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Can the utility value of educational sciences be induced based on a reflection example or empirical findings—Or just somehow?

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Educational sciences are a major component of German teacher education. However, student teachers often do not consider educational sciences in university courses (a profession-specific combination of educational psychology, pedagogy and sociology) as helpful for the practice of teaching. To prepare future teachers for evidence-based practice, this is a disadvantageous motivational starting point, because educational sciences offer a large amount of current and relevant findings that can have a positive impact on educational practice. Thus, it would be beneficial for student teachers to see the utility value of educational sciences. The present study attempts to encourage student teachers to perceive the utility value of educational sciences with a utility value short intervention. Utility value interventions contribute to connecting the learning content with one's own life to foster the motivation to use scientific knowledge. A 2×2 quasi-experiment was conducted. Two of the four groups received a utility value short intervention about educational sciences (Factor 1). In addition, a second factor was analyzed that takes up two patterns of educational reasoning in teacher education (Factor 2): Reasoning was either exemplified with an instruction to reflect on the usefulness of educational sciences (like in reflection-oriented educational reasoning) or with exemplary empirical findings from educational sciences (like in evidence-based educational reasoning). These two kinds of reasoning are objectives of teacher education and therefore could influence the effect of a utility value short intervention. Since epistemic goals influence engagement with educational sciences, they are also taken into account. The results showed that all four variants of the treatment increased the students' assessment of the utility value of educational sciences; the utility value intervention had no additional effect. This is discussed with recourse to motivational theories and concepts of teacher education.

KEYWORDS

utility value, evidence, reflection, educational sciences, teacher education

Introduction

In teacher education, there is a broad consensus that university courses in educational sciences—a profession-specific combination of educational psychology, pedagogy and sociology—are useful for evidence-based pedagogical practice (Slavin, 2008; Ferguson, 2021; Fischer, 2021; Renkl, 2022). Our understanding of evidence-based pedagogical practice follows Stark's (2017) broad conceptualization of evidence: Empirical findings and theories are pedagogical knowledge from educational sciences and contribute to ground pedagogical practice on a scientific basis. Educational sciences can therefore be understood as one source of evidence-based practice. This theoretical approach also underpins the fact that there is no direct linear application of evidence to practice. Bromme et al. (2014) emphasized that applying educational sciences is not a linear transfer of rules of action. Rather, applying educational sciences is about using it as a resource to interpret and reflect practice (e.g., *theoretical goggles* at Neuweg, 2013, p. 305; Neuweg, 2022, p. 45).

The scientific consensus on the usefulness of educational sciences is supported by findings regarding teachers' pedagogical knowledge. Teachers' pedagogical knowledge acquired in university courses of educational sciences is correlated positively with teaching quality, self-efficacy and student learning outcomes (Voss et al., 2011; König and Pflanzl, 2016). This means that when teachers have more pedagogical knowledge about the theories and empirical findings of educational sciences, they are more confident in teaching successfully under critical conditions. Furthermore, they realize better teaching and learning. This outlines the usefulness of educational sciences from an evidence-based point of view. However, evidence from educational sciences needs interpretation and can be understood as a step toward applicable knowledge (Groß Ophoff and Cramer, 2022, Figure 1). Such engagement with evidence from educational sciences is influenced by affective-motivational variables (Groß Ophoff and Cramer, 2022). Accordingly, these variables, such as usefulness, can support evidence use. This is underpinned by the effect of teachers' instrumental attitude on the use of data ($\beta = 0.25$; Prenger and Schildkamp, 2018). This finding suggests that when teachers believe in the improvement potential of data and evidence, they are more likely to engage with it. Prenger and Schildkamp (2018) pointed out that it is necessary to demonstrate the importance of research. Since evidence stems from educational sciences, the need to demonstrate its importance also counts for educational sciences.

German student teachers are prepared during teacher education to acquire knowledge from educational sciences and to learn how to apply it in teaching (Stark, 2017; Gogolin et al., 2020). In this context, applying educational sciences means that theoretical and empirical knowledge from educational sciences is used to analyze and cope with situations and requirements of classroom teaching (Bauer et al., 2015). An example with a focus on theory: A student teacher wants to make her lessons in an internship less disruptive. To achieve this, she draws on Kounin (2006) thoughts on disruption prevention and strives for teacher wittiness to prevent classroom disruptions. This process of using educational sciences when confronted with practical requirements can be understood as evidence-based reflection on school practice, which is a preparation for evidence-based pedagogical practice (Cramer et al., 2019; Hartmann et al., 2021). For this process, motivation to engage with educational sciences is required (Bauer et al., 2017).

However, findings show that student teachers lack motivation to engage in educational sciences. Diery et al. (2020) underpin that student teachers are more skeptical about the benefits of educational sciences for practice than teacher educators. A recent study by Voss (2022) pointed in the same direction. This can be interpreted as an indicator that student teachers are not fully convinced of the usefulness of educational sciences. Bråten and Ferguson (2015) also showed that student teachers favor knowledge from practitioners over scientific knowledge. This means that student teachers rate the opinions of teachers as more important for coping with school demands than scientific knowledge of educational sciences. Some studies have shown that the perceived usefulness of educational sciences depends on epistemic aims (Merk et al., 2017; Hendriks et al., 2021; Kiemer and Kollar, 2021). Student teachers generally find knowledge of educational sciences trustworthy for explanations and use it for academic requirements but consider it less relevant for practical requirements or fail to transfer scientific knowledge when dealing with practical educational tasks, such as preparing lessons (Merk et al., 2017; Hendriks et al., 2021; Kiemer and Kollar, 2021). This illustrates that the perceived usefulness of educational sciences depends on what aims the user pursues with the knowledge. Educational sciences might be rated as useful for one task and useless for another. Thus, epistemic aims shape engagement in educational sciences. In accordance, the current state of research illustrates that student teachers have problems perceiving the usefulness of educational sciences. This is an unfavorable motivational disposition for evidence-based reflection on school practice as preparation for evidence-based pedagogical practice. However, utility value intervention is a way to address this inappropriate motivational situation that is derived from expectancy-value theory (Wigfield and Eccles, 2000). In utility value interventions, learners perceive the usefulness of a learning content (Hulleman and Harackiewicz, 2021). Meta-analyses of utility value interventions show an effect size of $d = 0.24$ (Hulleman and Harackiewicz, 2021). According to expectancy-value theory (Wigfield and Eccles, 2000), value has three sources: intrinsic value, attainment value and utility value (Rosenzweig et al., 2019). These sources can be understood as potential starting points for interventions, with the goal of increasing motivation. The different sources have in common that they are important for new ways of seeing, doing, talking, knowing and thinking (Borg, 2010). We chose perceived utility value for designing the intervention in our study, because perceived utility value is more flexible than other sources of value. This flexibility is substantiated by the autonomy-supportive approach of utility value (Hulleman and

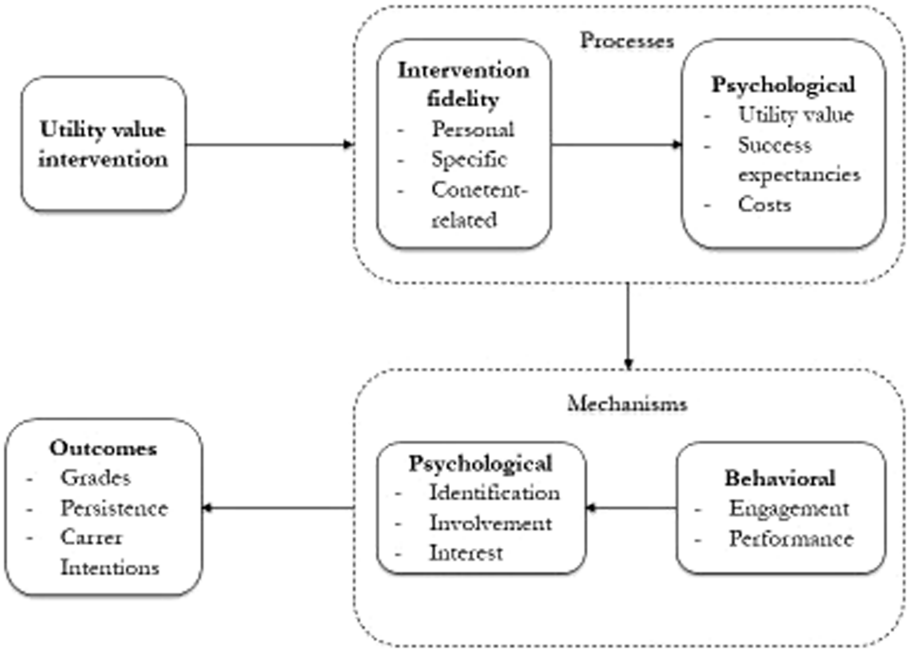

FIGURE 1
Utility value interventions logic model (Hulleman and Harackiewicz, 2021).

Harackiewicz, 2021): Student teachers are free to make their own connections between educational sciences and their lives but are still tied to the goals of teacher education to some degree. Another advantage of utility value interventions is the variability in intervention duration and content. There are short interventions that last about 5 min (Rosenzweig et al., 2019), medium ones that last 20 min (Kosovich et al., 2019), and long approaches that last around 90 min (Gaspard et al., 2015). Similarly, utility value can be fostered with different contents. Students can be asked to write a short essay or letter about the connection between a certain topic and their lives or to rate quotations for relevance and interest (Hulleman and Harackiewicz, 2021).

Recently, some studies have tried to encourage students to engage in educational sciences when dealing with practical educational tasks. Zeeb et al. (2019) promoted the integration of pedagogical knowledge and pedagogical content knowledge by emphasizing the relevance of different knowledge sources among student teachers. The researchers used examples that illustrated the relevance of integrated knowledge. Even though relevance and usefulness are different constructs, the effectiveness of the relevance instruction can serve as a theoretical orientation for usefulness. This is because interventions of usefulness and relevance work similarly (Hulleman and Harackiewicz, 2021). The results show that relevance instructions promote the use of evidence with a medium effect size, $\eta 2 = 0.10$ (Zeeb et al., 2019). A study by Lorentzen et al. (2019) followed a similar path. In that study, the authors successfully promoted the professional relevance of subject-related study content. Participation in the intervention correlated with the perceived relevance of the course as a whole ($\beta = 0.29$; Lorentzen et al., 2019).

All of these approaches have in common that they instruct student teachers on how to use educational sciences rather than letting them perceive the usefulness of educational sciences for themselves. From the perspective of utility value interventions, such approaches are less motivating because messages from external actors will not be internalized to the same degree as personally perceived utility value (Hulleman and Harackiewicz, 2021). Instead, student teachers should be encouraged to perceive the utility value of educational sciences by themselves. The authors point out that inducting utility value needs to take personal relations into account to trigger a mechanism of identification, involvement and interest. This means student teachers need an explanation for why educational sciences are useful but also need to think about the perceived usefulness of educational sciences for themselves and find opportunities to express the perceived usefulness. The present study aims to develop and investigate such an intervention according to the idea of utility value intervention. Due to Covid-19, this is more challenging than before (e.g., Hasselhorn and Gogolin, 2021). Online teaching became the status quo during the pandemic, and contact between student teachers and academic staff was reduced. Therefore, we decided to conduct an online utility value short intervention in educational sciences to avoid further burdening the tense teaching situation. This online short intervention can be implemented in teacher education seminars and lectures in a time-saving way. In the present study, we empirically tested a utility value short intervention.

Utility value as a predictor of the use of educational sciences

Increasing perceived utility value is about motivating students. One main reason for the lack of motivation is that students do not see why they should learn something about a certain topic (Hulleman and Harackiewicz, 2021). This is an adverse motivational disposition for the acquisition (and transfer) of knowledge. University education is also affected by this problem. For example, students find it difficult to see the need for statistics and correlations and often show little motivation to learn these contents (Jang, 2008; Hulleman and Harackiewicz, 2021). In contrast, when students consider a topic valuable, they expend more learning effort and achieve better learning outcomes (Wigfield et al., 2017). This means that when students ascribe value to a topic, they have a more favorable motivational disposition. Increasing perceived value can therefore be understood as promoting motivation to engage in a particular topic.

Here, utility value interventions come into play: Utility value interventions should enable learners to generate their own personal connections between the learning content and their lifeworld (Canning and Harackiewicz, 2015; Durik et al., 2015). How utility value interventions work is shown in Figure 1. To be effective, such connections should be (1) personal, (2) specific, and (3) relevant to the content (Hulleman and Harackiewicz, 2021). From the perspective of utility value theory, this means that connections should be made by the students themselves and should relate to the content as precisely as possible. Perceived utility value means stressing the benefits of certain knowledge, making it clear that knowledge is useful now or in the future (Hulleman and Harackiewicz, 2021). Interventions help clarify the utility and relevance of (scientific) knowledge for students. The strength of perceived utility value is that it connects knowledge acquisition to people's real lives. For example, students were asked to collect statistics (results and graphics) in popular magazines that seemed important to them. These were then discussed in the seminar (Hulleman and Harackiewicz, 2021). This helped the students see the relevance of statistics.

This state of research on utility value interventions can also be applied to teacher education: A utility value short intervention in educational sciences could foster student teachers' experience of the utility value of educational sciences. Empirical findings show that teachers who rate educational sciences as useful use them more often, with a medium effect size, $r = 0.44$ (Rochnia and Trempler, 2019). The situation is similar for student teachers. The rating of the perceived utility value of different sources of knowledge corresponds to the intended processing goals (Viehauser, 2021; Figures 6, 7). This means that the perceived utility value that student teachers associate with educational sciences predicts their use of educational sciences.

A utility value intervention about the use of educational sciences for student teachers and hypotheses

According to interventions on the theoretical basis of utility value, student teachers should perceive the utility value of educational sciences for themselves (Hulleman and Harackiewicz, 2021). Gaspard et al. (2021) proposed that this can be done *via* a combination of two factors: a communication of utility value in an essay-reading task and a short essay-writing task in which students write about their perceived utility value. This shows that utility value interventions consist of two steps: The interventions starts with explaining the utility value of educational sciences to student teachers using an example. This is rather passive and is followed by a more active step—student teachers write about their perceived utility value of educational sciences. This step is the main part of the intervention. Gaspard et al. (2021) suggested that student teachers should read about the utility value of educational sciences to set the stage for thinking about the perceived utility value of educational sciences for themselves in an essay task. The aim of the essay-writing task is to create a link between educational sciences and the student teachers' everyday lives—this is the first factor of our study. A similar approach can also be found in a study by Nickl et al. (2022).

The second factor provides an example of educational reasoning used in teacher education to the student teachers (e.g., Csanadi et al., 2021). Two classical methods of educational reasoning are used. (1) Evidence-based educational reasoning: The importance of educational sciences for teaching quality is shown to students by empirical findings. These findings should foster the perceived utility value of educational sciences. (2) Reflection: This is a common type of educational reasoning in German teacher education (Neuweg, 2021). Students are encouraged to think about educational situations or tasks; mostly, no evidence is provided or used (Hartung-Beck and Schlag, 2020). Classical reflection tasks use a cycle of reflection (e.g., Volmer, 2022, Table 1). Reflection is an established activity in the teaching profession (Schön, 1983; Hargreaves, 2000) and is currently frequently encouraged (Cramer et al., 2019). The findings are perceived by student teachers as less relevant for practice but trustworthy for explanations (Merk et al., 2017;

TABLE 1 Treatment of the present study.

Factor 1: Utility value short intervention (with/ without)	EG 1, $n = 36$ with utility value intervention empirical findings	CG 1, $n = 60$ without utility value intervention empirical findings
Factor 2: Educational reasoning (with empirical findings/ or reflection example)	EG 2, $n = 35$ with utility value intervention reflection example	CG 2, $n = 48$ Without utility value intervention reflection example

Hendriks et al., 2021; Kiemer and Kollar, 2021). It is unclear which option of educational reasoning would work best together with a utility value intervention – evidence-based educational reasoning or reflection. Both options can be interpreted as a form of educational reasoning and as a starting point for perceiving the utility value of educational sciences. This means that we distinguish between two ways of reasoning about educational phenomena: an evidence-oriented way based on empirical findings and a reflexive way. The distinction between the two forms of reasoning is rooted in what Hinzke et al. (2020) call the habitus of the design of teaching. The authors distinguish between scientific and praxeological approaches to educational reasoning. The scientific approach is more open to empirical findings than the praxeological approach, which focusses on reflecting educational matters right out from the situation.

Therefore, it is unclear whether student teachers are more likely to draw their own references to the perceived utility value of educational sciences based on empirical findings or reflection as an example. With regard to Hargreaves (2000) and Schön (1983), reflection might be more effective than empirical findings. On the other hand, from the perspective of evidence-based education it is desirable that, empirical findings can be the basis for professional decision making and should encourage student teachers to value the importance of educational sciences. Furthermore, findings show that student teachers judge empirical findings as trustworthy. Thus, there are different theoretical perspectives, and whether "encouraging student teachers to reflect" or "presenting findings to student teachers" has better effects in combination with the utility value short intervention depends on viewpoint. Since no studies have been conducted on this topic, we formulated the research question but no specific hypothesis on the effect of factor 2.

Against this backdrop, we formulated our research questions and tested the hypotheses under control of the epistemic aims, persuasion and comprehensibility of the treatment:

> Research question 1: To what extend does teacher students' perceived utility value of educational sciences improve after being engaged with the treatment? H1: The perceived utility value of educational sciences is higher after the treatment for all groups (effect of time, post-test vs. pre-test).
>
> Research question 2: How does a utility value short intervention affect the utility rating of evidence? H2: The two experimental groups with the utility value short intervention show higher perceived utility values for educational sciences than the two control groups without the utility value short intervention (main effect factor 1, utility value short intervention vs. no utility value short intervention).
>
> Research question 3: How does educational reasoning () influence utility value rating of evidence (main effect factor 2, empirical findings vs. reflection)? Because no direction can be derived from theory, we formulate no hypothesis here.
>
> Research question 4: How does educational reasoning (factor 2) interact with the utility value short intervention (factor 1)? With regard to this research question, we do not formulate a specific hypothesis, because it is a theoretically and empirically open question.

Materials and methods

Participants and design

One hundred and seventy-nine student teachers from six German universities participated in this study (77% female; $M_{age} = 27.47$, $SD_{age} = 4.99$). Recruitment took place *via* university courses and social media. All student teachers were enrolled in a Master of Education program. Participation in the survey was voluntary and not part of a course. Participants were randomly assigned to one of four groups in an experimental 2×2 factorial between-subjects design (see Table 1).

Procedure

An overview of the procedure is presented in Figure 2. The study was conducted online, with a link leading to the experiment. The link was sent to the student teachers. In the first step, participants agreed to participate in the study and then some demographic information was collected. Next, the student teachers rated the perceived utility value of educational sciences (see "Measures"). Subsequently, student teachers were randomly assigned to one of the four groups, as shown in Table 1. The material used is shown in "Materials". Experimental group 1 received the utility value intervention, and the usefulness of the evidence was clarified with empirical results. Experimental group 2 also received the utility value intervention, but the usefulness of the evidence was exemplified by reflection. An exemplary reflection cycle was outlined for this purpose. Control group 1 received no utility intervention—only an explanation of the usefulness of evidence backed by empirical results. Control group 2 received only an example for reflection. Afterwards, the participants again rated the perceived utility value of educational sciences. At the end of the survey, the student teachers were thanked for their participation.

In summary, EG 1 read a text about the usefulness of evidence from educational sciences, justifying its usefulness with empirical findings. After that, they were encouraged to write a short essay about what makes evidence from educational sciences useful in their opinion. This is the explicit utility value intervention. EG 2 engaged in the same short essay task, but before this, they read a different text about the usefulness of evidence from educational sciences. In this text, the usefulness of evidence from educational sciences was backed up with a reflection example. CG 1 and CG 2 were not engaged in short essay writing; both groups just read about the usefulness of evidence from educational sciences. CG 1

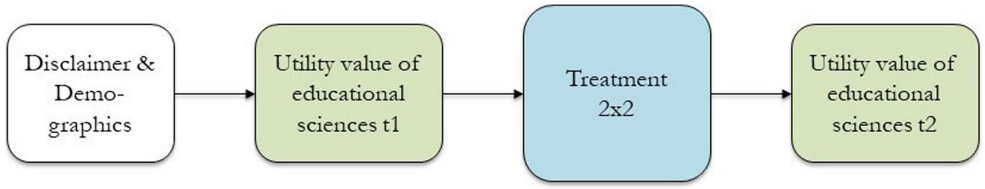

FIGURE 2
Procedure.

TABLE 2 Scales used for the perceived utility value of educational sciences *t*1 and *t*2.

Johnson and Sinatra (2013)		α *t*1/*t*2
1.	What I learn in educational sciences I can apply in the classroom.	0.93/0.95
2.	Educational sciences are useful for teaching.	
3.	I think that studies from educational sciences are useful for teaching.	
4.	I can apply my knowledge from educational sciences in school situations.	
5.	Knowledge of theories from educational sciences will be helpful in school.	
6.	It is useful for teachers to know what educational science says about teaching.	
7.	Knowledge of empirical results from educational sciences will be helpful in school.	

Translated from German.

read the same text as EG 1. Likewise, CG 2 received the same text as EG 2.

Materials

The study used four self-generated text materials to create the four groups (see Table 1); all texts were in the German language.

For each text, we calculated the length, Flesch reading ease score, and readability index LIX. All materials are very similar in terms of these indicators of text comprehensibility. The material for the experimental groups was longer because the utility value short intervention was inserted. Materials 1 and 2 started and ended with a utility value short intervention. The first section recognized the role of the student teachers and concluded with an essay assignment in which personal connections were to be drawn between the student teachers' lifeworld and educational sciences. The short essays produced had an average length of 87.75 words. Exemplary statements about the usefulness of educational science were as follows: *(1) The theories taught within the educational sciences provide a kind of framework or foundation for practice. (2) Evidence-based findings from educational science are indispensable at the macro level for teaching–learning processes. (3) I think that many aspects of the educational sciences are useful for later work as a teacher*. Materials 1 and 3 used empirical findings as an example of the utility value of educational sciences. In materials 2 and 4, the example of the utility value of educational sciences was based on reflection. The question about the central message of the text for both control groups served as an implementation check so that the study website was not skipped. All four materials are shown in the Appendix.

Measures

The measures used in this study can be divided into four categories: (1) demographics, (2) perceived utility value of educational sciences, (3) epistemic aims and (4) persuasion and comprehensibility of the treatment. The items in categories 2, 3 and 4 were presented in random order.

1. Demographics: Student teachers were asked for their gender, age, course of study, number of semesters, previously acquired credits and teaching experience.
2. Perceived utility value of educational sciences: We administered a 7-point Likert scale developed by Johnson and Sinatra (2013) before and after the treatment. The measurement of perceived utility value of educational sciences after the treatment (*t*2) was used as the dependent variable. Items and Cronbach's α are shown in Table 2. Johnson and Sinatra's (2013) instrument highlights the use of educational research in practice.
3. Epistemic aims: We used two scales with three items each to measure the students' epistemic aims (see Table 3). The 7-point Likert scales were administered before and after the treatment. This measure at *t*2 was used as a control variable.
4. Persuasion and comprehensibility of the treatment: We used two items from Richter (2007) to measure how

TABLE 3 Scales used for epistemic aims *t*1 and *t*2.

Hendriks et al. (2021)	*α t*1/*t*2
Epistemic aim: understanding	0.87/0.89
In educational sciences, my goal is …	
1. … to achieve as much of a comprehensive overview about the state of evidence regarding the topics addressed as possible.	
2. … to understand the addressed topics as thoroughly as possible.	
3. … to deal with as many current scientific findings as possible.	
Epistemic aim: practical knowledge	0.91/0.93
1. … to achieve an overview of possible applications of the topics addressed for school contexts.	
2. … to internalize applications of the topics addressed for the school context.	
3. … to deal with as many possible applications for everyday school life as possible.	

Translated from German.

TABLE 4 Items for persuasion and comprehensibility of the treatment.

Richter (2007)	
1.	How persuasive did you find the passage you just read?
2.	How comprehensible did you find the passage you just read?

Translated from German.

convincing and understandable the treatment was (see Table 4). Both items were administered with a 4-point Likert scale after the treatment. This measure was used as a control variable.

Data analyses

We analyzed the data according to the hypotheses. The alpha error level was set at 0.05, and we used Cohen's (1988) effect size measures.

As the first step, we checked whether the experimental groups and the control groups differed in their ratings of the perceived utility value of educational sciences before the treatment. This was not the case. The ANOVA results were calculated for the group differences in the perceived utility value of educational sciences: $F(3, 175) = 0.635$, $p = 0.593$.

Next, we tested whether the results differed for persuasion and comprehensibility. The ANOVA result for the group difference in persuasion was $F(3, 175) = 0.599$, $p = 0.616$. For comprehensibility, the ANOVA result was close to significance; therefore, we conducted *post hoc* tests ($F(3, 175) = 2.356$, $p = 0.074$). The *post hoc* tests showed that EG 1 rated their material—material 1, as more comprehensible than the other groups rated theirs.

We found no significant differences in epistemic aims between the groups: $F(3, 173) = 0.289$, $p = 0.834$ for the epistemic aim of understanding and $F(3, 173) = 0.435$, $p = 0.728$ for the epistemic aim of gathering practical knowledge.

As the next step, we tested the hypotheses with an ANCOVA with repeated measures and the grouping variable as a between-subject factor. As control variables, we used epistemic aims and the persuasion and comprehensibility of the treatment. We report the Greenhouse–Geisser correction of the ANOVAs and ANCOVAs.

We also analyzed dropout data. We compared the subjects who dropped out of the study with those who completed the study. Forty-seven student teachers (68% female; $M_{age} = 27.47$ s, $SD_{age} = 4.53$) finished the first two parts of the study (see Figure 2) but did not complete the treatment and the post-measures. In EG 1, 17 participants dropped out and 20 student teachers did not finish EG 2. Three subjects left CG 1 and 7 participants dropped out of CG 2. However, t1 data about the perceived utility value of educational sciences and epistemic aims is available for them. This data can be used to investigate differences in important variables of the study between the dropouts and subjects that stayed in the study. We conducted *t*-tests on the utility value of educational sciences and epistemic aims between the 47 student teachers who dropped out and the 179 student teachers who stayed in the study. There were no significant differences in the perceived utility value of educational sciences and epistemic aims between both groups ($p > 0.05$). This can be interpreted as an indication that the dropouts do not differ in key variables of the study from the subjects who remained in the study.

Results

To test hypothesis 1, we checked whether the rating of the perceived utility value of educational sciences after the treatment was higher than before. The ANCOVA result showed a significant effect of time: ($F(1,169) = 13.488$, $p < 0.001$, $\eta 2 = 0.074$). All four treatments had a positive impact on the rating of the perceived utility value of educational sciences (after treatment: $M = 4.58$, $SD = 1.27$; before treatment: $M = 4.39$, $SD = 1.23$), with a small effect size ($d = 0.15$; see Table 5). This result was held under the control of the epistemic aims and the persuasion and comprehensibility of the treatment as covariates. Therefore, the results are in line with H1.

We tested hypothesis 2 to further investigate the differences between the four treatment groups. There was no significant effect of grouping ($F(3,169) = 0.451$, $p < 0.717$, $\eta 2 = 0.008$) or interaction with time ($F(3,169) = 0.586$, $p < 0.625$, $\eta 2 = 0.010$). Combining this with the effect of time, it becomes clear that all variants of the intervention were similarly effective. It was expected that the two groups with utility value intervention would have a positive effect

TABLE 5 Perceived utility value of educational sciences pre- and post-differences.

Group	*n*	t1 *M (SD)*	t2 *M (SD)*
EG1	36	4.30 (1.41)	4.57 (1.48)
EG2	35	4.38 (1.18)	4.56 (1.22)
CG1	60	4.48 (1.27)	4.72 (1.32)
CG2	48	4.34 (1.08)	4.44 (1.10)
All	179	4.39 (1.23)	4.58 (1.27)

on the rating of the perceived utility value of educational sciences. The results led to the rejection of this hypothesis 2 and have relevance for research question 3 and 4. This result also means that the kind of educational reasoning had no effect, neither a main effect (RQ 3) nor an interaction effect (RQ 4), on the utility value intervention.

However, we found a remarkable interaction between treatment and the epistemic aim of understanding: ($F(3,169) = 4.308$, $p = 0.039$, $\eta 2 = 0.025$). Further analyses revealed that student teachers with the epistemic aim of understanding phenomena rated the perceived utility value of educational sciences higher after the treatment. In general, student teachers with the epistemic aim of understanding rated the perceived utility value of educational sciences higher. The result was supported by a main effect: $F(3,169) = 40.908$, $p < 0.001$, $\eta 2 = 0.195$.

Discussion

The findings can be summarized as follows: (1) University students in all treatment groups rated the perceived utility value of educational sciences higher after the treatments. (2) The utility value short intervention had no additional effect. There was no significant difference between the experimental and control groups. (3) Student teachers with the epistemic aim of understanding rated the perceived utility value of educational sciences higher. This means that our utility value short intervention did not have an additional positive effect.

The utility value short intervention gave student teachers the opportunity to make specific personal connections between educational sciences and their lives. According to the literature (Hulleman and Harackiewicz, 2021), the utility value short intervention should have an additional effect next to both types of educational reasoning on the perceived utility value of educational sciences. However, in our study this expected effect did not occur. This might indicate that the connections the student teachers made were not internalized (Hulleman and Harackiewicz, 2021). This means that the student teachers might not really identify with their own connections, and thus, the connections did not change the perceived utility value. Therefore, our study did not ensure that student teachers want to be reflective in terms of educational sciences (e.g., Brown et al., 2021). Furthermore, the connections could be experienced as forced to a certain degree. This would explain why the student teachers did not really identify with the connections they made (Hulleman and Harackiewicz, 2021). However, the connections might not have been specific enough. Perhaps student teachers need help drawing concrete connections between theory and practice—the examples we provided might not have been sufficient. Perhaps a concrete situation in which scientific knowledge clarifies a problem or corrects a mistake would have been better used in the intervention than our explanation without educational content. Our experimental situation did not offer a concrete problem to work on—probably this was not concrete enough to make personal connections. Neither the exemplary reflection nor the exemplary findings (Factor 2) set the stage for an additional effect of the utility value short intervention.

The student teachers rated the empirical findings and the reflection examples as equally convincing. This is surprising, as reflection is a central concern of German teacher education and should therefore be more familiar to student teachers (e.g., Hartung-Beck and Schlag, 2020; Neuweg, 2021). However, the finding that empirical findings are as effective as the reflection example also means that student teachers rate educational sciences as trustworthy (e.g., Hendriks et al., 2021; Kiemer and Kollar, 2021). Reflection may be a guiding principle of teacher education, but student teachers can evidently be convinced by the value of evidence, too, as, according to our results, reflection is not more persuading than empirical findings.

In summary, all groups expressed higher perceived utility values for educational sciences after the treatment. The effect size was smaller than the average effect of utility value interventions reported by Hulleman and Harackiewicz (2021) and smaller than effects in the studies by Zeeb et al. (2019) and Lorentzen et al. (2019). It is conceivable that a short intervention, such as this study, cannot evoke larger effects. Accordingly, a utility value short intervention would not provide any additional value in addition to the examples. Likewise, examples of the usefulness of educational sciences may have overwritten a potential effect of the utility value intervention itself. Therefore, the short essay-writing task had no additional effect because the exemplary texts already worked well in inducing the perceived utility value of educational sciences. Another explanation for the unspecific effects of our intervention might lie in the nature of the short essay task we gave to EG 1 and EG 2. This short essay task could be interpreted as some kind of reflexive writing (e.g., Spalding and Wilson, 2002). Therefore, maybe the short essay task triggered a reflection process like the examples about the usefulness of educational sciences already did—with no additional effect.

The relationship between the utility rating of educational sciences and the epistemic aim of understanding shows that when student teachers aim to understand pedagogical phenomena, they tend to perceive educational sciences as more useful than with an epistemic aim of gaining practical knowledge. This finding is in line with the current state of the research and sheds light on a problem in German teacher education: Student teachers might be disappointed by educational sciences when they expect practical knowledge (e.g., Hendriks et al., 2021; Kiemer and Kollar,

2021). Student teachers who want to understand pedagogical phenomena might find educational sciences more useful. Perhaps they do not expect any practical advice from educational sciences—understanding pedagogical matters is already a sufficient gain for them. This points out a direction for further studies: Epistemic aims might shape the perceived usefulness of educational sciences. Thus, the perceived usefulness of educational sciences depends on what one expects from educational sciences. Our findings underline the fact that there might be epistemic aims that foster (or hinder) engagement with educational sciences. This is in line with conceptions of inquiry learning. If we apply considerations of inquiry learning to engagement with educational science, it becomes clear that the understanding of pedagogical phenomena is in the foreground (e.g., Huber and Reinmann, 2019). Inquiry learning might therefore be an option to drive student teachers' epistemic aims toward understanding.

Therefore, two main directions for improving the intervention are emerging: Should student teachers change their epistemic aims or should educational sciences become more practical? The former illustrates that there are more or less favorable epistemic aims for the study of educational sciences. Those who expect practical tips will probably be chronically disappointed by abstract educational sciences. Future directions to improve the intervention ought to actively address epistemic aims. This means providing student teachers with realistic epistemic aims, i.e., making it clear that understanding a pedagogical issue is already a value that could be useful in future practice. From this perspective, the manipulation of epistemic aims may be a lever to foster the perceived usefulness of educational sciences. On the other hand, it is the task of educational sciences to generate knowledge for solving educational problems. It would be best to work on both possibilities.

Ferguson (2021) offers a useful guiding idea for this kind of teacher education: evidence-informed teaching and practice-informed research. Maybe students should have realistic epistemic aims with regard to educational sciences, i.e. perhaps they should not expect instructions on how to teach successfully. As Neuweg (2013) and Cramer et al. (2019) point out, theoretically permeating a pedagogical matter already brings a profit for practice. Following the perspective of Brown (2017), it could be that this is a challenge that is more likely to be met in research learning communities. In these communities, a group of experienced teachers engage with educational sciences to enhance practice. These communities might be close to what Hulleman and Harackiewicz (2021) understand as an identification with the connection between educational sciences and practice. Additionally, educational sciences should remain open to practical formats of evidence communication (e.g., Seidel et al., 2017). This means that getting educational sciences into practice is a task that can be approached from two sides: fostering the perceived utility value side of the user of educational sciences and providing the practical evidence side of the producer of educational sciences.

Limitations

This study has several limitations. The utility value measurement was somewhat abstract. No case study or similar format was used in which evidence was actually presented. Zeuch et al. (2017; Figure 1), for example, developed vignettes for the assessment of data literacy. Adapting such vignettes to illustrate the usefulness of educational sciences would be a viable avenue for future studies. Instead, our study was based on the intention to use educational sciences under certain conditions and no real pedagogical behavior. This means that our study is not about the usefulness of educational sciences' findings *per se* but about the perceived usefulness by student teachers. Another limitation is the selection of participants. An attempt was made to recruit students from several universities, but the majority of the participants came from one university.

Another weakness of the study relates to the implementation of the utility value intervention. Due to the Covid-19 pandemic, a short online-based intervention was conducted. It is conceivable that a longer face-to-face intervention would have been longer and therefore more effective. We also expect that a face-to-face intervention would suffer less from dropouts (Van Selm and Jankowski, 2006), because poor online response rates are a common issue (Nayak and Narayan, 2019).

Another limitation is the differences in dropouts among the four groups. The participants were unequally distributed among the survey groups, although the survey software randomly assigned the participants to one of the four groups. This means that more participants were not motivated to write down the personal connections between educational sciences and their lifeworld in the essay task of the utility value short intervention and thus finished their participation in the study. This indicates that utility induction itself was not motivating for the students. One could even speak of demotivation, because the student teachers were willing to participate in the study but dropped out in the essay task quite often. The control group (CG 1), in which the utility value of educational sciences was illustrated with empirical results, contained the largest number of participants and therefore experienced the lowest number of dropouts. This can be interpreted as an indication of the motivational effect of this variant. This suggests that the exemplary findings were most likely to be interpreted as interesting and convincing. Furthermore, it could be possible that student teachers have become a little weary of reflection and therefore dropped out. Another limitation of the study is that reflection and empirical findings are not combined. In a further study, the two factors of educational reasoning could be connected. Perhaps an evidence-based reflection might be even more convincing about the utility value of educational science than our present attempts.

Conclusion

This study highlights two points. (1) The utility value short intervention did not have the expected effect. When student teachers wrote about personal connections between their lives and

educational sciences, they did not rate the perceived utility value of educational sciences as higher than the other groups. (2) However, the perceived utility value of educational sciences can be fostered. All four intervention conditions raised the rating of the perceived utility value of educational sciences to a small degree. Student teachers with the epistemic aim of understanding were most likely to benefit from all forms of intervention.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study involving human participants in accordance with the local legislation and institutional requirements. Written informed consent to participate in this study was not required from the participants in accordance with the national legislation and the institutional requirements.

Author contributions

MR and CG developed the theoretical conception of the study and wrote parts of the manuscript. MR performed all analyses, designed the figures and tables, collected the data, and wrote the main part of the manuscript. All authors contributed to the article and approved the submitted version.

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.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2022.1006079/full#supplementary-material

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