

LINGUISTIC AND EPISTEMOLOGICAL ACTIVATORS OF INTERDISCIPLINARITY

The module aims to provide the students with the linguistic and epistemological tools in order to analyze the STEM identities in scientific textbooks
<https://identitiesproject.eu/linguistics-and-epistemology/>



















Modular blocks	Goals of the block	Activities	IDENTITIES approach to interdisciplinarity					Role of participants	Mode of interaction	Suggested digital tools	Workload time	Non-editable format	Editable format	Hints for implementation
Pre-activity	Analyzing the difficulties found by different STEM discipline students reading STEM textbooks.	Reading an excerpt of a STEM textbook.								Assignment	2 h	https://identitiesproject.eu/wp-content/uploads/2022/11/Text-for-pre-activity.pdf	not editable	This block aims to activate a cognitive process of reflecting on the language used in textbooks and its comprehensibility for students, considering their scientific backgrounds (disciplines). At the first moment, it might be helpful to ask the students to work on the text alone and take notes about what linguistic element or part of the text creates the most significant difficulties in reading and comprehension for them. In a second moment, it might be helpful to engage in a joint discussion to compare the students' reading experiences and thoughts.
		Answering the questions about the textbook excerpt.								Assignment		https://identitiesproject.eu/wp-content/uploads/2022/11/Question-for-pre-activity-1.pdf	https://identitiesproject.eu/wp-content/uploads/2022/11/Question-for-pre-activity-docx-1.docx	
		Discussion about pre-activity with particular attention to the comprehensibility of interdisciplinarity.								Jamboard				
Ambiguities, negation, interpretation, logical aspects	Facing the ambiguities with the negation of various statements in different disciplines.	Negation of quantified sentences addressing translation issues: logical issues.								Assignment	3 h	https://identitiesproject.eu/wp-content/uploads/2022/11/Negation-of-quantified-sentences.docx.pdf	https://identitiesproject.eu/wp-content/uploads/2022/11/Negation-of-quantified-sentences.docx.pdf	Ask the students to negate in English, then translate some sentences with quantifiers in their languages, transforming them into negative clauses. In the following discussion, it might be interesting to compare their negated sentences and engage them in sharing how they interpreted the task of negating (negating verbs only, negating meanings, negate formally/mathematically) and reflecting on consequent ambiguities that can emerge.
		Discussion about the relevance of the logical analysis for discussing ambiguities								Jamboard		https://identitiesproject.eu/wp-content/uploads/2022/11/Ambiguities-negation-interpretation-logical-aspects.docx.pdf	https://identitiesproject.eu/wp-content/uploads/2022/11/Ambiguities-negation-interpretation-logical-aspects.docx.pdf	
Linguistics and STEM sciences: linguistic tools to look at interdisciplinarity in STEM textbooks.	Providing the students with the linguistic tools and a grid in order to detect STEM identities and interdisciplinarity narratives in textbooks.	Explaining to the students the linguistic characteristics of the scientific language variety, also referring to its history, with a particular focus on Galileo Galilei's language and texts									4 h	https://identitiesproject.eu/wp-content/uploads/2022/11/Linguistics-and-STEM-Science-why-language-is-important.pdf	https://identitiesproject.eu/wp-content/uploads/2022/11/Linguistics-and-STEM-Science-why-language-is-important.docx	The lesson intends to give the students the main linguistic notions about scientific language and its history and to enact a metalinguistic reflection, pushing the students to think over the linguistic uses which they are exposed to when they read or the linguistic habits which they have when they talk or write about scientific topics. The grid must be considered a tool for guiding the students in this reflection. The analysis is a way to familiarize them with the linguistic aspects that can affect the recognition and comprehension of a discipline and its topics. This block should be conducted (at least) with the help of a linguist or a language teacher (depending on the institution's possibilities). The importance of language and language uses must be explained to the students, giving them why scientists must be aware of language uses.
		Presenting the linguistic grid to analyze scientific texts.								Assignment		https://identitiesproject.eu/wp-content/uploads/2022/11/Questionnaire_Lesson-2-1.pdf	https://identitiesproject.eu/wp-content/uploads/2022/11/Questionnaire_Lesson-2.docx.pdf	
		Analyzing a textbook excerpt through the linguistic grid								Assignment		https://identitiesproject.eu/wp-content/uploads/2022/11/WallerBonehShoup_extract.pdf	not editable	
		Discussion on the analysis of the textbook excerpt								Jamboard				
Habermas' rationality to analyze scientific reasoning and textbooks	Providing the students with an epistemological tool and an analytical grid to bring out disciplinary and interdisciplinary issues in students reasoning and scientific textbooks.	Conjecturing and proving statements about the following question: "what is it possible to say about the divisors of two consecutive natural numbers?"								Assignment	4 h	https://identitiesproject.eu/wp-content/uploads/2022/11/Habermas-rationality-to-analyze-scientific-reasoning-and-textbooks.docx.pdf	https://identitiesproject.eu/wp-content/uploads/2022/11/Habermas-rationality-to-analyze-scientific-reasoning-and-textbooks.docx.pdf	The students should explore the suggested mathematical problem and be engaged in finding conjectures and in their proof. Asking them to keep a written trace of all their reasoning processes might be an excellent way to make them deeply consider the entire proving process in each stage. Habermas' construct of rationality in mathematics education (epistemic, teleological, communicative) should then be used to look at their texts and observe how disciplines emerge through the analysis and the following discussion. Finally, the students should be engaged in discussing how disciplines are represented in the textbooks, leveraging Habermas' dimensions of rationality.
		Explaining the construct of Habermas' rationality to analyze students' conjectures and proofs												
		Analyzing students reasoning								Assignment		https://identitiesproject.eu/wp-content/uploads/2022/11/Consecutive-natural-numbers-conjectures-and-proofs.pdf.pdf	https://identitiesproject.eu/wp-content/uploads/2022/11/Consecutive-natural-numbers-conjectures-and-proofs.docx.pdf	
		Discussion								Jamboard				
		Reading and analyzing two excerpts from two scientific textbooks								Assignment		https://identitiesproject.eu/wp-content/uploads/2022/11/GiancoliWalker-exch3.pdf	not editable	
		Discussion								Jamboard				
Wrapping up	Reflecting on the entire module.	Analysing a new excerpt of a textbook using the linguistic and epistemological grids								Assignment	3 h			This block aims to reach a more complex view of how disciplines are presented in a textbook, combining both the linguistic and the epistemological lenses. Rethinking the proof description in terms of other textual types (for example, a dialogue) should engage students and make the proving process emerge more dynamically. In fact, they have to think and consider the more effective way to share scientific knowledge with an interlocutor, which might be someone other than an expert in the field on which they are talking/writing. The awareness of a receiver is important to make them select carefully the way to convey scientific information. The teacher should guide the final discussion to make the students share the difficulties, doubts, and solutions they have found in composing the text.
		Reformulation of a textbook excerpt about the parabolic motion proof reproducing and renovating the textual structure of Galilean dialogue								Assignment/video		https://identitiesproject.eu/wp-content/uploads/2022/11/Habermas-rationality-to-analyze-scientific-reasoning-and-textbooks.docx-1.pdf	https://identitiesproject.eu/wp-content/uploads/2022/11/Habermas-rationality-to-analyze-scientific-reasoning-and-textbooks.docx-1.docx	
		Final discussion and post-activity								Jamboard		https://identitiesproject.eu/wp-content/uploads/2022/11/Question-for-post-activity.pdf	https://identitiesproject.eu/wp-content/uploads/2022/11/final-questionnaire.pdf	

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Legend

Keywords for the IDENTITIES approach to interdisciplinarity	Keywords for the participants' roles in the module	Keywords for the type of participants' engagement in the activities
   identities of the disciplines  mathematics  physics  computer science  interdisciplinarity zone  Boundary objects  Boundary-crossing mechanisms  Epistemological activators  Linguistic activators	 Role of explorer  Role of student  Role of analyst  Role of teacher-designer	 Individual activity  Group activity  Interactive activity trainer-trainees