EFForTS-Education – Knowledge Transfer regarding Research on Tropical Lowland Rainforest Transformation Systems into Indonesian Teacher Education

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Background:

- Collaborative Research Centre 990 - **EFForTS**: ***E****cological and Socioeconomic* ***F****unctions of Tropical Lowland Rain****for****est* ***T****ransformation* ***S****ystems* (Sumatra, Indonesia) investigates land-use change in Jambi Province[1].
- Science-based knowledge as generated by EFForTS is crucial for informed decision-making concerning sustainable land-use.
- From Science Education perspective, land transition towards crops, e.g., oil palm and rubber, and its effects can be classified as **Socioscientific Issue (SSI).**
- Need for teacher training on such a factually and ethically complex, controversial SSI in Indonesia[2] and worldwide[3].
- Teacher educators and teachers act as change agents and multipliers for **SSI** teaching and learning.

Figure: Making EFForTS-Education available with Indonesian partners from Sumatra, Java, Bali and Sulawesi.

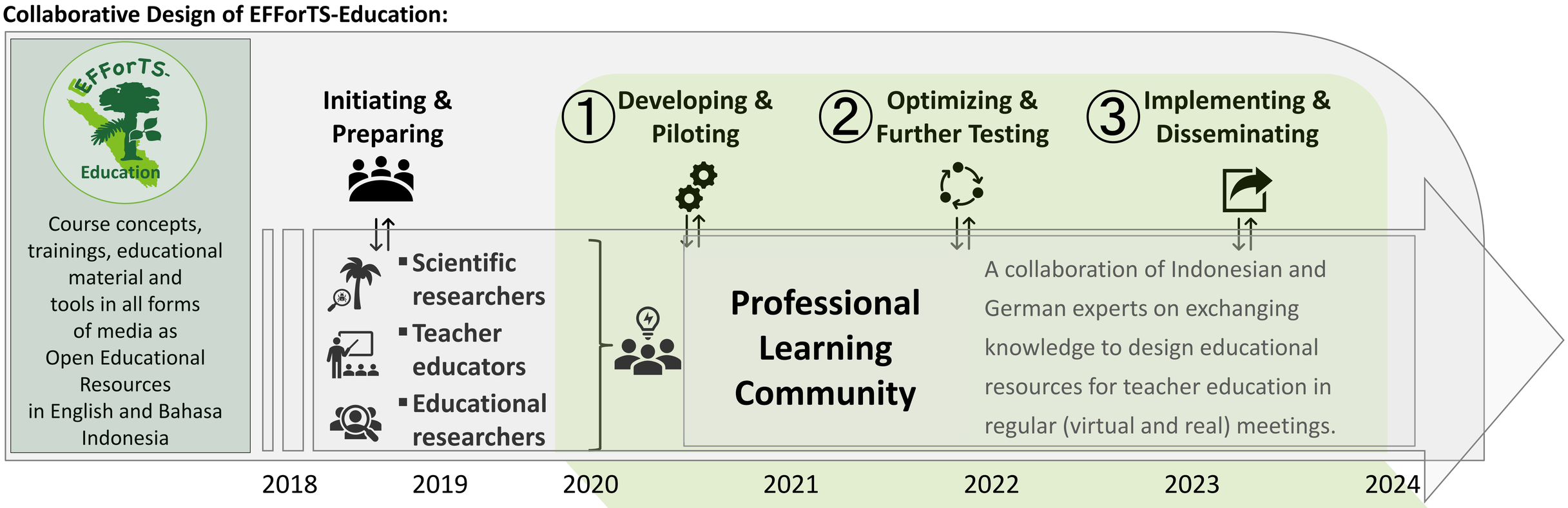
Goals:

- Qualifying (teacher) educators for teaching EFForTS-related Socioscientific Issues (SSIs) and fostering corresponding competencies
- Developing evidence-based EFForTS educational resources
- Implementing EFForTS-education into Indonesian higher education, evaluating the effects and dissemination in Indonesia and worldwide

Research questions:

- How can EFForTS-related SSIs be reconstructed and evaluated for SSI teaching and learning in Indonesian teacher education?

Collaborative Design of EFForTS-Education:



Educational Reconstruction of EFForTS-Research using the *SSI teaching and learning model* [3]

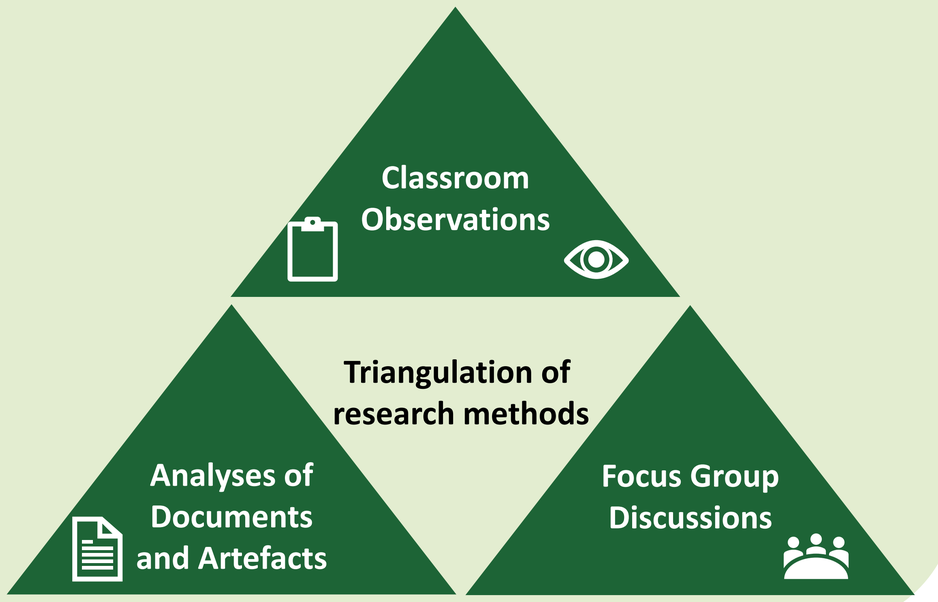
Exemplary Course Concepts of EFForTS-education	**Phases of Course Concepts based on the SSI Teaching and Learning model** Learning objectives: ➢ Understanding and applying of Scientific practices, Disciplinary Core Ideas, and Cross-cutting Concepts of EFForTS-Research ➢ Decision-making and socioscientific reasoning including scientific inquiry, perspective-taking and dealing with complexity.		
	(1) Encounter Focal Issue in context of land-use change in Jambi province	**(2) Engage with EFForTS-Research** (topics, methods, and findings)	**(3) Synthesize Key Ideas & Practices** for application and transfer to further contexts
I) ***Biodiesel from Palm Oil****: Impact of Land-Use Transformation on Biogeochemical Cycles*	Identification of - preconceptions and controversial positions regarding palm-oil-based biodiesel - ecological and socio-economic consequences of biodiesel production and consumption	Engagement with - Life Cycle Analyses (LCA) of palm-oil-based biodiesel - measurement methods for meteorological parameters and biogeochemical cycles in oil palm plantations	- Development of own LCA for different management scenarios of plantations - Discussion on potentials and limits of LCA and future of palm-oil-based biodiesel - Reflection with respect to the focal issue
II) ***Agent-based modeling*** *– socio-economic and ecological impacts of farmer households' decisions and behaviors*	- Perception of multi-perspective narratives of farmer households on land-use decisions and their socio-economic and ecological impacts - Identification of synergies & trade-offs	Engagement with Agent-Based Modeling (ABM) - Development of agent-based flowchart as initial model - Practice with (premade) educational ABM (Netlogo)	- Revision of agent-based flowchart and transfer to further contexts of land-use - Outlook on EFForTS ABM and landscape-level assessment - Reflection with respect to the focal issue
III) …			

Formative and Summative Evaluation

Mixed-methods approach following Design-Based Research[4]

Questionnaires on

- **self-efficacy beliefs** to SSI in the context of land-use change
- **competence assessment** for decision-making and perspective-taking.



Outlook

How effective is the resulting training with educational course concepts and the corresponding materials?

Literature:

[1]Drescher, J., Rembold, K., Allen, K., Beckschäfer, P., Buchori, D., Clough, Y., et al. (2016). Ecological and socio-economic functions across tropical land use systems after rainforest conversion. *Philosophical Transactions of the Royal Society of London. Biological Sciences*, *371*(1694).
[2]Subiantoro, A. W. (2017). *Promoting Socio-scientific Issues-based Learning in Biology: Indonesian Students' and Teacher's Perceptions and Students' Informal Reasoning* (Curtin University). Curtin University, Perth.
[3]Sadler, T. D., Foulk, J. A., & Friedrichsen, P. J. (2017). Evolution of a Model for Socio-Scientific Issue Teaching and Learning. *International Journal of Education in Mathematics, Science and Technology*, *5*(2), 75.
[4]McKenney, S. E., & Reeves, T. C. (2019). *Conducting educational design research* (Second edition). London ; New York: Routledge.

DFG Deutsche Forschungsgemeinschaft German Research Foundation

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