

Student teachers' perception of dilemmatic demands and the relation to epistemological beliefs

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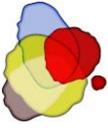
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Abstract

Teaching is characterized by contradictory demands, resulting in teaching dilemmas. For example, to promote the continuous learning of students, teachers need to set up rules and control them, which in turn can undermine students' intrinsic motivation. Teachers have to become aware of these contradictions and need to understand that not all aspects of good teaching can be maximized at the same time. An adequate representation of the dilemmatic nature of problems of teaching is therefore crucial for judging different teaching situations. Also, an adequate epistemological understanding is needed. We assessed student teachers' (N = 122) perceptions of demands in teaching in general and in regards to specific situations, as well as their epistemological beliefs. Perception of demands in general influenced the judgment of specific situations, but there was also a situation-specific component. Epistemological beliefs were related to the perceptions of demands in general, especially in situations in which the dilemmatic content was highly visible. Together, findings suggest that epistemological beliefs shape the perception of demands in teaching in general, and that the perception of demand in general again influences perception in specific situations.

Keywords: Dilemmas in teaching; epistemological beliefs; teacher decision making; reflection



1. Introduction

Can teachers “force” students to be motivated? Can they adapt instruction to students’ individual needs and treat them equally at the same time? A number of researchers have pointed out that there are several aspects of teaching that are in conflict with each other (e.g. Berlak & Berlak, 1981; Helsper, 2004; Lampert, 1985). Therefore, teachers need to continuously decide between equally desirable goals, even though deciding for one goal reduces the possibility of reaching another goal because both options cannot be maximized at the same time. Dilemmatic demands, as well as uncertainties and role-conflicts, have also been linked to the high rate of teachers that retire early from their jobs (e.g. Schwab & Iwanicki, 1982). Teacher candidates have been shown to have difficulties in dealing with these kinds of dilemmatic demands (e.g. Harrington, 1995; Levin, 2002; Schoen, 2005). Teachers and teacher candidates expect that more knowledge about pedagogy could solve dilemmatic problems (Lampert, 1985; Fenstermacher, 1994). Therefore, the perception of demands in teaching should be related to beliefs about the nature of pedagogical knowledge or knowledge in general, that is, epistemological beliefs. Also, there is evidence that some kinds of dilemmas are more apparent than others (Levin, 2002; Wegner & Nückles, 2011). Therefore, the awareness of dilemmatic demands might be situation-specific.

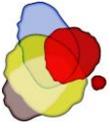
The question of the role of epistemological beliefs in the perception of demands in teaching, and the question of situation-specificity of the perception of demands in teaching have important consequences for the development of measures for fostering awareness of dilemmatic demands. Therefore, we examined in our study (1) how teacher students perceive the demands in teaching in general and how they judge specific dilemmatic teaching situations, (2) how the general perception of demands relates to judgment of specific situations, and (3) which role epistemological beliefs in general and in regards to pedagogy play in the perception of demands in teaching and the judgment of specific teaching situations.

We will at first outline what we mean by dilemmatic demands and characterize teaching as dealing with ill-structured problems, then we will summarize the (sparse) research on teacher candidates’ dealings with dilemmatic demands, and afterwards we will outline the relation of perception of demands in teaching to epistemological beliefs. Finally we will present evidence from our study suggesting that the general perception of demands in teaching is related to epistemological beliefs, and also influences the judgment of specific teaching situations, but that there is also a situation-specific component in the judgment of teaching situations.

1.1 Dilemmas in teaching and their sources

Dilemmas in teaching can be tracked down to multiple sources, such as insufficient resources, too many tasks, administrative hierarchies, and badly organized departments that can force teachers to choose between equally necessary actions (e.g. Berlak & Berlak, 1981; Cuban, 1992; Windschitl, 2002). Other dilemmas stem from the multiple roles to which teachers are assigned within the educational system (e.g. Schwab & Iwanicki, 1982). For example, educational institutions typically fulfill the function of both educating and assessing students at the same time. Because students’ grades in school or university greatly impact the future lives of the students, students will usually try to get as good grades as possible. Therefore, the double demand of educating and assessing can present teachers with the dilemma that they want students to indicate if they have problems, but because the teacher has the power to fail them, students might decide to conceal their problems from the teacher (Helsper, 2004).

Resource dilemmas and role conflicts are a frequent, but not necessarily inherent aspect of teaching, because they might be overcome by a different organizational structure or a better allocation of resources. However, there are other dilemmatic demands that cannot be resolved since they are part of the very nature of teaching. These genuine teaching dilemmas are located “in the idea of teaching, constituting contradictions or contradicting demands of ideals that are equally relevant and can equally claim validity” (Helsper, 2004, p. 61, translated by author). The following teaching dilemmas are relevant in almost all educational settings:



The dilemma of self-regulation: How much should a teacher guide students to foster learning (Bräu, 2008; Labaree, 2000)? Teachers need to guide students in learning, provide structure and feedback in order to facilitate learning. At the same time, these supporting actions reduce opportunities for students to learn in a self-regulated way, to develop their own approaches to learning, and to learn to give feedback for themselves (e.g. Windschitl, 2002). Also, too much structure leads to pressure which easily reduces intrinsic motivation (Deci & Ryan, 1985; Labaree, 2000). The dilemmas of self-regulation have been discussed with regard to many different kinds of learning environments, such as computer aided learning (Koedinger & Aleven, 2007) or collaborative settings (Dann, 2002).

The dilemma of didactic structure: How should teachers arrange the learning contents? Should they arrange the contents according to the substantive structure of the subject, that is the key principles, theories and explanatory frameworks of the discipline (Schwab, 1964), or should they arrange the material according to problems and situations (e.g. Geddis & Wood, 1997)? While the systematic approach facilitates the understanding of the subject, there is the risk of “inert knowledge”, which is not available for students if they have to solve complex problems as encountered in real life settings (Renkl, Mandl, & Gruber, 1996). On the other hand, the problem-based approach facilitates the transfer of knowledge to real-life situations, because the knowledge is acquired in a way that corresponds to situations in which it could potentially be used. Nevertheless, arranging learning contents in a problem-based fashion makes it potentially more difficult for students to grasp the substantive structure of the subject (Albanese & Mitchell, 1993).

Assessment dilemmas: Which reference standard should assessment follow? Linking assessment to individual growth fosters intrinsic motivation and values the individuals’ progress, but on the other hand, it would be unfair if students did not receive the same grade for the same output, thus creating a dilemma between criterion-based norm and individual-based norm (Hager, Gonczi, & Athanasou, 1994; Pearson, DeStefano, & Garcia, 1998). Another dilemma in assessment is the interdependence of validity and reliability (Brookhart, 1994): reliable measurement of achievement needs clear criteria. This often leads to tests that ask students to reproduce knowledge rather than to demonstrate their ability to apply it (e.g., multiple choice questions). Assessments of learning outcomes that allow for higher validity, such as essays or scientific writing, have usually a lower reliability because they are less standardized and assessment is more prone to multiple biases.

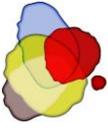
Heterogeneity dilemma: How should teachers deal with the heterogeneity regarding students’ prior knowledge, interests and needs? Optimal teaching calls for respecting the individual and his or her needs, but at the same time teachers need to treat all students equally (e.g. Ball, 1993; Brodie, 2010; Lampert, 1985; Osborne, 1997).

The dilemma of professional relationship: How closely or distanced should teachers relate to their students? Teachers share with other professions the challenge that they have to maintain a professional relationship, that is, they have to build a relationship without emotional involvement. They need to be neutral and need authority, but at the same time they need to create a positive climate and relationship. This creates a tension between proximity and distance (Labaree, 2000).

Often several teaching dilemmas and structural aspects interact in creating a dilemmatic situation for a teacher. Also, sometimes several teachers are involved in a dilemma and have to face the consequences of the decision, for example in assessment dilemmas. Other decisions are just dilemmatic for specific situations (for example, didactic structure of one lesson), while other decisions reach out further (for example, arrangement of contents for a whole term). Teaching dilemmas can be amplified by diverging expectations of students and teachers (Barcelos, 2001), especially if neither learners nor teachers are aware of the dilemmatic nature of the demands in teaching.

1.2 Teaching as an ill-structured problem

But what do teacher students need to learn in order to deal with dilemmatic demands? Teaching can be viewed as an “ill-structured problem” (Nespor, 1987, p. 324), that is, “a problem for which there are conflicting assumptions, evidence, and opinion which may lead to different solutions” (Kitchener, 1983, p.



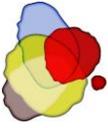
223). The first crucial step in dealing with this kind of problem is to come to an adequate representation of the problem space. This means, before one can start solving the problem, one needs to determine whether the problem is solvable at all, which goals might be pursued, which strategies there are to deal with it, and by which criteria these strategies might be judged. The representation of the problem space is the frame for any further cognition, such as the actual determination of the goals and the actual selection of strategies (Kitchener, 1983). Which kind of representation a person develops about a problem is also influenced by their epistemological beliefs, (i.e. beliefs about the nature of knowledge and knowing), because one's beliefs about the available knowledge for dealing with a problem also influence the perception of whether a problem can be solved at all. For example, a person who expects pedagogical knowledge to be stable and simple will be more likely to expect all problems in teaching to be solvable than a person who believes that pedagogical knowledge is imprecise and permanently changing.

Therefore, teachers need to develop an adequate representation of the problems of teaching, that is, develop awareness for dilemmatic demands of teaching, in order to be able to act in dilemmatic teaching situations. Also, they need adequate beliefs about the knowledge that is available to solve dilemmatic problems.

1.3 Awareness for dilemmatic demands of teaching

Even though there has been a substantial amount of publications on the problem of teaching dilemmas (e.g. Ball, 1993; Berry, 2007; Cuban, 1992; Geddis & Wood, 1997), there are few publications that look at teachers' awareness of the dilemmatic demands of teaching. Lampert (1985) distinguishes four perspectives on dilemmatic demands. In the perspective of "opposing camps", there is little or no awareness for the dilemmatic aspects of teaching. There is one right answer, and teachers with deviant opinions have to be convinced that they are wrong. The perspective of teachers besieged by expectations accepts dilemmatic demands, but teachers are described as helpless and troubled by these demands. The origin of the conflicts is mainly seen in the organizational structure of the educational system. Therefore, dilemmas can be solved by changes in the system. However, this does not help with genuine teaching dilemmas. The perspective of teachers as technical production managers and cognitive information processors holds the idea that dilemmas are created by too little knowledge. Therefore, researchers have to discover the rules of how to teach, and if teachers implement these rules correctly, all problems will be eliminated. A more refined version of this view accepts the complexity of teaching. In this approach, one has to specify conditions under which circumstances which teaching behavior is appropriate. If the resulting rules are implemented correctly, problems will disappear. This view seems to be especially attractive to pre-service teachers, political decision makers and the public (Fenstermacher, 1994). Such "technical rationality" has been criticized repeatedly by educational researchers, teacher educators and practitioners (e.g. Calderhead, 1989; Hatton & Smith, 1995; Schön, 1983). Therefore, Lampert puts forward the view of the teacher as dilemma manager. In this perspective, teachers realize that there are dilemmas that cannot be resolved, but only managed by reflecting on different options and weighing arguments against each other.

Up to now, only a few empirical studies have been conducted on how teachers or teacher candidates conceive of such dilemmas in general, and how they judge different teaching situations. Lack of research might also be due to the fact that most studies used qualitative methods such as interviews or writing tasks. Such methodologies are, on the one hand, appropriate given the complexity of the research question and the multitude of different kinds of dilemmas. On the other hand, qualitative methods typically limit the research to small samples. For example, Schoen (2005) reports that in a sample of 10 pre-service teachers in field placements, all participants experienced dilemmas regarding students' discipline (e.g. "how can a teacher keep control in the classroom without being oppressive?"). More than half of them struggled with dilemmas between "teacher-directed" and "student-centered" instruction, as well as with dilemmas in dealing with heterogeneity among students. Also quite frequent were dilemmas resulting from the need to prepare students for high stakes testing (such as college entrance tests), while at the same time wanting to promote complex understanding. Pre-service teachers faced dilemmas in the development of a personal identity (such as developing a professional relationship to their students without too much emotional involvement) and feeling torn between the demands of field supervisors and their teaching education institution, as well as



their own goals. Similarly, Levin (2002) asked 12 pre-service elementary school teachers to reflect on dilemmas they encountered in their field placements. Most dilemmas revolved around the relationship with their cooperating teachers and students, or classroom management concerns. None of the pre-service teachers connected their dilemmas with structural, moral, social or political issues. Levin concludes that pre-service teachers were only “beginning to see the complexity and ambiguity of teachers’ work” (p. 215). Also, this indicates that some kinds of dilemmas are more visible than others.

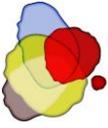
Harrington (1995) examined how student teachers’ ability in making reasoned decisions on exemplary dilemmas developed within one semester. Participants were given dilemmatic, ill-structured cases and had to identify important issues of the case, the priority of the issues at stake, and discuss different perspectives in interpreting the case. Also, they had to propose solutions, analyze different consequences of the solution and add critique to their own solution and analysis. Special emphasis was put on including different perspectives on the case. 65% of the participants had difficulties in identifying the ill-structured nature of the dilemmatic cases. They failed to make connections between the different issues they had identified and addressed the issues only in isolation. Figures improved substantially during the course, thus indicating the need to support pre-service teachers’ decision making skills.

1.4 Perceptions of demands and epistemological beliefs

As pointed out above, perceptions of demands in teaching should be related to epistemological beliefs, because beliefs about the domain of pedagogy in general should influence perception of pedagogical problems. Epistemological beliefs have been described in different ways. Some researchers describe epistemological beliefs in the form of different dimensions, such as structure, certainty and sources of knowledge, as well as control and speed of knowledge acquisition (Schommer, 1994; Hofer & Pintrich, 1997). Trautwein and Lüdtke (2007) found two dimensions of epistemological beliefs, relativism (“scientific knowledge can change”) and dualism (“there is just one truth”). The two dimensions were not independent of each other, but correlated negatively (-.36). Similarly, Stahl and Bromme (2007) described two negatively correlated dimensions, stability and texture. Other researchers (King & Kitchener, 1994; Kuhn, 1991; Kuhn, Cheney, & Weinstock, 2000), who have investigated the development of epistemological beliefs, have described a stage-like development of epistemological beliefs. Individuals start out from absolutistic stages (“There is only one truth”), develop into relativistic stages (“There is no truth but only opinions”), and eventually reach the highest, evaluatistic stage (“Knowledge is subjective but can be justified to various degrees”). Krettenauer (2005) argues that the distinction between dimensional models and stage models is a result of different methodological approaches. Interviews bring out the stage-like qualities of development of epistemological beliefs, whereas questionnaires focus on inter-individual differences in regards to certain dimensions of epistemological beliefs at a given point in time (see also Hofer & Sinatra, 2010). Therefore, when assessing epistemological beliefs, one has to choose the methodological approach in consideration of the goal of the assessment.

Both the dimensional models as well as the stage-models of epistemological beliefs assume that epistemological beliefs are the same in all domains. However, reviews have come to the conclusion that epistemological beliefs also have a strong domain-specific component (e.g Buehl, Alexander & Murphy, 2002; Muis, Bendixen & Haerle, 2006). Muis, Bendixen and Haerle (2006) state that epistemological beliefs are influenced by the socio-cultural context. Academic knowledge is situated in another socio-cultural context than everyday knowledge, and also the academic contexts differ between each other. Therefore, individuals’ epistemological beliefs can differ depending on whether they relate to everyday knowledge or to knowledge in academia, and they can also differ in relation to different domains. According to Muis, Bendixen and Haerle, beliefs from different socio-cultural contexts influence each other reciprocally. Within these contexts, beliefs develop stage-like from absolutistic via relativistic into evaluatistic stages.

Against this background, how does the perception of demands relate to epistemological beliefs? At present, there exists a paucity of empirical evidence. Wegner and Nückles (2011) studied academics’ awareness for dilemmatic demands in teaching in higher education. In an interview study they assessed the argumentative reasoning of 36 academics with regard to four dilemmatic scenarios. The authors identified



five different perspectives on the scenarios, which mirrored both Kuhn's stages of epistemological development (Kuhn, 1991) and the types of dealing with dilemmas, as Lampert (1985) had described them. Interviewees adopting an absolutistic perspective did not see any dilemma in the scenarios. Interviewees adopting a technological perspective acknowledged the complexity of the problem, but made decisions based on heuristics and clear rules, thus ignoring the dilemma. Similarly, academics with a relativistic perspective denied the principally dilemmatic nature in the scenario, because they argued that each individual teacher has his/her own approach to teaching. The academics with the most advanced perspectives recognized that there was a dilemma. Under the general evaluatistic perspective, academics acknowledged complexity and were aware that an easy, general answer is not possible. Academics adopting a dilemma management perspective additionally stated that dilemmatic demands have to be weighed against each other and that the problem can only be solved by making reflected decisions between equally desirable goals. Wegner and Nückles also found that interviewees had different perspectives in different scenarios, and that some scenarios were perceived as dilemmatic by more participants than others. This indicates that the perception of demands was specific to the situation and that dilemmas vary in their visibility.

Schoen (2005) further analyzed in their above-mentioned study of ten pre-service teachers how they dealt with teaching dilemmas they experienced in their field placement. She also determined different levels in dealing with dilemmas based on King and Kitchener's (1994) stages of development in reflective judgment, ranging from "Knowledge as limited to concrete observations" to "Knowledge as the outcome of reasonable inquiry". Reflective judgment level was linked to the perception of dilemmas and teachers' classroom activities regarding these dilemmas. Generally, pre-service teachers showed medium levels of reflective judgment, thus indicating the need for improving the awareness for genuine teaching dilemmas. Contrarily to the Wegner and Nückles study, each teacher was assigned to one level of reflective judgment, i.e. no situation-specific component was determined.

Both studies, Wegner and Nückles (2011) as well as Schoen (2007), suggest that there are structural similarities in the development of the perceptions regarding the dilemmatic nature of demands in teaching and in the development of epistemological beliefs as described in the stage models by Kuhn (1991) as well as by King and Kitchener (1994), but that the perception of demands in teaching is a different construct. However, both studies leave important questions open for further research. None of the studies assessed epistemological beliefs separately. Therefore, no conclusions about the kind of relation between epistemological beliefs and the perception of demands in teaching can be drawn from these studies. Also, the studies differ in regards to whether they describe situation-specific or general aspects of the perception of demands.

1.5 Relations between epistemological beliefs, general perception of demands in teaching, and the judgment of different teaching situations

From the review of literature it can be concluded that teachers need to be aware of the dilemmatic nature of teaching in order to make reflected decisions. The perception of demands in teaching shape the way teachers deal with a concrete teaching dilemma and thereby their ability to make reflected decisions. Also, the perception of demands in teaching is related to epistemological beliefs, especially to beliefs in the domain of pedagogy, but is nevertheless a different construct. Additionally, the perception of demands might vary based on the situation. For example, there might be a difference between dilemmas that are restricted to one teaching situation (e.g. choice of contents for one lesson), and dilemmas that are more visible because they have further consequences (e.g. choice of contents for a whole term). Figure 1 summarizes the assumed relations between epistemological beliefs, the general perception of demands in teaching, and the judgment of different teaching situations based on the model on Muis, Bendixen and Haertle (2006). General and domain-specific beliefs are taken together in the graphic in order to aid in clarity.

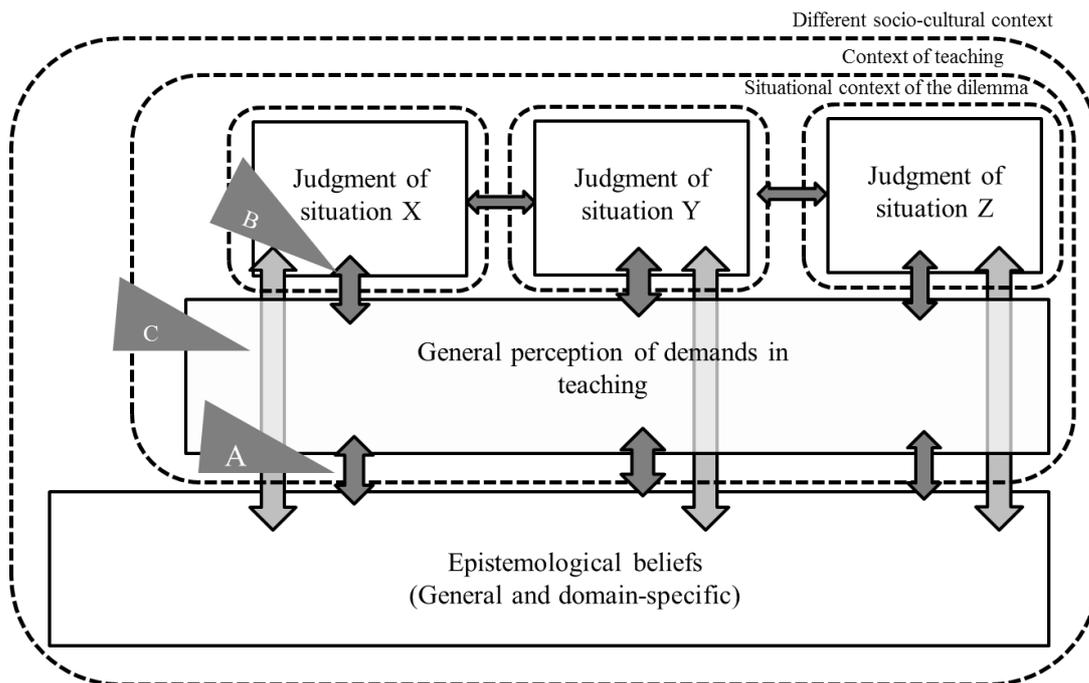
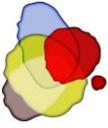


Figure 1. Relations between epistemological beliefs, general perception of demands in teaching, and the judgment of different teaching situations, adopted from Muis, Bendixen and Haerle (2006), p. 31. The arrows A, B and C denote different hypotheses (see section 2, scope of the study).

2. Scope of the study

In our study, we aimed to examine (1) the perception of demands in teaching in general, (2) the relation of the general perception of demands in teaching to the judgment of specific teaching situations, and (3) the relation of epistemological beliefs to the perception of demands in general as well as to the judgment of specific teaching situations.

Based on Muis, Bendixen and Haerle (2006), we assume that epistemological beliefs influence perceptions of demands in general. Therefore we expect medium correlations between general perception of demands in teaching and general epistemological beliefs, and slightly higher correlations to epistemological beliefs in the domain of pedagogy (Hypothesis A; see arrow A in Fig. 1). Also, perception of demands in general influences the judgment of specific situations, but there is also an influence of the situational context. Specifically, we expected differences in judgment of situations with high visibility and with weak visibility of the dilemma. Due to the dependence on the situational context, we expected medium correlations of the judgment of different teaching situations with the perception of demands in teaching in general (Hypothesis B). Finally, we expected the correlation between general epistemological beliefs and situation-specific measures of perception of demands to be only low, because of the strong dependence on the context. Again, we assumed the correlation to epistemological beliefs in the domain of pedagogy to be slightly higher than general beliefs (Hypothesis C).



3. Method

3.1 Sample

One hundred twenty-two teacher students preparing for teaching in college-track high schools (“Gymnasium”) took part in the study. All of them filled in the questionnaires in a paper-and-pencil version at the end of a lecture on pedagogy. Participants were 22.2 years old ($SD = 3.3$) on average; 59% were female. Half of the participants (50.2%) already had had teaching experience in a field placement, lasting at least 3 months.

3.2 Material

3.2.1 *General perceptions about demands in teaching*

For the development of the questionnaire on demands in teaching, in a first step, a broad range of statements capturing different beliefs about the general nature of demands in teaching were collected based on the literature, mirroring the different perspectives on demands as outlined by Lampert (1985), Wegner and Nückles (2011) and Schoen (2005, for examples see Table 2). Items were piloted with a small number of teacher students, until finally 30 items were included in the questionnaire. Participants were asked to rate each statement on a 6-point scale (“I don’t agree at all – I mostly don’t agree – I rather don’t agree – I rather agree – I mostly agree – I completely agree”).

3.2.2 *Judgment of different teaching situations*

Based on Krettenauer (2005), we developed a format of assessment in which for each item two positions were described that were related to a dilemmatic decision in teaching (e.g. Teacher A says: “I rigidly check homework because students otherwise don’t do their assignments.” Teacher B says: “I usually don’t check homework. Students need to learn that they are responsible for their own learning.”). To make sure that participants actively thought about the statements, they were asked to indicate which statement reflected their opinion most. Afterwards they were asked to rate four different judgments on a 6-point scale. These judgments were developed according to Kuhn’s (1994) stages of epistemological development, Lampert’s (1985) differentiation between different perspectives on dilemmas and Wegner and Nückles (2011) findings (Table 1). A complete sample item is given in Figure 2. The final version of the questionnaire contained eight different scenarios relating to different dilemmatic decisions:

- decisions related to the dilemma of self-regulation (opposing statements about regulation within cooperative learning tasks in the classroom, opposing statements about monitoring self-regulated learning tasks such as homework in general)
- one decision related to the heterogeneity dilemma (opposing statements in regards to the choice of tasks for a heterogeneous group)
- two decisions related to the dilemma of didactic structure (problem-centered vs. content-centered approaches in a chemistry class, opposing approaches to the choice of contents in history classes)
- two decisions related to assessment dilemma (comparison of two students according to individual vs. criterion based norm; opposing statements about the adaptation of grading to students’ individual situations)
- one decision related to the dilemma of professional relationship (opposing statements about contact with students outside school)

We varied the visibility of the dilemmas by varying whether the decision had only consequences for one specific situation (that is, choice of tasks for a group, the regulation within cooperative learning tasks in the classroom, problem-centered vs. content-centered approaches, contact with students outside school), or whether the decision had further consequences for future situations or for other people as well (e.g. both of the assessment dilemmas, choices of contents for history classes, control over homework).

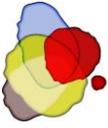


Table 1.

Selection of judgments for the scenarios

Kuhn (1994): Epistemological beliefs	Lampert (1985): Dealing with	Wegner & Nückles (2011)	Statement
Absolutistic stage	Opposing camps	Absolutistic perspective	<i>“It is absolutely clear what is right”</i>
Relativistic stage	Teachers as technical production managers	Technological perspective	<i>“There should be clear rules for what to do in this situation”</i>
Evaluatistic stage	Dilemma manager	Relativistic perspective	<i>“Everyone thinks something else. You have to develop your own style”</i>
		Evaluatistic perspective	<i>“Both teachers have good reasons. One needs to weigh the options carefully”</i>

Situation: Due to holidays and other circumstances the academic year is especially short and there is not much time. The history teachers are discussing their plans for the year.

Teacher A says: I think it is most important that the students get an overview over German history starting from WWI until today and that they know about the international context.

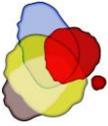
Teacher B says: I think, it is most important thing is that students understand historical processes by means of examples and that they can explain them. For example, they need to be able to explain reasons for the failure of democracy from different perspectives.

	Teacher A	Teacher B	A and B	Neither A nor B		
<i>Please choose an option:</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
<i>Generally I would say:</i>						
	<i>I don't agree at all</i>	<i>I mostly don't agree</i>	<i>I rather don't agree</i>	<i>I rather agree</i>	<i>I mostly agree</i>	<i>I completely agree</i>
(1) <i>Both options are good. One has to weigh according to the specific situation.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(2) <i>Everyone thinks something else. Each teacher needs to develop his/her own style.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(3) <i>There should be clear rules what to do in this situation.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(4) <i>It is absolutely clear what is right.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 2. Sample item from the questionnaire on judgment of teaching situations

3.2.3 Epistemological beliefs

For the assessment of epistemological beliefs both in general as well as in regards to the domain of pedagogy, we chose questionnaires instead of interviews because we wanted to describe inter-individual differences in beliefs, and not individual belief structures. General epistemological beliefs were assessed by a German questionnaire on epistemological beliefs, containing the two dimensions, “dualism” (sample item:



“If two scientists have a different opinion on a matter, one of them has to be wrong.”) and “relativism” (sample item: “Scientific insights that seem true today can turn out to be wrong”, Trautwein & Lüdtke, 2007). Domain-specific epistemological beliefs in the area of pedagogical knowledge were assessed by using the Questionnaire on Connotative Aspects of Epistemological Beliefs (CAEB, Stahl & Bromme, 2007). The CAEB aims at measuring connotative aspects of beliefs that are difficult to express. Participants have to rate pairs of adjectives that represent a semantic differential (such as “strong – weak”) on a 7-point rating-scale. The CAEB comprises two dimensions that are similar to the scales of Trautwein and Lüdtke (2007). The dimension of “texture” is related to the factor “dualism” and contains items that describe the accuracy and structure of knowledge in a given domain (e.g. “knowledge in pedagogy is... precise- - - - - imprecise”, “structured - - - - - unstructured.”). The dimension of “stability” is related to the factor “relativism” and describes the stability and dynamics of knowledge (e.g. “knowledge in pedagogy is... stable - - - - - unstable”, “dynamic - - - - - static”).

4. Results

4.1. General perception of demands in teaching

At first, we analyzed the general perception of demands in teaching. For this purpose, we first determined the factorial structure of the construct of general perception of demands in teaching. We performed an exploratory factor analysis (Principal Component Analysis, PCA), because we did not expect a certain number of factors due to the complexity of the construct. Findings on epistemological beliefs suggest that different factors of the perception of demands as a form of epistemic thinking are correlated with each other (e.g. Stahl & Bromme, 1997; Krettenauer, 2005, see above). Therefore we used oblique rotation (Promax). Neither the Scree Plot nor the eigenvalue criterion yielded a clear picture of the number factors. Therefore, we ran factor analyses with 3, 4 and 5 factors. The three-factor solution yielded the best result, explaining altogether 37.3% of the variance. We labeled the factors “*Simple demands*”, “*Subjective demands*”, and “*Complex demands*” (see Table 2). Items which had loadings < .3 were excluded. The scale of *simple demands* had the lowest mean values, with the *complex demands* scale having highest mean values. This shows a generally high awareness for the complexity of demands in teaching. Internal consistency as measured by Cronbach’s α was good. Also, the three factors were inter-correlated. The *complex demands* factor was correlated negatively with the factors *subjective demands* and *simple demands*. *Simple* and *subjective demands* were correlated positively (see Table 3).

Table 2.

Characteristics of the scales on perception of demands

	Highest loading item (factor loading)	Cronbach’s α	M (SD)	Number of items
Simple demands	“It is clear to teachers how they have to fulfill their task” (.692)	.716	2.51 (0.56)	9
Subjective demands	“Teachers with a good personality don’t have to think about their teaching” (.755)	.710	2.45 (1.04)	8
Complex demands	“When planning a lesson, there are a lot of aspects that have to be considered” (.711)	.700	4.65 (0.53)	6

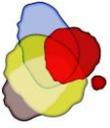


Table 3.

Inter-correlation of the three factors representing perceptions of teaching demands in general

		1	2	3
1	Simple demands	1	.40**	-.48**
2	Subjective demands		1	-.20*
3	Complex demands			1

Note: ** $p < .01$, * $p < .05$

4.2 Medium correlation between perception of demands in teaching and epistemological beliefs (Hypothesis A)

To determine the relation between the general perception of demands and epistemological beliefs, we calculated the two factors of the CAEB according to Stahl and Bromme (2007), as well as the two scales on general epistemological beliefs (“relativism“ and “dualism“) according to Trautwein and Lüdtke (2007). Epistemological beliefs in the domain of pedagogy were correlated with perceptions of demands in teaching (Table 4). The factor of “texture” correlated negatively with perception of demands as simple, and positively with the perceptions of demands as complex. This means that persons who perceived knowledge in pedagogy as rather well structured were also likely to perceive demands as simple. The factor of “stability” was positively correlated with perceptions of the demands as simple, and negatively with demands as complex. Also, general epistemological beliefs that knowledge is stable and simple were also correlated with perception of teaching as simple. All correlations were significant, but only at a small to medium degree. Taken together, these results support our hypothesis that epistemological beliefs are related to the perception of demands in teaching, but that the perception of demands in teaching is a separate construct. Nevertheless, there was no difference between domain-specific and general epistemological beliefs.

4.3 General perception of demands and situation specificity of judgments of teaching demands (Hypothesis B)

4.3.1 Situation specific aspects

Next we analyzed how the perception of demands in general was related to judgment of specific teaching situations. For this purpose, we calculated in a first step a general measure across all kinds of situations. Because for each scenario, participants had to rate the same four strategies on a 6-point scale, we calculated means for each strategy across the eight scenarios. The strategy of *reflective decision making* was rated highest, whereas *simple decision making* received the lowest values (see Table 5), indicating that students were in general aware of the dilemmatic content of the decisions. The scores were correlated systematically: *Simple decisions* correlated positively with *clear rules* and negatively with *own style* and *reflective decision making*. *Own style* also correlated negatively with *clear rules* and positively with *reflective decision making* (see Table 6). We could not find any differences in regards to demographic measures or field experience. Internal consistency over the scenarios was low to medium, ranging from .449 (*reflective decision making*) to .691 (*clear rules*). This indicates that there is some consistency across the situations, but also a situation-specific component in the judgment of teaching situations.

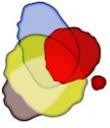


Table 4.

Correlation between epistemological beliefs and general perception of demands

	Domain specific epistemological beliefs: Pedagogy		General epistemological beliefs	
	Texture	Stability	Relativism	Dualism
M (SD)	4.29 (.75)	3.80 (.43)	1.89 (.47)	1.92 (.48)
Simple demands	-.24**	.29**	.27**	.30**
Subjective demands	-.04	-.00	.13	.27*
Complex demands	.29**	-.32**	-.05	-.18

Table 5.

Characteristics of the scales on judgment of different teaching situations

Scale	Prototypic statement	M (SD)	Min	Max	Cronbach's α
Simple decisions	"It is absolutely clear what is right"	2.67 (.68)	1.00	4.71	.618
Clear rules	"There should be clear rules what to do in this situation."	3.54 (.81)	1.29	5.71	.691
Own style	"That is just a matter of opinion. You've got to develop your own style."	3.83 (.65)	2.00	5.86	.635
Reflective decision making	"One needs to weigh the options carefully."	4.56 (.60)	2.71	6.00	.449

Table 6.

Intercorrelation between the four scales

	1	2	3	4
1 Simple decisions	1	.33**	-.25**	-.42**
2 Clear rules		1	-.26**	-.05
3 Own style			1	.45**
4 Reflective decision making				1

Note: ** $p < .01$, * $p < .05$;

Next we compared situations with high and low visibility of the dilemma. Judgments differed between scenarios in which the decision had consequences for one instance only (weak visibility of the dilemma), and scenarios in which the decision had further reaching consequences as well as consequences for other teachers (high visibility of the dilemma, see Fig. 3). We analyzed differences between both kinds of scenarios by four one-factorial ANOVAs with repeated measurement, with weak vs. high visibility of the dilemma as within-subject factor and the strategy under consideration as the dependent measure.



Dilemmas with weak visibility were rated to a higher degree as simple decisions than those with high visibility, $F(122, 1) = 7.959$, $p = .01$, partial $\eta^2 = .062$, but there were no differences between the two kinds of dilemmas in regards to the rating of *reflective decision making*, $F(122, 1) = 1.997$, $p = .160$, ns, partial $\eta^2 = .016$. However, in situations in which the dilemmatic content was highly visible, because rather large consequences or consequences for other teachers were to be expected, *clear rules* were rated higher than in dilemmas with weak visibility. For the development of an *own style*, the result was reversed: For the dilemmas with low visibility, the development of an *own style* was rated higher than for the dilemmas with high visibility (difference between the items for clear rules: $F(122,1) = 121.062$, $p = .000$, partial $\eta^2 = .50$; for own style: $F(122,1) = 74.547$, $p = .000$, partial $\eta^2 = .38$). This seems adequate to the situations, because the highly visible dilemmas contained scenarios with consequences for others, which clear rules might help to minimize.

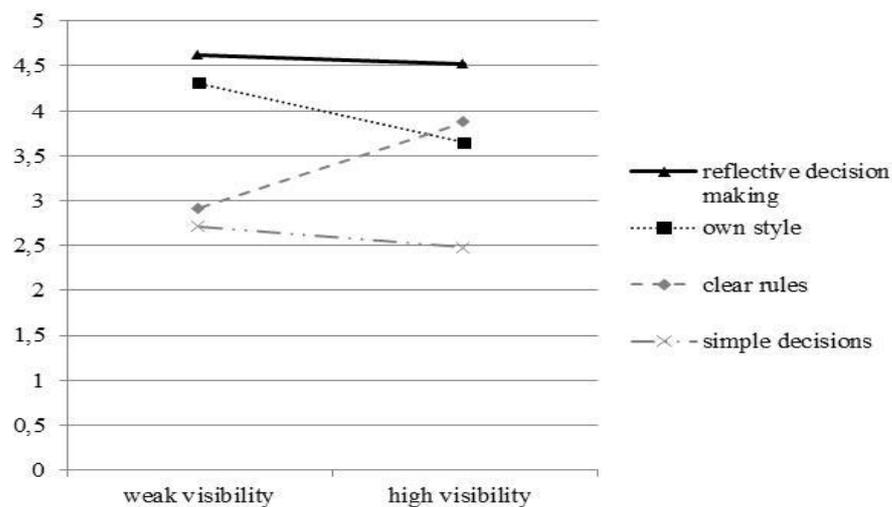


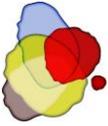
Figure 3. Mean ratings of teaching situations in regards to decisions with individual and with school-wide consequences.

4.3.2. Relation of the general perception of demands to the judgment of specific situations

We analyzed how the general perception of demands related to the judgment of specific situations. We found systematic relations (see Table 7). Perceiving general demands in teaching as simple was associated with positive judgment of simple decisions in specific situations. General perception of demands as subjective was related mildly to simple decisions as well as to developing one's own style in teaching. Interestingly, perception of demands as complex was associated most strongly with a positive appreciation for the establishment of rules, and only mildly with the strategy of reflective decision making. This indicates that students might wish for a reduction in the complexity of situations.

We checked whether the correlation patterns were different for situations with weak and with high visibility of the dilemma. In both types of situations, *simple demands* were correlated significantly with *simple decisions*, and *complex demands* with the establishment of *clear rules*. Only for situations in which the dilemma was highly visible, positive correlations between *subjective demands* and *simple decisions* as well as with the development of an *own style*, and negative correlations with the establishment of *clear rules* were significant. From this pattern of results, we can conclude that general perceptions of demands do influence the judgment of teaching situations, but there also is a situation-specific component. The influence of general perceptions of demands seems to be somewhat stronger for situations in which consequences are to be expected for other teachers, that is, for situations in which the content is experienced as particularly dilemmatic.

Taken together, (a) the medium internal consistency of the four scales on judgment of specific teaching situations, (b) the differences between dilemmas with high and with weak visibility, and (c) the



medium correlation of general perception of demands with the judgment of the teaching situation can be seen as an indicator that there is both a personal as well as a situation-specific component of perception of demands, thus confirming hypothesis B.

Table 7

Correlations between perception of demands and judgment of teaching situations (N=122). Weak = scenarios with weak visibility of the dilemma, high = scenarios with high visibility of the dilemma, all = all scenarios.

	Simple demands			Subjective demands			Complex demands		
	weak	all	high	weak	all	high	weak	all	high
Simple decisions	.23*	.29**	.26**	.10	.23**	.28**	-.02	-.04	-.01
Clear rules	.10	-.03	-.14	-.00	-.15	-.26**	.24**	.36**	.37**
Own style	-.03	-.03	-.03	.17	.23**	.22*	.14	.07	-.00
Reflective decision making	-.06	-.15	-.18*	-.07	-.13	-.14	.19*	.15	.07

Note: ** p < .01, * p < .05;

4.4 Relation of judgment of teaching situations to epistemological beliefs (Hypothesis C)

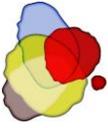
Last, we checked the relation between epistemological beliefs and the judgment of teaching situations. We only found small or no correlations between judgment of specific situations and general epistemological beliefs or epistemological beliefs in the domain of pedagogy (Table 8). As with the other scales, neither gender, nor subject of study, nor field experience as teacher had an impact on the epistemological beliefs. Again, for the highly visible dilemmas the relationship between epistemological beliefs was more pronounced than for dilemmas with weak visibility. This indicates that epistemological beliefs have only a minor influence on the judgment of specific teaching situations.

Table 8.

Means and SD for the epistemological beliefs. Correlations between epistemological beliefs and perception of demands as well as strategies

	Domain specific epistemological beliefs: Pedagogy		General epistemological beliefs	
	Texture	Stability	Relativism	Dualism
M (SD)	4.29 (.75)	3.80 (.43)	1.89 (.47)	1.92 (.48)
Simple decisions	-.19*	.07	.15	.19*
Clear rules	-.11	.02	.10	.04
Own style	.18	-.16	-.02	.02
Reflective decision making	.15	-.01	.03	-.02

Note: ** p < .01, * p < .05



5. Discussion

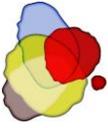
In our study, we examined how teacher students perceive demands in teaching in general and in specific situations, and how these perceptions relate to epistemological beliefs in general and in the domain of pedagogy. Epistemological beliefs correlated with perception of demands in teaching in general, but only mildly with judgment of specific teaching situations. General perception of demands in teaching influenced the judgment of specific situations, especially in situations in which the dilemma was highly visible. Also, there was a situation-specific component in the judgment of situations, as indicated by the medium to low internal consistency of the judgments across all teaching situations. Taken together, the results can be interpreted in such a way that epistemological beliefs shape the general perception of demands, and that the general perception of demands shapes the way different teaching situations are judged. The influence is especially strong in situations in which the dilemma is especially visible. Therefore, it is important to help teacher students to understand the dilemmatic content of specific situations as well as to develop a differentiated perspective on teaching in general. However, these results are based on correlations and cannot be interpreted as causal relations. Longitudinal designs are needed to further support our hypothesis.

Generally, teacher students showed a high awareness for dilemmatic demands. In regards to specific situations, reflective decision making was rated as the best way to deal with the situation, whereas simple decisions received the lowest rating. Links between perceptions of demands in general with the judgment of teaching situations yielded an interesting pattern. For both kinds of scenarios (weakly vs. highly visible dilemmas), general perceptions of the demands as simple were related to judgment of dilemmatic situations as simple, but also a complex representation of the demands in teaching led to a positive judgment of the establishment of clear rules. This was interesting, because rules can help to reduce the complexity of teaching (e.g. Koedinger, Booth & Klahr, 2013). We conclude that especially teacher students who experience teaching as a very complex task wish to be supported in difficult teaching situations by clear directions for dealing with the situation. However, this can be problematic, because rules can prevent teachers from acting deliberately and reflectively in such situations (Lampert, 1985). Therefore, teacher students should be prevented from thinking about rules in the form of a rigid, technological perspective, but rather be supported as thinking of them as a guideline or heuristic.

Generally, the ability to deal with contradicting demands is one of the core competences of teachers (e.g. Berlak & Berlak, 1981; Labaree, 2000) that has received little attention by empirical researchers. The present study gives first insights into student teachers' perceptions of demands in teaching. Because the results are only based on self-reports in questionnaires, we cannot make any inferences about actual decision making in dilemmatic situations. However, the study is a first step in the exploration of teachers' ability in dealing with this kind of demands. Research on teachers' dealing with contradictory demands should therefore be put on the research agenda. Future research should be especially directed to the question of how this ability can be fostered and which kind of interventions are most helpful in making teacher students aware that teaching is not merely a question of heuristics and simple answers, but that the challenge in teaching is to manage dilemmas by reflected decision making (Lampert, 1985; Nückles & Wegner, 2013).

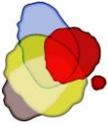
Keypoints

-  Teachers have to realize that demands in teaching are contradictory in order to be able to make reflected decisions
-  Perception of demands in teaching has a situation-specific as well as a general component, and is related to epistemological belief, especially in situations with strong dilemmatic content.
-  Perception of demands as complex promotes reflective judgment of teaching situations, but also the wish for implementing clear rules for everyone.

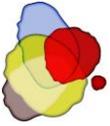


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