student-friendly response style and age-sensitive texts. Talos acts as an educational tool, a facilitator, an expert and a friend in a targeted effort to develop scientific literacy in a personalised way. In addition, a discussion follows of the opportunities and challenges that emerge during the testing phase of Talos.

Keywords: artificial intelligence, science education, scientific literacy, chatbot, writing.

Introduction

For centuries, writing has been a core component of literacy, as reflected in the etymology of the word, derived from the Latin litterae, meaning 'letters' and 'literature' (Merriam-Webster). In education, writing continues to be emphasized as a fundamental skill that permeates school life across all subjects and serves as a key aspect of academic success.

Over the past few decades, literacy has evolved into 'literacies', incorporating writing as a sociocultural practice valued differently by different people in various contexts and for diverse

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purposes (Gee, 2015). In science education, being literate—or acquiring 'scientific literacy'—encompasses a range of cognitive, linguistic, digital, sociocultural, and critical skills that enable fuller participation in public discourse (Yore, 2012). Writing about science has transformed into a multifaceted, fluid, and omnipresent skill used for (a) accessing and transforming universal knowledge available to everyone and (b) engaging with inter- and transdisciplinary practices in a holistic and multimodal manner (Kalantzis & Cope, 2025). As such, it demands adaptability to different audiences, both specialised and non-specialized, as well as to varied purposes and formats.

Over-accessibility to writing artifacts becomes increasingly evident with Generative AI, which "is more than anything a technology of writing" (Kalantzis & Cope, 2025, p. 1), leading to concepts such as the 'platformization of writing and learning' (Stornaiuolo et al., 2023) and 'AI-integrated science teaching' (Kim, 2022). This raises the question of which developmental stages AI-integrated science writing can effectively target (see also Yim, 2024).

Theoretical background

School literacies equip students to communicate effectively, critically engage with information, adapt to technological advancements, develop creative thinking, and address complex global challenges. Scientific literacy (OECD, 2017; Siarova et al., 2019), AI literacy (Ng et al., 2021), multiliteracies (Unsworth, 2001), and pluriliteracies across subjects (Meyer et al., 2015) are four distinct yet interconnected literacy types central to this paper. Two common threads among them are (1) the intersection between language, society, science, and technology, which allows us to understand how teachers and students make meaning of science, and (2) platform-mediated writing.

The platformization of writing is being accelerated by Generative AI, which, in many cases, proves to be the most efficient writer (Kalantzis & Cope, 2025). However, its writing competencies are highly dependent on its users. The most prevalent function of AI platforms in writing is assistive. To provide support in writing about science, we customized Talos using an ecological and multiperspectival approach, as proposed by Stornaiuolo et al. (2023)—writing as a cognitive, sociocultural, and critical process. This approach aligns with the view of scientific literacy as engagement in practices that critically involve students with scientific texts, allowing them to construct, justify, and critique scientific knowledge claims that are relevant to their daily lives across multiple modes and forms, enabling them to make informed decisions (Siarova et al., 2019).

In this work, we argue for the calibration of AI technologies to better adapt to the needs of beginners, such as primary and lower secondary school students, in scientific literacy and writing. To achieve this, we trained Talos, a chatbot hosted on the activities platform (e-tetradio.elefys.gr) of the pedagogical e-content ELeFyS - Illustrated Science Dictionary for School (Lefkos & Mitsiaki, 2021), as a custom GPT model based on ChatGPT 4.0. Talos functions as a science and language expert designed to assist learners with writing across various science-specific genres. After outlining the criteria or steps for Talos's customisation, we present feedback from its testing.

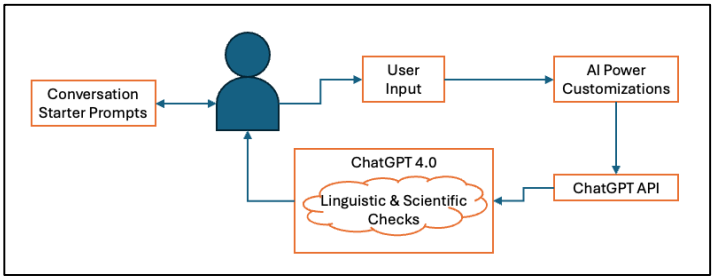
Methodology

To customise Talos, we took the following steps: (1) In the plugin settings, we configured the response tone to be conversational, friendly, and pedagogically appropriate for young school learners while simultaneously simulating the role of an expert. (2) Based on the theoretical background of scientific literacy and multi- and pluriliteracies, we added six science-specific genres as conversation starters: personal narratives, scientists' biographies, term definitions, explanations, experiment reports, and argumentation. This makes it easier for students to interact with Talos according to their interests. The six genres are scaled according to the developmental continuum of text production in school science (from the easiest to the most

complex), as outlined by Christie & Derewianka (2008). (3) We enabled the Internet search feature to allow the model to verify the scientific accuracy of the texts provided by the students.

After customisation, we are currently testing Talos by revising different prompts and analysing its responses in terms of linguistic and scientific accuracy, ethics, and inclusiveness.

Figure 1. Schematic of the implementation of Talos chatbot and the way it interacts with users



Discussion and Conclusions

In the following lines, we will discuss Talos's competencies and limitations regarding its use as a learning resource from various perspectives, whether in the classroom or for self-study.

First, its most significant strength is its ability to adapt content to individual learning stages, paces, and styles, such as offering more suitable term definitions for younger learners. Second, it provides cognitive scaffolding based on writing strategies, particularly when learners request ready-made texts instead of drafting their own. Third, from a linguistic perspective, it offers corrective feedback, such as identifying grammatical errors and typos, which is especially valuable for non-native speakers of Greek. Moreover, it serves as a platform for translanguaging practices, supporting learners who struggle with academic language or discourse. Talos presents both sides of arguments on everyday socio-scientific issues (e.g., the pros and cons of using wind generators) while allowing room for further discussion of underlying social and cultural biases in the classroom. For example, students can contribute their own arguments and test them by engaging with Talos (Lee et al., 2021). Fifth, the chatbot's ability to maintain coherence in science-related topics and interactions encouraged users to adopt a more critical stance toward its written outputs. Sixth, Talos's configuration enables students to discuss their views on scientific concepts and phenomena in a fun and engaging way while at the same time challenging any alternative conceptions they may hold.

Using chatbots like Talos in the classroom can increase learners' motivation and curiosity to engage with science, fostering a fun learning environment (Topal et al., 2021). Moreover, the sociocultural and critical dimensions of platform-mediated writing—those that situate writers and their products within social, cultural, political, and material contexts, draw on multimodal semiotic practices, question power structures and ethics (e.g., data extraction), and even challenge the platform's role as the writer—can be addressed by teachers and students during or after the writing process.

In conclusion, by leveraging Talos appropriately, science teachers can create interactive, personalised, and engaging writing experiences that cater to the diverse needs of their students. They can help students understand scientific terms, simplify complex scientific ideas, transform communicative language into academic language, acquire plurilingual support, receive real-time feedback, foster curiosity through inquiry-based learning, explore interdisciplinary connections, develop essential skills for future scientific exploration, and critique entrenched ideas. However, integrating AI into school science education also presents challenges. Although the concept of scientific literacy encompasses language and the way scientific content is articulated, the emphasis continues to be placed primarily on scientific content as an end in itself. Furthermore, significant progress is needed before both teachers

and learners can achieve AI literacy and critically engage with the human collective intellect that Generative AI industry sells back to us (Kalantzis & Cope, 2025, p. 8).

In future work, a *Teacher's Guide* outlining key aspects of AI-integrated science teaching and learning will be developed to ensure the effective use of Talos. Moreover, we plan to integrate a knowledge base so that the chatbot can reference textbooks and other learning materials. Additionally, a piloting phase will be conducted, and data gathered from the implementation of Talos will provide essential feedback for further refining the chatbot.

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