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PARABOLA AND PARABOLIC MOTION



https://identitiesproject.eu/parabola-and-parabolic-motion/

Modular blocks	Goals of the block	Activities	IDEN	ITITIES approad	ch to interdiscip	blinarity	Role of participants	Mode of interaction	Suggested digital tools	Worklo time	ad Non-editable format	Editable format	Hints for implementation
Introduction	This first block aims to gain confidence with the main general times of the project while making people act by themselves	Ice-breaking and boundary activities						ß	Forum		http://identRiesproject.eu/wp: content/upleads/2022/12/CE-BREAKING-activity-and- tools-for-collecting-data.pdf	https://dentiliesproject.eu/wp: content/uploads/2022/12/ICE-BREAKING-activity-and- tools-for-collecting-data.odp	These activities are designed to reflect on the image of interdisciplinarity students built in their experiences. After the introdiction of the boundary metaphor and key words that characterize the approach in order to inspire an attitude toward interdisciplinarity, the students were divided in different groups to share their interdisciplinary experiences and create a basis, a common ground. Particular emphasis was put on the cognitive, emotional, epistemic, and linguistic aspects (both barriers and positive experiences).
		The IDENTITIES project (disciplines, interdisciplinarity, and key questions)						ලුරි	Assignment		https://identRiesproject.eu/wp. content/up/cads/2022/12/INTRO.pdf	https://identitiesproject.eu/wp. content/uploads/2022/12/INTRO.odp	Introduction to the interdisciplinary approach developed within IDENTITIES, the main values and goals.
		Introduction to curricular and S-T-E-M advanced interdisciplinarity						lô	Assignment	2h	https://youtu.be/CSBwQkd-v/		This video aims to introduce different kinds of interdisciplinarity in the project. Since it is more common to consider interdisciplinarity as an extracurricular issue, after assigning it as honework or during the lesson, ask students what are their reactions and if they think that the 03 modules can be really considered interdisciplinary and if they consider the experience of emergent interdisciplinarity presented in the 02 modules as relevant also to curricular activities.
		Interdisciplinary images activity]				ß	Word cloud		http://identiticsproject.eu/wp: content/uploads/2022/12/mages-activity.pdf	https://identitiesproject.eu/wo. content/uploads/2022/12/images-activity.odp	This video aims to introduce different kinds of interdisciplinarity in the module. Since it is more common to consider interdisciplinarity as an extracurricular issue, after assigning it as honework or during the lesson, ask students what are their reactions and if they think that the 03 modules can be really considered interdisciplinary and if they consider the experience of emergent interdisciplinarity presented in the 02 modules as relevant also to curricular activities.
		The taxonomy of interdisciplinarity						ß	Assignment		https://www.youtube.com/watch? y=YEINxxxhnxK&lst=PLMH8788CUxxMyOHCYgaGJ6ICA6Og op7Hk&index=2		In the video it is presented a comparison between different teaching situations: ask the students other examples to check if they understood the key points. In particular check if in their examples students mention the need to discuss or question the epistemologies of the disciplines in interdisciplinary teaching.
Curves and trajectories	This block aims to foster the students to share their knowledge so as to build the module on this, dealing with the specific themes of this	Parabola images and discussion		\odot					Forum		https://identRiesproject.eu/wp- content/uploads/2022/12/Explorer-activity.pdf	https://identitiesproject.eu/wp. content/uploads/2022/12/Explorer-activity.odp	Encourage the students to motivate their answes thinking in first person as students and not as teachers in the first phase. The main risk in this activity is that students take for granted the fact that the curve is a parabolar arrying on their habits and not in a critical way. Starting from images without further explanation is a choice made to encourage reasonings at the boundary, so the analypity of the activity represent its richness since it makes senerge habits of reasoning and then allow to question them. After divided the students in group, collect the groups' answers with an online board such as Padiet, lamboard or Mirb board.
	Evaluating tool	Production of a home report about the group's discussion						ß	Journal	-3h -			Ask the students to produce an individual report of the discussion in groups and upload it on a platform as assignment or send it by email. This report will be receive a feedback, or in a collective discussion or individually.
Lenses to look at interdisciplinarit	This scaffolding block aims to reflect on interdisciplinarity and shape the discourse already developed. In the page of Filth make boundaries visible	Introduction to the boundary metaphor						ළුරි	Assignment		https://identiticsproject.eu/wp. content/uploads/2022/12/Boundary-vocabulary.pdf	https://identitiesonoject.eu/wp. content/uploads/2022/12/Boundary-vocabulary.odp	Stress the relation between identities of the disciplines and the notion of boundary in general, encouraging a reflection related to mathematics and physics.
		Introduction to boundary objects and boundary-crossing mechanisms						ß	Assignment		https://youtu.be/fK0Kv/FeO_U		Assign the video as homework or during a lesson.
		Brainstorming on "What do you mean by science?"						ÊÊ	Jamboard	3 h			Students are engaged to think individually on what they mean by science and then to discuss it all together starting from the post-it on the jambaard. Particular attention is posed on possible streeotyped vision of science.
		Introduction to the Family Resemblance Approach (FRA) to reflect on disciplinary identities and their comparison						ලුරි	Assignment		https://identitiesproject.eu/wp. content/uploads/2022/12/FBA-scaffolding.pdf	https://identitiesproject.eu/wp- content/uploads/2022/12/FBA-scaffolding.odg	Introduction to the value of FRA to NOS, the FRA wheel and the categories
		The Nature of Science and Family Resemblance Approach wheel survey						lô	Word cloud		http://identRiesproject.eu/wp. content/uploads/2022/12/NOS-and-FRA-wheel-survey.pdf	https://identitiesproject.eu/wp. content/uploads/2022/12/NOS-and-FRA-wheel-survey.odp	Collect the answer to the final question with an online tool such as wooclap that allows also to visualize the main aims and valus, methods and practices that students thought and use the visualization to trigger the discussion
Conics and motions in the history of Mathematics an Physics	This block aims to show how the theme of parabolic motions has been foundational for establishing physics as a discipline, also in relationship with the development of conics in the history of mathematics	Parabolic motion and the birth of Physics as a discipline: Aristotle, Tartaglia, Guidobaldo, Galileo				×		ලුරි	Assignment		https://dentiliesproject.eu/wp- content/uploads/2002/12/Parabola-and-parabolic-motion Physics.pdf	https://identitiesproject.eu/wp; content/uploads/2022/12/Parabola-and-parabolic-motion- Physics.odp	Introduction to the first historical case: the discovery of the parabolic shape of the projectile's motion stressing the structural role of mathematics in the birth of the modern physics.
		Epistemological differences between parabola images	٢	الد بي بي بي بي]			ß	Word cloud	3 h	https://identitiesproject.eu/wp_ content/uploads/2022/12/Epistem-differences.docx.pdf	https://identitiesproject.eu/wp. content/uploads/2022/12/Epistem-differences.docx.odt	Foster students to reflect on and choose the image that better represent their idea of interdisciplinarity and why.
		Parabola as a conic section. A historical dialogue between mathematics and physics: Euclid, Apollonio, Archimede, Witelo, Kepler]			ලුරි	Assignment		https://identiticsproject.eu/wp: content/uploads/2022/12/student-activity_mathematics_ pdf	https://dentitiesproject.eu/wp: content/uploads/2022/12/student-activity_mathematics, cdp	Introduction to the second historical case: the classification and unification of the conics stressing on the role of physics in the unification leading to the birth of the projective geometry.
Argumentation and proof at the boundary between Mathematics an Physics	This block aims to discuss the construct of proof and argumentation, in order to make disciplinary d backgrounds visible	Make a proof of Pythagora's theorem]			Ø	Ĉ	Padlet	2.6	https://identiliesproject.eu/wp:- content/uploads/2022/12/Make-a-proof-of-Pythagoras- theorem.pdf	https://dentitiesproject.eu/wo: content/uploads/2022/12/Make-a-proof-of-Pythagoras- theorem.odg	Students are asked to individually think and write a proof of Pythagora theorem. The answers are collected through a Padlet. The answers are collectively discussed focusing on the differences between the different answers and the reason why students decided to propose that kind of proof and why they consider it a proof.
		Proof in mathematics and the Galileo's proof analysis					Ø	ß	Assignment	311	https://identitiesproject.eu/wp. content/uploads/2022/12/Proof-in-mathematics.pdf	https://identitiesproject.eu/wp. content/uploads/2022/12/Proof-in-mathematics.odp	Proofs is analyzed in terms of argumentation. Through the sides, students are introduced to the notion of the theorem, the role of the theory, the metatheory, the analogies, and differences between proof in mathematics and physics. Gailieo's proof is analyzed to point out its Euclidean structure and its interdisciplinary nature, that ishow mathematical and physical objects appear in the text and are intertwined.
		Linguistic scaffolding (general questions)					Ø	ලුරි	Assignment		http://identiliesproject.eu/wp. content/uplaads/2022/12/Linguistic-analysis.pdf	https://identitiesproject.eu/wp. content/uploads/2022/12/Linguistic-analysis.odg	Introduction to the main linguistic tool for the textbook analysis (i.e. synstaxt, implicits,).
		Textbook linguistic analysis (ad hoc questions grid)					Ø	ලුරි	Assignment		https://dentRiesproject.eu/wp- content/uploads/2022/12/fextbook linguistic analysis.ad- hoc-questions-grid.odf	https://dentiliesonoiect.eu/wp. content/uploads/2022/12/Textbook-linguistic-analysis-ad- boc-questions-grid.odg	Presentation of the linguistic analysis grid.

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Ma	odular blocks	Goals of the block	Activities	IDENTITIES approach to interc	disciplinarity Ropart	ole of M icipants int	lode of S eraction	iuggested digital tools	Workload time	Non-editable format	Editable format	Hints for implementation
Text analysis	analusie	This block aims to share and apply an analytic grid to analyse textbooks	Linguistic analysis of textbooks (Physics, volume 1, by James S. Walker, 2017)			<u>م</u>	38,	ssignment	6 h	https://identitiesproject.eu/wp: content/ke/sads/2002/117/liguistic.analysis.of.textbooks. Physics-volume-1-by-James S. Walker 2017.pdf	https://identitiesproject.eu/app. content/uploads/2022/12/Linguidic_analysis_of.textbooks_ Physics-volume-1-by-James SWalker 2017.odg	Application of the analysis grid to school testbooks. Engage students in the application of the grid.
	anaiysis		Habermas' rationality introduced as scaffolding to analyse a text			<u>کا</u>	දුරි	ussignment	011	https://identitiesproject.eu/wp_ content/uploads/2022/12/Habermas-scaffolding.pdf	https://identitiesproject.eu/wp. content/uploads/2022/12/Habermas-scaffolding.odp	Introduce the main key ideas of Habermas' rational behavior adapted to mathematics education (epistemological, teleological, communicative).
			Walker's Habermas analysis (guide questions)			<u>م</u>	38^	ssignment		https://dentRiesproject.eu/wp- content/uploads/2022/12/Example-of-a-textbook-analysis- with-Habermas-Lens.pdf	https://identifiesoroiect.eu/wp: content/uploads/2022/12/Example-of-a-textbook-analysis- with-Habermas-lens.odp	Show an example of analysis of a textbook using Habermas' lens and and ask the students to look in the texts for explicit elements referring to such dimensions.
			Epistemological analysis of textbooks (Physics, volume 1, by James S. Walker, 2017)			<u>م</u>	<u>کگ</u>	ssignment		https://identRiesproject.eu/wp. content/uploads/2022/12/03_Text-Analysis_PART-2.pdf	https://identitiesproject.eu/wp. content/uploads/2022/12/03_Text-Analysis_PART-2.odp	Introduction to the FRA categories as an analytical tool for textbooks analysis. Students are engaged in identifing and recognizing aims and values, scientific practices, methods and methodological rules and knowledge in the chapter.
Wrap-up activities		This block aims to make the students reflect on the curve and proof as epistemological activators	Discussion on the comparison between Galileo and Walker			<u>م</u>	38	orum	1.6			Students are engaged in a collective discussion to reflect on the differences between the proof in the Walker's textbook and the Galileo's one. In particular students are guided to reflect on the different structure, functions of the proof, assumptions, etc.
	p-up vities		Discussion on novel elements of activators (e.g. curves and proofs)			<u>م</u>	38),	amboard				Students are invited to reflect individually (through the jamboard) and then collectivily on the curve and the proof as epistemological activators.
		Evaluating tool	Final report			\bigcirc	ڰٳ	ournal	Home workload	http://identifiesproject.eu/wp_ content/uploads/2022/12/Final-evaluation.pdf	https://identitiesproject.eu/wp- content/uploads/2022/12/Final-evaluation.odg	Students where asked to individually answer to some questions about the role of proof and curve in the two historical episodes, the disciplinary and interdisciplinary aspects of those, the learning potentialities of introducing the two episodes from an historical and interdisciplinary perspective.

Legend

