SIMULATIONS OF COMPLEX SYSTEMS

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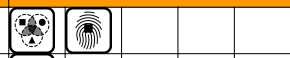
https://identitiesproject.eu/simulations-of-complex-systems/

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
Complex systems in physics and sciences	Exploring the properties of physical complex systems (non-linearity, high sensitivity to initial conditions, circular causality, emergent properties)	Introduction to complex systems in physics				Assignment	1 h	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_01_intro_complex_systems_physics.pdf	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_01_intro_complex_systems_physics.odp	
Complex systems education	Exploring the basics of research in science education about teaching and learning complexity	Introduction to complex systems education				Assignment	2 h	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_02_complex_systems_education-1.pdf	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_02_complex_systems_education-1.odp	
		Search for an explanation of the movement of sand dunes				Chat		https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_02_dunes_text.pdf	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_02_dunes_text.odt	After the participants' work in groups, the instructor invites the groups to present their reasonings and explanations.
		Analysis of the problem of sand dunes				Assignment		https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_03_sand-dunes-analysis.pdf	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_03_sand-dunes-analysis.odp	
Simulations of complex systems: examples of equation-based and agent-based simulations	Discussing definitions of simulation and presenting three main approaches: the equation-based, agent-based and network-based ones	Simulations of complex systems: examples of equation-based and agent-based simulations				Assignment	3 h	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_04_simulations-of-complex-systems.pdf	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_04_simulations-of-complex-systems.odp	
Equation-based, agent-based and network-based epidemiological models and simulations	Discussing definitions of simulation and presenting three main approaches: the equation-based, agent-based and network-based ones	Equation-based, agent-based and network-based epidemiological models and simulations				Assignment	4 h	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_05_epidemiological-models.pdf	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_05_epidemiological-models.odp	
		Extending the SIR equation-based model				Assignment		https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_05_extending-SIR.pdf	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_05_extending-SIR.odt	After the participants' work in groups, the instructor invites the groups to present their results, and asks both the mathematical formulation of the model and the graphical representation.
		Exploring SIR equation-based simulation				Assignment		https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_05_exploring-equation-based-simulation.pdf	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_05_exploring-equation-based-simulation.odt	The simulation proposed is equipped with a guide that the instructor and the participants can access to investigate more in depth how the simulation works.
		Formulating SIR agent-based model				Assignment		https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_05_formulating-agent-based-model.pdf	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_05_formulating-agent-based-model.odt	After the participants' work in groups, the instructor invites the groups to present their rules and models.
		Reading SIR agent-based simulation				Assignment		https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_05_reading-agent-based-simulations.pdf	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_05_reading-agent-based-simulations.odt	In case of need, the participants can be encouraged to access the NetLogo user guide in order to clarify how the different parts of code function.
		Designing an epidemiological network				Assignment		https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_05_designing-a-network.pdf	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_05_designing-a-network.odt	A possible difficulty can be observed and it is related to the superposition, in participants' answers, between the structure of the network and the possible evolution of a contagion phenomenon in this network. The focus of the activity is on the first issue.
Comparing equation-, agent-, and network-based model	Reflecting on the entire module from an epistemological and interdisciplinary perspective	Comparing equation-, agent-, and network-based models				Assignment	2 h	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_06_epistemological-comparison.pdf	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_06_epistemological-comparison.odg	
		Table for models' comparison				Assignment		https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_06_comparison-approaches.pdf	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_06_comparison-approaches.odt	In case of lack of time, the discussion can be developed in the whole classroom group instead than in small groups with following discussion.
		Interdisciplinary analysis of the module: in search of disciplinary boundaries in simulations and complex systems				Jamboard		https://identitiesproject.eu/wp-content/uploads/2022/11/Question-for-post-activity.pdf	https://identitiesproject.eu/wp-content/uploads/2022/11/final-questionnaire.odt	
		Detection of boundaries and disciplinary identities				Assignment		https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_07_interdisciplinary-analysis.pdf	https://identitiesproject.eu/wp-content/uploads/2022/12/CSS_07_interdisciplinary-analysis.odt	In case of lack of time, the discussion can be developed in the whole classroom group instead than in small groups with following discussion.

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