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Editorial: Evidence-informed reasoning of pre- and in-service teachers

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Editorial on the Research Topic

Evidence-informed reasoning of pre- and in-service teachers

Evidence-informed reasoning as an important requirement for pre- and in-service teachers

How can I help my students acquire the skill of dividing fractions? How can I increase my students' learning motivation? What is the reason for Fiona's learning difficulties? These are just a couple of problems that teachers face in their classes on a daily basis. To competently cope with such problems, teachers should be able to retrieve, use, and apply evidence from Educational Science, Educational Psychology, and subject-matter didactics, and, in that way, engage in "evidence-informed reasoning" (e.g., [Greisel et al., 2023](#)).

This Research Topic assembles scientific contributions that refer to four questions: (1) What does evidence-based education mean and why is it important? (2) What are barriers for pre- and in-service teachers' evidence-informed reasoning? (3) How can pre- and in-service teachers' evidence-informed reasoning be scaffolded? (4) How does in-service teachers' evidence-informed reasoning impact student performance?

The contributions within this Research Topic

What does evidence-based education mean and why is it important?

In their contribution, [Dekker and Meeter](#) discuss and evaluate the arguments with which evidence-based education and especially the view that randomized controlled trials should be regarded most important to inform educational practice are criticized. Taking the critique into account, they propose not to dismiss evidence-based education in general and randomized controlled trials in particular, but show how they should be administered and complemented to be more informative to research and practice.

What are barriers for pre- and in-service teachers' evidence-informed reasoning?

Three contributions of this Research Topic show that *unfavorable beliefs and low trust toward educational science* may act as barriers for pre- and in-service teachers' evidence informed-reasoning:

Voss presents three empirical studies that indicate that pre-service teachers tend to hold skeptical beliefs about the importance of educational science for the solution of educational problems, especially when they have little experience with educational science as a domain, and when they have a background in natural sciences. In turn, such unfavorable beliefs seem to go hand in hand with pre-service teachers' low engagement in educational science courses.

Schmidt et al. investigate to what extent in-service teachers trust knowledge claims from educational research. They find that teachers' trust in claims from educational research is higher than their trust in claims made on the basis of anecdotal evidence, and that their trust in educational science is positively related to general trust in science. Yet, the authors also show that teachers trust knowledge claims from educational research more when they confirm their prior beliefs.

Similarly, Futterleib et al. show that pre-service teachers tend to devalue findings from educational science when they do not confirm their prior beliefs. However, this only seems to apply when the evidence is strong and unambiguous. If the evidence leaves more room for interpretation, pre-service teachers might find other ways to protect their beliefs instead of devaluing science. Furthermore, pre-service teachers assess educational science as pertinent to investigate educational topics independent of whether they are confronted with belief-challenging evidence.

Two articles of this Research Topic show that pre- and in-service teachers' *suboptimal skills regarding the retrieval and argumentative use of educational evidence* may act as another barrier for pre- and in-service teachers' evidence-informed reasoning:

Zimmermann et al. investigate how pre-service teachers search for information on educational topics on the internet. They find that pre-service teachers' search strategies are often suboptimal, especially when it comes to evaluating the trustworthiness of websites and the quality of their content. Yet, even though the authors hypothesized that the employment of advanced search strategies should depend on pre-service teachers' internet-specific epistemological beliefs, the results do not support this assumption.

Bauer et al. demonstrate that pre-service teachers often have difficulties using evidence from educational science when arguing for or against diagnostic judgments. They show empirically that diagnostic argumentation consists of three facets (justification of a diagnosis with evidence, disconfirmation of differential diagnoses, and transparency regarding the processes of evidence generation) and demonstrate that pre-service teachers often perform poorly on all three of these facets when arguing for or against certain diagnostic judgments.

Finally, two articles in this Research Topic stress the problem that pre- and in-service teachers sometimes *lack appropriate scientific knowledge and hold misconceptions* on important educational evidence that guide their decision-making processes:

The study by Surma et al. indicates that novice secondary school teachers hold widespread misconceptions regarding the effectiveness of different study strategies. Additionally, they demonstrate that novice teachers are unaware of specific strategies that educational research has shown to be effective (such as summarizing or spaced practice). These findings call for interventions that help novice teachers acquire scientific and sound knowledge on effective study strategies.

Similarly, Ferguson and Bråten show that for some topics (such as the alleged existence of learning styles), misconceptions and educational myths are also prevalent among Norwegian pre-service teachers, while for other topics, they seem to argue in an evidence-informed manner. Further, Norwegian pre-service teachers seem to focus especially on teacher behavior as cause for student performance and less on student factors. In general, participants rarely refer to educational research during pedagogical decision-making.

How can pre- and in-service teachers' evidence-informed reasoning be scaffolded?

The contributions introduced so far indicate a clear need for interventions that help pre- and in-service teachers develop their beliefs and competences regarding evidence-informed reasoning further. Six articles in this Research Topic investigate how such interventions could look like:

Rochnia and Gräsel investigate how to increase the utility value pre-service teachers attribute to educational sciences when solving pedagogical problems. Pre-service teachers read a short description of either empirical results or a theoretical reflection model which both illustrated the utility of educational sciences. Then, they had to summarize it or connect it to their own lives. While utility value was found to increase in all conditions, the four interventions did not differ in their effects.

Grimminger-Seidensticker and Seyda study how attitudes and self-efficacy toward inclusive teaching among physical education pre-service teachers can be supported. Their participants either received an information-based seminar, a seminar that combined theoretical input with practical exercises, or no training. While pre-service teachers' self-efficacy did not change in any condition, the intervention that combined theory input with practical exercises showed the most positive effects on some of their attitudes toward inclusive teaching.

Engelmann et al. focus on improving pre-service teachers' abilities to critically appraise scientific literature. After all participants were introduced to a set of criteria to appraise scientific evidence, they were provided with model solutions to several pedagogical problems and either explained them to a learning partner (interactive condition) or to themselves (constructive condition). While students' skills improved significantly from pre- to post-test, no differential effects for the experimental conditions appeared.

Krause-Wichmann et al. compared the effects of different sample solutions pre-service teachers received after they had analyzed an authentic classroom case. These solutions either

included example-free or example-based instruction on functional procedures, and were combined with either example-free, example-based or no instruction on dysfunctional procedures. The authors find example-based instruction, both on functional and on dysfunctional procedures, to work best in order to help pre-service teachers develop their evidence-informed reasoning scripts further.

Lohse-Bossenz et al. report on the development of a vignette-based instrument to measure pre-service teachers' abilities to apply scientific knowledge in ambivalent educational situations. Participants were well able to spot the differences in the quality levels of teacher behavior that were described in the different vignettes. Further, a second study shows that an intervention that was designed to improve participants' theoretical knowledge led to a further increase in students' performance.

Tannert et al. investigate how best to scaffold pre-service teachers' conceptual knowledge and reasoning about video cases through signaling. In one condition, participants were informed about the use of signals within the videos, whereas students in the other condition were not. Results indicate that pre-service teachers from the informed condition acquired more conceptual knowledge than their uninformed counterparts, while there were no differential effects on reasoning.

How does in-service teachers' evidence-informed reasoning impact student performance?

Groß Ophoff et al. investigate the impact of teachers' engagement with educational research on student performance. Their findings show that students of teachers from schools with a strong climate toward research use indeed perform better than students of teachers working at schools that are less research-informed. Further, they find that trust among colleagues and organizational learning has a positive impact on research use climate, which in turn acts as a mediator for student performance.

Conclusions

The articles assembled in this Research Topic provide important answers on what evidence-informed reasoning is,

what barriers pre- and in-service teachers face when engaging in evidence-informed reasoning, how their evidence-informed reasoning skills can be scaffolded, and what impact teachers' evidence-informed reasoning has on student performance. That way, the contributions in this Research Topic hold great potential to inform educational practice, research, and policy-making.

Author contributions

IK provided a first draft of this article and finalized the manuscript. MG, TK-W, and RS commented extensively. All authors contributed to the article and approved the submitted version.

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Conflict of interest

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