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Klaassen, R.G.; MacLeod, Miles; Nizamis, Kostas; Isaac, Siara

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EDITED AND REVIEWED BY
Hui Luan,
National Taiwan Normal University, Taiwan

*CORRESPONDENCE
Renate G. Klaassen
✉ r.g.klaassen@tudelft.nl

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Editorial: Integrating epistemological fluency in interdisciplinary learning

Renate G. Klaassen^{1*}, Miles A. J. MacLeod^{2,3}, K. Nizamis⁴ and
Siara R. Isaac⁵

¹EEMCS, Delft Institute of Mathematics, Prime- Research, Delft University of Technology - 4TU Centre for Engineering Education, Delft, Netherlands, ²Department of Philosophy, Faculty of Behavioural, Management and Social Sciences, University of Twente, Enschede, Netherlands, ³University of Twente, Enschede, Netherlands, ⁴Faculty of Engineering Technology, University of Twente, Enschede, Netherlands, ⁵Center for Learning Sciences, Ecole Polytechnique Federale de Lausanne, Lausanne, Geneva, Switzerland

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Editorial on the Research Topic

Integrating epistemological fluency in interdisciplinary learning

Introduction

Learning increasingly occurs in collaborative, emerging, complex and dynamic situations in which moving problems, changing contexts, and the need to rely on a plethora of methods from multiple disciplines are the new normal (Ankrah and Al-Tabbaa, 2015; Lury, 2021; Dooremalen et al., 2007, p. 559). Many view interdisciplinary education as a “solution” to this emerging complexity (Markauskaite et al., 2024). This Research Topic, “*Epistemic Fluency in Interdisciplinary Learning Environments*,” is a collaborative exploration of ‘How uncertainty about knowing, the discovery of epistemological gaps, and different knowledge systems and environments impact the development of epistemic fluency.’ The relevance of this Research Topic lies in its potential to provide researchers and educators with insights and frameworks in interdisciplinary learning design. Epistemic fluency is the ability of a learner to understand, switch between and combine different types of knowledge sources while participating in knowledge creation within various inter- and transdisciplinary learning environments in Higher Education (Markauskaite and Goodyear, 2018).

Modes of learning and epistemic fluency

In our call for studies, we utilized Savin-Baden’s concept of “modes of learning,” also referred to as levels of knowing, to identify the situated conditions that support students in developing epistemic fluency—the modes of learning increase in terms of complexity, uncertainty, and gaps in knowledge. Savin-Baden (2008, 2014, 2020) identified five levels of knowing (Figure 1), which she defines as “modes of learning,” each with a different learning focus:

1. Mode 1 represents a traditional learning environment.
2. Mode 2 transcends different existing disciplines, inquiry, and problem-solving practices.



FIGURE 1
Modes of learning adapted from Savin-Baden (2014); Markauskaite and Goodyear (2018).

3. Mode 3, which involves creating new knowledge, is becoming increasingly challenging.
4. Mode 4 puts the learner in control orchestrating input, learning, and knowledge application.
5. Finally, mode 5 refers to the professional who supposedly orchestrates their learning relevant to a specific context and its requirements.

We assume these modes of learning represent levels of interdisciplinary complexity in learning contexts and help design and navigate interdisciplinary learning.

Learning modes in this Research Topic

Interdisciplinary learning environments at the Mode 2 level (Figure 1), which transcend existing disciplines and inquiry and problem-solving practices, are discussed in the articles by Beckerle et al. and van Goch. Beckerle emphasizes the need to develop shared terminology to facilitate integration through collaborative learning, the use of diverse instructional methods, and structured guidance. These elements of curriculum design not only enable learners to acquire epistemic fluency as they move between different disciplinary perspectives but also inspire cognitive development through reflection and interaction with broader academic contexts. However, misalignment between the target group and the context can lead to unintended outcomes. Indeed, this underscores the challenges of learning epistemic fluency. It shows the boundary conditions by handling practical constraints, the necessity of making collaboration work, and discovering and accessing relevant sources.

Norris et al. focus on **mode 3** (Figure 1), the creation of new knowledge. Students learn to determine through systems engineering practices and the acquisition of competencies which systems modeling approaches contribute to operating in increasingly complex systems.

These practices include reducing complexity by creating problem schemata involving reductionism, prior experience, and assessment prompt-driven approaches. This process enables students to develop fluency by identifying knowledge gaps and relevant constructs in addition to employing analogical reasoning with specific tools across various domains.

Another approach in **mode 3** (Figure 1) is the more attitudinal approach, which addresses how teachers can scaffold students' learning of meta-cognitive strategies to deal with uncertainty (Bohm et al.), and addresses how to acquire intellectual humility as a precursor to epistemic fluency (Sivakumar and Boon). Bohm et al. uncovers the metacognitive skills needed to deal with uncertainty, such as interactional skills to collaborate with stakeholders, coping mechanisms on a personal level, and a different attitude that embraces empathy, flexibility, and relativism. Sivakumar and Boon argues that epistemic fluency can be achieved through practicing intellectual humility which involves (i) the ability to question one's perspectives and beliefs, (ii) the recognition that diverging perspectives exist, (iii) the willingness to learn about other disciplinary viewpoints and their underlying assumptions, and (iv) the understanding and appreciation of the role these differing perspectives play in an interdisciplinary setting.

Lambalgen and Vos explain how knowledge emerges in an interdisciplinary research course in a liberal science arts bachelor's program in **mode 4** (Figure 1). They ask, "How do students making use of the platform Miro solve interdisciplinary problems

in teams?” The particularly examined the processes of concept construction, conflict, co-construction, and integration levels as a mental process for students who engage in boundary crossing through an artifact in interdisciplinary research. Importantly, they point out the enlightening fact that epistemic fluency is not a competence with a beginning or an end. Rather, it is a regenerative process that emerges from different starting points and iterates to various or more in-depth types of epistemological knowing, facilitated through reflection on and in action. Group participation is considered to be necessary to enhance the level of interdisciplinary integration and the development of epistemic fluency.

Discussion and conclusion

How does one acquire epistemological fluency for inter- and transdisciplinary practices, and how do we shape the educational environment to accommodate this type of learning? This is typically bound to (1) how knowledge emerges, (2) the nature of knowledge and (3) the situatedness of learning. This means that each context needs to be unraveled along these three dimensions to offer appropriate methods and scaffolds for learning. Based on the notion of pedagogical modes, we found that epistemological fluency takes on a different color for different modes of learning offered. The environment thus provides an opportunity to experience responsibility for learning, critical reflection, collaboration, and the co-construction of knowledge within dialogic, triologic, and professionally situated ecosystems or environments.

Learning occurs within an epistemic environment that fosters activities and participation to enhance epistemic fluency. The ability of students to navigate these different modes of learning shows the effectiveness of instructional designs and the acquisition of epistemic fluency competencies in interdisciplinary education. Contributions to this Research Topic focus on attitudinal skills

that foster epistemic fluency and guide decision-making. Moreover, they help identify instructional design indicators and constraints in different learning modes intended to foster epistemic fluency in interdisciplinary learning contexts.

We hope this Research Topic will be a valuable resource for researchers and educators by providing new insights and frameworks for learning epistemic fluency in inter- and transdisciplinary contexts, and for instructional design.

Author contributions

RK: Writing – original draft, Writing – review & editing. MM: Writing – review & editing. KN: Writing – review & editing. SI: Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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