



Section of the conference: Educational sciences

Sekcja konferencji: Nauki o edukacji

How to cite: Pereira, M. A, Santos, M. M., Mendonça, J.C. F, & Grasseli, M. F (2025). Developing critical thinking through scientific literacy in higher education: Management students. *World Conference on Emerging Science, Innovation and Policy 2025*. Futurity Research Publishing. <https://doi.org/10.5281/zenodo.16596414>

Developing Critical Thinking Through Scientific Literacy in Higher Education: Management Students

Pereira, M. A¹, Santos, M. M.², Mendonça, J.C. F³, Grasseli, M. F³.

¹Master of Science (M.Sc.) in Environmental Geology and Natural Resource Management, Professor, Trivento Educação, Brazil

²PhD candidate in Ethnopsychology from the Postgraduate Program in Psychology at the University of São Paulo - USP/RP. Master's in Psychoanalytic Studies, Professor, Trivento Educação, Brazil

³Doctor in Food Science., Professor, Trivento Educação, Brazil

⁴Master in Business Administration, Professor, Trivento Educação, Brazil

Accepted: July 11, 2025 | **Published:** July 20, 2025 | **Language:** English

Abstract: Brazilian higher education faces challenges in developing critical thinking due to knowledge fragmentation and the marginalization of Humanities. In response, the "Conexão com Nosso Futuro" program was implemented in 2025 across private institutions to foster scientific literacy and adaptability. The program employs active methodologies, including Plato's Allegory of the Cave, to stimulate questioning. Results from 94% Business Administration and Accounting students indicated that while 68% recognize the scientific method, interpreting complex concepts remains a challenge (approx. 20% struggled with the allegory). Nevertheless, 94-96% reported acquiring new knowledge and perceiving the relevance of philosophical foundations, highlighting the importance of continuous pedagogical optimization to train professionals with critical competencies.

Keywords: Scientific Literacy, Critical Thinking, Higher Education, Pedagogical Strategies, Humanities.



Introduction

In Brazil, undergraduate pedagogical projects are guided by the National Curricular Guidelines (NCGs), which are established by the National Council of Education (NCE) (Brazil, MEC/CNE, 1997). These DCNs aim to orient educational institutions in constructing their pedagogical projects by defining the essential skills and competencies for graduates, all while respecting the institutions' autonomy (Teixeira Junior, 2020). For the Bachelor's degrees in Business Administration and Accounting, the NCGs were established by Resolutions No. 5, of October 14, 2021, and No. 1, of March 27, 2024, respectively. Although professionals graduating from these courses perform distinct roles in specific areas of practice, the competencies and skills defined for them share clearly convergent points such as Critical and Analytical Thinking and Problem Solving, Ethical Action and Social and Environmental Responsibility, Effective Communication, Continuous Learning, Multidisciplinary and Interdisciplinary Vision, and Innovation and Creativity (Brazil, CNE/CES, 2021; Brazil, CNE/CES, 2024).

For students to develop the required skills and competencies, it's crucial to expand their cognitive lexicon through transdisciplinary learning experiences. This allows them a holistic understanding of the world and the problems they will face. However, Brazilian higher education has historically been marked by the fragmentation and isolation of knowledge areas (Cardoso, 1995). This fragmentation can lead to intellectual fragmentation in professionals themselves, hindering the development of complex intellectual skills. An empirical consequence of this failure is the existence of vacant positions in the job market due to a lack of professionals with what are increasingly being called soft skills (Ferreira & Resende, 2025).

In response to this scenario, the academic coordination of Trivento Educação created an Institutional Program of Human Sciences and Affirmative Policies titled "Connection with Our Future." Implemented in three private higher education institutions in Brazil in 2025, its objective is to go beyond simple technical application, empowering professionals to utilize scientific literacy daily. The goal is for them to solve simple and complex problems, overcoming what we are calling intellectual blunting. This paper specifically explores the performance results observed in engineering students who participated in this program.

Connection with Our Future: Its Role in Building Scientific and Functional Literacy in Brazilian Higher Education

According to the 2022 demographic census, the illiteracy rates of the Brazilian population aged 15 or older is 7% (IBGE, 2024). This number, while encouraging, doesn't reflect the skills needed for daily activities that are currently, and will be, required. This is because, for the IBGE, individuals are considered literate if they can read and write a simple note or a shopping list (IBGE, 2024). For this reason, other indicators should be analyzed and considered when proposing interdisciplinary activities in higher education curricula.

The Functional Literacy Indicator (from Inaf - Instituto Paulo Montenegro, 2024) is a study conducted by Ação Educativa and Conhecimento Social in partnership with Ipsos (formerly IPEC). This indicator measures the literacy of the Brazilian population aged 15 to 64 through a written test that assesses functional skills in the fields of literacy, numeracy, and digital context, organized into 4 skill groups: functional skills: recognizing and decoding, locating and identifying, understanding and inferring, and evaluating and reflecting. Based on the assessment results, respondents are classified into 5 literacy levels. These literacy groups can be re-grouped for analysis purposes into 3 or 2 levels



(Instituto Paulo Montenegro, 2024). For this work, 2 levels will be considered: functionally illiterate and functionally literate. The Inaf indicates that schooling is a preponderant factor for increasing literacy, but it doesn't guarantee that people with high levels of schooling are functionally literate. Approximately 12% of functionally illiterate individuals reach higher education. For this reason, adopting strategies that promote the development and improvement of the fundamental skills assessed is crucial.

Connection with Our Future is an educational program focused on Critical Human Formation, comprising four mandatory courses in the student's curriculum. The approval criteria for these courses include participation and the completion of learning pathways designed by instructors and developed by DreamShaper's technology team. These learning pathways are summative assessments created by instructors to develop verbal and textual communication skills and critical thinking. They achieve this through the study of and reflection on 21st-century social problems, viewed through the lens of philosophy, anthropology, and sociology.

Currently, the program impacts over 4,000 students across three regions in Brazil: Itabirito-MG, Lorena-SP, and Altamira-PA. The curricular components of the "Connection with Our Future" Program are: Epistemology and Scientific Literacy, Ethics and Artificial Intelligences, Ethno-Racial and Gender Relations in Brazil, Sustainability and Global Climate Crisis

Methodology

The "Epistemology and Scientific Literacy" course has a workload of 40 semester hours, was offered to 5 classes of Business Administration and Accounting students, with weekly 100-minute remote meetings for all three Trivento Educação units. During the sessions, the topics of the classes and their conceptual basis are presented with triggers that contribute to debate and the expression of students' opinions and arguments. The assessment process occurs through participation in classes and by completing the Learning Pathways made available on the DreamShaper platform. This article will present the results from the "Epistemology and Scientific Knowledge" Pathway, which included questions on the scientific method, Plato's Allegory of the Cave, and the classification of important scientific milestones according to student opinion. The pathway also inquired about students' perceived learning and understanding of the content. Tables were generated from reports requested from the company. grouping.

Research Results

The "Connection with Our Future" course had an enrollment of 3,323 students from all undergraduate programs at Trivento Educação. However, this article focuses on the 94 students from the Business Administration and Accounting Sciences programs who completed the "Epistemology and Scientific Knowledge" pathway. This group represents 63% of the total students enrolled in these specific programs at Trivento Educação.

The majority of students understood the meaning of the shadows projected on the wall when the Allegory of the Cave was discussed. However, approximately 21% of Business Administration students and 32% of Accounting Sciences students chose incorrect alternatives, as can be observed in Table 1. Of these, the majority interpreted the shadows as complete reality. This prompts reflection on the interpretative capacity for metaphors applied to abstract concepts.

**Table 1***Interpretation of Plato's Allegory of the Cave*

In the context of Plato's Allegory of the Cave, the shadows projected on the walls are	Business Administration	Accounting Science
a) Complete reality.	18.31%	30.43%
b) The appearances of the world.	78.87%	69.57%
c) The gods.	1.41%	0.00%
d) Happiness.	1.41%	0.00%

Source: author (s) own development

Following the contextualization and presentation of the principles of science, students were introduced to the fundamentals of empiricism, rationalism, and criticism. They were then prompted to discuss how knowledge is developed based on the observation of their context. When asked about the cited fundamentals and the development of science, 66.20% of Business Administration students and 65.22% of Accounting Sciences students responded affirmatively.

Table 2*Student Learning Perception*

About my learning so far:	Business Administration	Accounting Sciences
I learned many things I didn't know.	70.42%	65.22%
I learned some things I didn't know.	23.94%	30.43%
I learned few things as I had already studied this content.	2.82%	4.35%
I learned few things as I didn't understand the content very well.	2.82%	0.00%

Source: author (s) own development

Table 3*Students' Perception of the Relevance of Acquired Knowledge*

About the relevance of what I learned.	Business Administration	Accounting Sciences
Very relevant.	67.61%	82.61%
More or less relevant.	25.35%	13.04%
Slightly relevant.	5.63%	4.35%
Not relevant at all.	1.41%	0.00%

Source: author (s) own development

Approximately 94% and 96% of Administration and Accounting Sciences students, respectively, report having acquired new knowledge when considering the first two items in Table 2. The remaining students show a lower perception of learning, either because they had already seen the content or due to a lack of understanding of the content. In the latter case, strategies must be sought for the



recovery of these students. In Table 3, the results demonstrate that students consider the learning of the philosophical foundations of science to be relevant.

Conclusions

The "Conexão com Nosso Futuro" Program addressed the gap in critical thinking and adaptability among management students, attributed to the historical marginalization of Humanities in Brazilian university education (LEOPOLDO, 2004). The program aimed to develop scientific literacy, enabling students to use knowledge to solve complex problems and promote the social use of knowledge, as outlined by INEP (2025) and Borges & Damatta (2023).

The pedagogical strategy adopted employed active methodologies and summative assessments to develop the formulation of consistent questions and the creation of hypotheses. This approach was based on concepts such as Plato's allegory of the cave and the Socratic method, contextualized with the phenomenon of fake news, aiming to stimulate questioning and investigation. Additionally, the curriculum covered the functioning of scientific publications and databases.

About 20% had difficulty interpreting the allegory of the cave. However, 94% and 96% of Administration and Accounting Sciences students, respectively, reported acquiring new knowledge and perceiving the relevance of the philosophical foundations of science. These observations reinforce the complexity of scientific literacy and the importance of continuous pedagogical optimization for training professionals with the intellectual and behavioral competencies for critical thinking.

References

- Brasil. Conselho Nacional de Educação, Câmara de Educação Superior. (1997, 3 de dezembro). *Parecer CNE/CES nº 776/97: Orientação para as diretrizes curriculares dos cursos de graduação*. MEC/CNE. https://portal.mec.gov.br/cne/arquivos/pdf/1997/pces776_97.pdf
- Brasil. Conselho Nacional de Educação, Câmara de Educação Superior. (2016, 16 de novembro). *Resolução CNE/CES nº 5, de 16 de novembro de 2016: Institui as Diretrizes Curriculares Nacionais para os cursos de graduação na área da Computação*. *Diário Oficial da União*, nº 220, Seção 1, 22-24 (17/11/2016). <https://portal.mec.gov.br/docman/novembro-2016-pdf/52101-rces005-16-pdf/file>
- Brasil. Conselho Nacional de Educação, Câmara de Educação Superior. (2024, 27 de março). *Resolução CNE/CES nº 1, de 27 de março de 2024: Institui as Diretrizes Curriculares Nacionais do Curso de Graduação em Ciências Contábeis*. *Diário Oficial da União*, Seção 1, 43-44 (28/03/2024). <https://portal.mec.gov.br/docman/marco-2024/257031-rces001-24/file>
- Instituto Brasileiro de Geografia e Estatística (IBGE). (2024). *Censo Demográfico 2022: Panorama*. IBGE. Retrieved July 30, 2025, from <https://censo2022.ibge.gov.br/panorama>
- Cardoso, I. A. R. (1995, maio). Imagens da universidade e os conflitos em torno de seu modo de ser. *Revista USP*, (25), 84-91. <https://doi.org/10.11606/issn.2316-9036.v0i25p84-91>



- Ferreira, P., & Resende, P. T. de. (2023). O que fazer diante da falta de profissionais qualificados? *GV Executivo*, 22(3). <https://periodicos.fgv.br/gvexecutivo/article/view/89904>
- Instituto Paulo Montenegro. (2025). *Indicador de Alfabetismo Funcional - INAF 2024*. Ação Educativa & Conhecimento Social. <https://alfabetismofuncional.org.br/> (див. також стисле видання даних: <https://alfabetismofuncional.org.br/dados-inaf-2024.pdf>)
- Teixeira Junior, P. R. (2020). Diretrizes curriculares nacionais para o ensino superior: A lógica das competências em foco. *Crítica Educativa*, 6(1), 1-18. <https://doi.org/10.22476/revcted.v6.id483>