Facilitating teachers' interdisciplinary collaborative diagnostic reasoning in simulation-based learning

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Collaborative Diagnostic Reasoning

- Teacher collaboration is considered a central feature of school quality and a key driver for school development processes, however, it's potential for instructional development in the context of digitalization has not yet been fully exploited (Drossel et al., 2022)
- An effective means for collaboratively developing teaching practice is **peer feedback** (Hammerness et al., 2005)
- Research suggests that **diagnostic competence** is a crucial prerequesite for delivering effective feedback (e.g. Prilop et al., 2024)
- As approximations of practice (Grossmann et al., 2009) simulations can reduce the complexity of real-life teaching situations and thus help improve diagnostic competences (Heitzmann et al., 2019)
- According to the model by Radkowitsch et al. (2022) two or more individuals generate a joint diagnosis by engaging in **diagnostic** and **collaborative problem-solving activities**
- The integration of collaborative problem-solving and diagnostic reasoning in teacher collaboration provides a framework for collaboratively enhancing diagnostic competences in simulation-based learning environments.

Collaborative Problem-Solving: „process whereby two or more agents attempt to solve a problem by sharing the understanding and effort required to come to a solution and pooling their knowledge, skills and efforts to reach that solution" (OECD, 2013, p. 6)

Diagnosing: „the goal-oriented collection and interpretation of case-specific or problem-specific information to reduce uncertainty in order to make […] educational decisions." (Heitzmann et al., 2019, p. 4)

Collaborative Diagnostic Reasoning (CDR; Radkowitsch et al., 2022)

The Role of Interdisciplinarity

- Interdisciplinary teacher collaboration enables the inclusion of multiple perspectives on the simulations (Pickal et al., 2023) which enhances the co-construction of knowledge (Roschelle & Teasley, 1995)
- The current pilot study investigates teacher dyads' engagement while diagnosing a teaching video in order to shed light on the collaborative patterns of teachers with diverse backgrounds and to derive suitable scaffolds for the facilitation of teachers' CDR on a simulation-based learning environment
- **Research Question:**
  To what extent do diagnostic and collaborative activities differ in the collaborative diagnosis of teaching videos between interdisciplinary teacher teams and teachers from the same discipline?

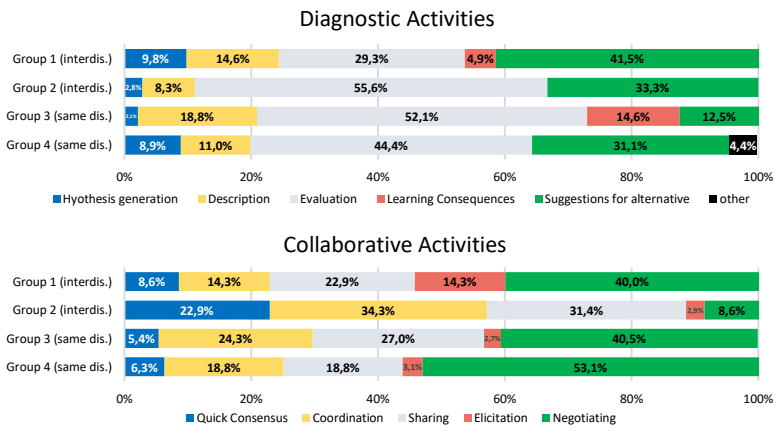
Method

Group	Study Discipline	Age	Sex	Topic of the Video	Topic of Diagnosis
1 Interdisciplinary	Chemistry Edu. (MA) Chemistry (BA)	32 27	m f	Science: State of Matter (3:30)	Cognitive Activation
2 Interdisciplinary	English Edu. (BA) Physics Edu. (BA)	42 19	f f	Science: State of Matter (3:30)	Cognitive Activation
3 Same Discipline	Science Edu. (BA) Science Edu. (BA)	25 20	m f	Science: State of Matter (3:30)	Cognitive Activation
4 Same Discipline	English Edu. (MA) English Edu. (BA)	26 42	m f	English: Past Tense (5:07)	Constructive Support

Procedure:

1. Individual, video-based diagnosis of teacher behavior on a web-based video-platform
2. Collaboration: exchange in dyads about diagnosis and creation of joint feedback for the observed teacher on the platform ZOOM
3. Coding of the transcribed discussions according to diagnostic (Heitzmann et al., 2019; Kramer et al., 2021a) and collaborative activities (Liu et al., 2015, von Davier et al., 2017)

Results



Examples of Dominant Collaborative Activities

Negotiating (Group 1; interdisciplinary)

	Coded Segment	Collaborative Activity	Diagnostic Activity
Speaker 1 (Chemistry, teacher education)	What did you write down as an alternative approach?	Elicitation	Suggestions for alternative
Speaker 2 (Chemistry)	So, um, for example, one could give the students homework as preparation beforehand. Not just listening in school first, but rather: please read this paragraph and prepare it for tomorrow. This way, the students might develop a better understanding of the tasks	Sharing	Suggestions for alternative
Speaker 1 (Chemistry, teacher education)	Do you think that activates students? I mean, homework and assignments aren't exactly the most popular among students, right? I'm not sure if that really activates them.	Negotiating	Suggestions for alternative
Speaker 2 (Chemistry)	Okay, yeah, that's true, they are still young. (..) Hmm. Yeah, I think I'm being too ambitious, but what is your suggestion?	Negotiating/ Elicitation	Suggestions for alternative

Coordination (Group 2; interdisciplinary)

	Coded Segment	Collaborative Activity	Diagnostic Acivity
Speaker 1 (Englisch, teacher education)	Okay, so the first question, you can interrupt me at any time, um, that doesn't bother me at all. […] So the first question was, um, is the person successful in the cognitive activation?	Coordination	Evaluation of teacher behaviour

Quick Consensus (Group 2; interdisciplinary)

	Coded Segment	Collaborative activity	Diagnostic Activity
Speaker 1 (Englisch, teacher education)	And I do think so, um, he asks open-ended questions, he gives hints, he doesn't present a solution, um, he incorporates movement, he relates to everyday life […] I think he has good participation from his students. So in my opinion, it's totally fine.	Sharing	Evaluation of teacher behaviour
Spreaker 2 (Physics, teacher education)	Yeah, that's what I thought.	Quick consensus	Evaluation of teacher behaviour

Discussion

- Group 2: High proportion of Quick Consensus (22.9%), low proportion of Negotiating (8.6%)
- ➢ The collaborative pattern of this interdisciplinary group differs noticeably from the other groups in terms of collaborative activities
- Transactivity (a measure of how learners refer to their partner's contributions) is considered a strong predictor of learning success in collaborative problem-solving settings (Noroozi et al., 2013)
- ➢ Possible scaffold to support negotiating in (interdisciplinary) collaboration: transactive CSCL script (Fischer et al., 2013)
- Coordination taks up relatively high proportion in the problem-solving process (average 23% of all codes)
- ➢ Possible Scaffold to reduce coordination effort: text-based (asynchronous) discussion

Conclusion

- Due to the exploratory nature of the study and the sample size (n=4), the results are not generalizable. However, the findings suggest that (inter)disciplinarity could act as a predictor for teachers' collaborative behavior
- Further quantitative studies with larger sample sizes are planned to support this hypothesis.

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Funded by the European Union NextGenerationEU
Federal Ministry of Education and Research