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Studia paedagogica. 2019, vol. 24, iss. 4, pp. [143]-171

ISSN 1803-7437 (print); ISSN 2336-4521 (online)

Stable URL (DOI): <https://doi.org/10.5817/SP2019-4-7>

Stable URL (handle): <https://hdl.handle.net/11222.digilib/142244>

Access Date: 19. 02. 2024

Version: 20220831

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THE ROLE OF THE TEACHER IN SUPPORTING STUDENTS' EPISTEMIC THINKING IN DIALOGIC ARGUMENTATION. A CASE STUDY

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Abstract

The purpose of this qualitative research paper was to explore the role of a teacher in supporting students' epistemic understanding and argumentation. The main subject of our research was expert teacher Daniela, who had been teaching Czech language arts for twelve years and undertook a developmental program on dialogic teaching three years prior to this study. Data were gathered through structured observations, six video recordings of teaching, and several interviews with the teacher and students. The findings showed that the teacher tried to depersonalise students' arguments and sought to make the argument jointly owned by everybody in the classroom so that it was possible to discuss the nature of the argument and not the student's personal opinion. The findings reveal that the depersonalisation is a unique procedure that could increase students' participation in dialogic argumentation while preserving their personal opinions.

Keywords

epistemic thinking, dialogic argumentation, case study

Introduction

The belief that students should play an active role in classroom communication has become widely accepted among education scholars in recent decades (Wilkinson, Murphy, & Binici, 2015). The view that student participation has a fundamental influence on learning found support in sociocultural theories of learning (Bruner, 1978; Sfard, 2016; Vygotsky, 1970, 1978). This position was developed in several talk-intensive pedagogies: dialogic teaching (Kuhn, Zillmer, Crowell, & Zavala, 2013; Sedova, Svaricek, Sedlacek, & Salamounova, 2016; Wegerif, 2007), collaborative reasoning (Chinn, O'donnell, & Jinks., 2000; Reznitskaya et al., 2009), research approach (Nassaji & Wells, 2000; Wells & Arauz, 2006); and Paideia Seminars (Billings & Fitzgerald, 2002).

In this perspective, good instruction is understood as instruction that encourages students to actively participate in educational communication (Lefstein & Snell, 2014). Teaching in which the teacher asks more cognitively demanding questions and the students respond to them frequently and using elaborate arguments that the teacher builds on is deemed an ideal frame (Nystrand, Gamoran, Kachur, & Prendergast, 1997). We define student participation as the active involvement of students in educational communication. There is agreement in the current pedagogical community that student participation has an impact on both student learning and student engagement.

Learning in this case is not identified with memorization; it is seen as taking part in a shared discourse (Lave & Wenger, 1991) in which the teacher leads a discussion with students that is rich in students' arguments (referred to as dialogic argumentation). Although argumentation is a desirable element in teaching practice, the conditions in an ordinary school do not provide sufficient space for dialogic argumentation to develop (Means & Voss, 1996). Students lack motivation to discuss school curricular topics (Matusov, 2011), avoid participation in argumentation (Nussbaum & Bendixen, 2003), and, when they take part in discussion, do so mainly to present their own views and are unable to combine their arguments with or evaluate the arguments of others (Felton, Garcia-Mila, & Gilabert, 2009; Felton, Garcia-Mila, Villarroel, & Gilabert, 2015; Kuhn & Udell, 2007; Simonneaux, 2001). Introducing dialogic argumentation into teaching therefore involves a number of challenges (Zohar & Nemet, 2002).

The vast majority of research conducted on student argumentation employs a cause-effect research model: the attention is on whether, for example, intervention in improving student reasoning will result in the students' better conceptual understanding, an improvement in their ability to argue, or enhanced knowledge in the subject concerned by way of increasing their

level of engagement. However, empirical findings showing in detail the teacher's work with student arguments in the classroom are lacking. If even a small intervention leads to an improvement in the students' arguments (Venville & Dawson, 2010), how should teachers approach their lessons to combine school-controlled education with the unique motivation of each student and encourage them to participate actively in the discussion? In the present study, we will focus on dialogic argumentation in authentic classroom situations.

Theoretical background

Argumentation is defined as “a verbal, social, and rational activity aimed at convincing a reasonable critic of the acceptability of a standpoint by putting forward a constellation of one or more propositions to justify this standpoint” (van Eemeren, Grootendorst, R., & Snoeck Henkemans, 2002, xii). Argumentation thus means both the argumentation process itself (hereinafter “dialogic argumentation”) and the product of a rational process of reasoning. The higher the degree of students' participation in the dialogue in an open discussion in the classroom, the more likely their talk is to contain an argument (Sedlacek & Sedova, 2017).

For the purposes of this paper, we will focus on oral argumentation in the classroom: the product, the process, and the main actors – the teacher and the students. The view that argumentation is a social activity and that the social context is important for the development of argumentative competence (Kuhn et al., 2013) is crucial for us. Although empirical research provides increasing evidence of the link between the level of students' oral arguments and their learning outcomes (Chinn et al., 2000), we still need to ask the fundamental question: Why is student argumentation in class important?

Teachers who devote more time to developing arguments with their students contribute to their students' learning more in their classes than teachers who spend more time presenting the subject matter (McNeill, Pimentel, & Strauss, 2013). Through argumentation, students learn basic scientific practices in which members of a community try to get to the root of the phenomenon being examined by criticizing, evaluating, reasoning, and defending their positions (Berland & Reiser, 2011). Argumentation increases the complexity of knowledge (Venville & Dawson, 2010) and leads to an improvement in students' conceptual understanding of the curriculum (Mason, 1996; Zohar & Nemet, 2002). Students must be able to argue to critically understand the information in the text (Duschl & Osborne, 2002; Norris & Phillips, 1994).

The social environment of the classroom can play a crucial role in developing argumentation through dialogic teaching. First, the core principle of dialogic teaching is purposefulness (Alexander, 2017), which means that talk should be aligned with educational aims and should meet curricular goals. Second, the dialogue in teaching is close to common argumentation led by students and teachers because argumentation skills are latent within students (Kuhn, 1991). Third, dialogic teaching is based on open questions of high cognitive demand (Wilkinson, Murphy, & Binici, 2015). Students are thus encouraged to provide their own rationale rather than to search for learned information in their memory. Walton (2008, p. 22) distinguishes four formal moves important for dialogic systems: 1) questions, 2) the making of assertions, 3) the retracting of assertions, and 4) the putting forward of arguments. Fourth, dialogic teaching emphasizes scaffolding (Wood, Wood, & Middleton, 1978), which is seen as a specific interaction between a more knowledgeable other and a student. The more knowledgeable other (a teacher or an experienced peer) supports the student in solving a task that would be insolvable without help. The aim of this interaction is not only to solve the task but also to develop the skills needed for solving it.

Key factors that influence students' engagement in dialogic argumentation

Three main factors influence students' participation in dialogic argumentation: 1) knowledge of curriculum, 2) argumentation skills, and 3) epistemic thinking.

Knowledge of curriculum

Knowledge of the subject matter is one of the key determinants of argumentation in the school classroom and it receives the greatest portion of research attention (Asterhan & Schwarz, 2016). A multitude of studies have shown that knowledge of the subject affects both the number of arguments that students produce in the class and their quality (Means & Voss, 1996; von Aufschnaiter, Erduran, Osborne, & Simon, 2008). Understanding scientific arguments requires specific knowledge of the issue, which makes scientific texts difficult to understand even for readers familiar with the principles of argumentation. As pointed out by philosophers of science, including Kuhn (1968), Toulmin (1972), and Latour (1987), scientific arguments are based on complex knowledge.

It has been established that when students are having a discussion (e.g., on an issue involving animal transgenesis), a lack of field-specific knowledge (e.g., of biotechnology) does not prevent them from being actively involved in dialogic argumentation (Simonneaux, 2001). While they need not be knowledgeable about all the aspects of the subject, they need to show a threshold level of knowledge necessary for quality argumentation (Sadler & Fowler, 2006).

Argumentation skills

The second key factor is an individual's ability to articulate arguments. Kuhn (1991) and Schwarz (2005) argue that argumentation skills are present in every student from their third year in school, and that argumentation skills are used by people in everyday life to create or evaluate arguments. Kuhn (1991) claimed that argumentation skills consist of 1) constructing an argument, 2) justifying an argument, 3) constructing a counterargument, and 4) rebutting another's counterargument. A more recent concept is the notion of argumentative competence, which is described as a metaknowing competence consisting of three main types of knowing: 1) metacognitive knowing, 2) metastrategic knowing, and 3) epistemological knowing (Rapanta, Garcia-Mila, & Gilabert, 2013).

The conditions of an ordinary school, however, rarely provide enough opportunities for students to develop argumentation skills (Means & Voss, 1996). Studies conducted in many countries have consistently shown that classroom discourse is not filled with whole-class discussions and that there are few opportunities for students to engage in dialogic argumentation (Newton, Driver, & Osborne, 1999). Yet, as Zohar and Nemet (2002) demonstrated through their short intervention program, even a short episode of explicit teaching of argumentation can bring about substantial changes.

Epistemic thinking

Epistemic thinking is thinking about knowledge and knowing (Hofer & Pintrich, 1997). It is currently defined as a multifaceted construct with both cognitive and metacognitive aspects. In our study, we will selectively focus on this key factor impacting dialogic argumentation.

In an experiment, Mason and Scirica (2006) gave students two texts that were quite dense with information; the students were subsequently expected to formulate arguments and counterarguments using these texts. Familiarity or unfamiliarity with these texts was not the key factor determining the differences between students in the quality and number of arguments. The determining factors were epistemic components (Mason & Scirica, 2006, p. 505).

Students without developed epistemic beliefs have the tendency to avoid argumentation (Gronostay, 2018; Nussbaum & Bendixen, 2003), whereas students with developed epistemic beliefs create better arguments (Mason & Scirica, 2006).

Bendixen (2002) indicated that students with less developed epistemological beliefs may experience a sense of uncertainty about their possible success in argumentation and therefore avoid cognitive conflicts. This creates a vicious circle: if students with less developed epistemic beliefs tend to avoid argumentation (Nussbaum & Bendixen, 2003), their epistemic beliefs cannot develop any further.

Epistemic thinking

Epistemic thinking is not a separate construct within all existing cognitive structures but rather an inseparable part of them (Hofer, 2004). The distinguishing element that identifies epistemic processes is an epistemic aim of the process (Chinn, Rinehart, & Buckland, 2014). Consequently, any cognitive process that fulfills an epistemic aim (e.g., justification of knowledge, evaluating claims, considering multiple views, or seeking understanding) can be considered an epistemic process.

There are two basic approaches towards describing epistemic thinking and epistemic cognition. The first approach is concerned with epistemic beliefs. Initial attempts to conceptualize epistemic beliefs were made by Perry (1970), followed by Schommer (1990, 1993), who claimed that epistemological beliefs represent a system of several more or less independent beliefs. Independence in this context means that not all beliefs in a given individual need to be connected by the same relationships as in another individual. Given that we examine the role of the teacher in developing epistemic thinking, the second approach seems to be more appropriate for us. It concentrates on the development of epistemic thinking and understanding. Kuhn (1999, p. 23; Kuhn, Cheney, & Weinstock, 2000) defines four levels of epistemological understanding. Level 1, the realist view, is based on the thesis that our knowledge is certain, unproblematic, and direct, and that assertions are a copy of the outside world; critical thinking is therefore unnecessary. Level 2, the absolutist view, is based on the idea that individual assertions are facts that may be right or wrong. Level 3, the multiplist view, holds that assertions are merely the views of the participants in a debate and there is no point in subjecting them to a critical discussion. Opinions are “freely chosen by and accountable only to their owners” (Kuhn, 1999, p. 23). Conversely, a characteristic of the higher level 4, the evaluativist view, is that assertions are judgments that can be evaluated on the basis of external criteria that are open to public discussion. Assertions are perceived as judgments that we can compare using certain (common) criteria, evidence or arguments.

People with developed epistemological understanding recognize different problems in a complex topic and are also able to consider the significance of individual arguments for or against the topic under discussion (Mason & Boscolo, 2004, p. 108). The Kuhn model was repeatedly tested with positive results (Mason & Scirica, 2006).

Mason and Scirica (2006) continued in Kuhn’s (1991) research on argumentation concerning controversial topics. Italian eighth-grade students were asked to read two texts, one on global warming and the other on genetically modified food, and then to produce an argument, a counterargument, and a rebuttal of a given position. The researchers reviewed the students’ previous knowledge and interest in the subject. The results show that general

epistemological beliefs (absolutist, multiplist, evaluativist) correlate with the ability to construct arguments. Students who held a general multiplist epistemological belief produced far fewer arguments than students holding an evaluativist position. The authors explain this result by the fact that multiplists, believing that every assertion is equally true, are not driven to create better, more valuable, or more demanding new arguments.

Problems with development of dialogic argumentation and epistemic thinking

We know very little about how teachers contribute to the development of epistemic thinking (see Barzilai & Zohar, 2014; Bendixen & Feucht, 2010; Zohar & Ben David, 2008). The basic premise, however, is that education, rather than age or gender, is a key factor influencing the level of development of epistemic thinking (Kuhn, 1991; Kuhn et al., 2000). Empirical studies of different groups of students at different types of schools (high school – Schommer et al., 1997; or college – Perry, 1970) show a strong correlation between educational level and the level of epistemic thinking.

In the classroom, epistemic beliefs can be developed in a controlled way by teacher instruction and teacher-led epistemic reasoning discourse (Muis, Bendixen, & Haerle, 2006; Kuhn & Weinstock, 2002).

Although the instructional application of the research about epistemic thinking is in its early stages, there have been several successful interventions (Cavagnetto, 2010; Muis & Duffy, 2013). Both successful and unsuccessful interventions show that although argumentation is a general human skill and epistemic thinking can be also developed through self-regulated learning (Muis, 2007), both are very demanding processes requiring considerable cognitive resources (Kuhn, 2005, 2009). Not all students in the class develop epistemic cognition to the same extent, and not all interventions have a long-term effect (Zohar & Ben David, 2008).

What are the problems with the development of dialogic argumentation and epistemic thinking in dialogic argumentation? Nokes (2014) uses the example of teaching history to point out that teaching this common subject is not easy from an epistemic point of view. Students should not automatically take over ready-made historical facts, and they should be able to interpret facts from multiple perspectives, accepting or rejecting evidence and justifying their claims. But how can we teach students facts as well as theories of argumentation and epistemology? While textbooks are full of facts, epistemology is completely disregarded. In order for students to learn to “think like historians” (Stahl, Hynd, Britton, McNish, & Bosquet, 1996), the teacher should teach them the curriculum of the subject and also different ways of generating subject knowledge and guide them to understand epistemic thinking.

The next obstacle is related to the motivation of students to engage in dialogic argumentation. In a regular school it is possible to observe the transfer

of knowledge or skills to students without any regard to the students' motivation. The school curriculum and personal aims, needs, interests, and talents are separated (Matusov, 2011). On the one hand, we see a strong tendency to get students involved in dialogue in the classroom; on the other hand, we see that it is not technically possible for all thirty students to be active in formulating arguments in one lesson. Further, we need to ask ourselves how to motivate students to participate in an argumentative way in a discussion that may not be remotely interesting for them. Students are usually (from the teacher's point of view) presented with a provocative topic to discuss. But how should the teacher get the students not only to discuss, but also "to preserve the individual's desired action" (Matusov, von Duyke, & Kayumova, 2016, p. 429)? Consequently, we need to be concerned both with the question of making the topic of discussion "more interesting" for students, as the popular cliché goes, and with the ways to combine school-controlled education with the unique motivation of each student to bring them to active participation in the discussion.

It has been demonstrated repeatedly and across many cultural contexts that students most often use the space for dialogic argumentation to engage in critical attacks against a given position. Furthermore, they are able to defend their own position by producing new supporting arguments. However, their ability to integrate and critically assess their own arguments and the arguments of others seems to be less developed (Felton et al., 2009, 2015; Kuhn & Udell, 2007; Simonneaux, 2001). We must therefore ask ourselves what it is that the students would actually learn from a discussion led in this way. Do they learn to defend their positions by attacking those of others?

A further danger may be the phenomenon we call brainstorming of arguments. In a microanalysis of argumentation moves, Gronostay (2016) showed that students produce a large number of arguments, but they do not critically evaluate them. This creates a situation in which good and strong arguments go unnoticed in the debate. Thus, without the intervention of the teacher or the moderator of the discussion, it is possible that no attention is paid to students' important statements and that they are not further developed. Students churn out ideas like in a brainstorming session, but they do not work with them further, which would be cognitively more demanding for them. When looking at students in the classroom, there is also a social aspect that must be remembered—students may be reluctant to argue against some of their classmates.

Another possible barrier is the discussion position assigned to the student by the teacher. Based on the Piagetian theory of conceptual conflict, it is recommended that students be presented with problematic or controversial topics. However, research shows that students who are given the task of defending a position in a discussion with which they disagree often do not

participate in the discussion at all (Gronostay, 2018). Paradoxically, the teacher's effort to clarify the roles of individual students by assigning the roles can in fact lead to silencing the students, not least when controversial topics are discussed. It can be rather difficult for teachers to predict for which students a particular topic will be highly controversial.

Research gap and research questions

These problems expose two research gaps not yet covered by empirical research. The first gap concerns motivation. We see that the pressure on students to engage and the pressure on students to argue are contradictory. Students most often engage by churning out their personal arguments to defend their own position, which also indicates how important the student's personal motivation in dialogue is. However, the pressure to argue moves in an opposite direction: students should evaluate arguments and integrate their own arguments and arguments of others, which is cognitively and socially more demanding, takes more time, and reduces their engagement. Moreover, assigning students a different position than they actually support will significantly reduce their engagement, as they cannot express their personal motivation and opinion. If student's personal perspective and motivation play such an important role in engaging in dialogic argumentation, what approach to leading argumentation can the teacher apply? How does the teacher work with these two pressures to combine school-controlled education with the unique motivation of each student to encourage them to participate actively in the discussion?

The second gap is directly related to the role of epistemic thinking in argumentation. In addition to the student's personal interest, the level of development of their epistemic thinking also seems to be a powerful factor. Students with a lower level of development of epistemic thinking argue significantly less often than students with the highest level of development of epistemic thinking. And if the key element for the development of epistemic thinking is teacher-led discourse, then we also need to ask the second question: How does the teacher develop epistemic thinking?

Empirical research has not yet covered these two gaps and therefore the present study aims to investigate the role of the teacher in supporting students' epistemic thinking in dialogic argumentation. In our consideration of the design of the empirical research, we were guided by several theses that we adopted as our own epistemological bases. First, we assume that teachers can use classroom talk to guide learning (Mercer & Littleton, 2007). Second, many authors insist that argumentation should not be examined solely as an individual's ability to produce arguments, but as a social practice reflecting

shared norms of a given social context (Reznitskaya et al., 2001). Third, to differentiate between cognitive, metacognitive and epistemic processes, it seems necessary to investigate argumentation in a given specific learning context (Bromme, Pieschl, & Stahl, 2010; Zohar & Ben David, 2008).

For this reason, we decided to undertake a case study of an experienced teacher of language arts, closely following the learning context of her classes. Our research questions were as follows:

1. How does the teacher work with the students' individual motivation and personal opinions in dialogic argumentation?
2. How does the teacher support students' epistemic thinking in dialogic argumentation?

We intend to show how the teacher intervenes in the discussion, encourages students to argue, and guides students to comprehend the epistemic level of understanding.

Methods

The aim of our research is to cover both research gaps described above using a case study of an experienced teacher who had completed a teacher development program focused on the development of dialogic teaching and whose students produce in our sample ($n=639$) an above-average number of high-quality arguments per lesson.

Data collection

This study is a part of a large research project which was divided into two consecutive stages. In the first stage (October to December 2017), we carried out a large-scale survey involving 32 school classes. The subjects were ninth-grade students and their Czech language arts teachers. In the given period, all these classes underwent reading literacy testing carried out by the Czech School Inspectorate; we obtained the results of individual student tests. In each class, we conducted a structured observation of two literature lessons in order to measure the quantity and quality of verbal participation of individual students in classroom talk. We also collected various other data about the students; we were interested in their academic achievement, sociometric status in the classroom, and judgment by their teachers.

Our present study is the output of the second, qualitative ethnographic stage. We selected four teachers from the whole sample of 32 teachers. We conducted structured observations, six video recordings of teaching, and several interviews with teachers and students. The aim of the qualitative stage of our research was to research classroom discourse in more detail with special attention to teaching practices and the quality of students' utterances.

Focal teacher

The main subject of our research is teacher Daniela, who had been teaching Czech language arts for twelve years. Daniela can be considered an experienced teacher. She continually educates herself and strives to improve in her job.

In 2014 and 2015, Daniela participated in our development program, which had several components: 1) four workshops for the teachers; 2) documentation of lessons using video recording; and 3) reflective interviews led by a researcher with a teacher about the video recordings of individual lessons. The duration of the program was eight months (beginning in November and ending in June of the school year). At the workshops, the teachers were introduced to the concept of dialogic teaching and its theoretical foundations, along with some of the relevant principles, key indicators, and methods (as selected by the researchers). The goal was to direct everybody towards the implementation of the same indicators and principles using a variety of teaching methods. A detailed description of the program and the results from this intervention has been provided elsewhere (Sedova, Sedlacek, & Svaricek, 2016).

We deliberately chose Daniela and her class because her students produced 8.47 arguments in an average lesson; the students in the other 31 monitored classes produced 0.57 arguments per lesson (see Sedova et al., 2019). Consequently, it is an extreme case study (Yin, 2009) that seeks to examine argumentative discussion.

Before looking at the epistemic climate and the role of the teacher in managing it, it is necessary to consider what style of teaching Daniela prefers or what goals she defines for her teaching. In an interview, she admits that her teaching changed after completing the teacher development program towards dialogic teaching, as can be seen in several aspects.

Excerpt 1, interview between teacher and researcher

Teacher (T): I try to help the kids, I want to pass something on to them, yeah, but I've learned a lot... that it's not bad at all if they pass it on among themselves or that I can actually learn something from them too... but generally I think it's characteristic of me that there is a relaxed atmosphere in my lessons and a kind of a safe climate, that I try to make sure that they are not afraid to say something wrong, to be humble about correcting themselves... I am very glad when the kids get involved. That's, it's like a success for me, and it happens a lot in that grade nine... Now I want them much more to be able to produce an argument when talking about a text. I try to give them the floor to be able to present their arguments about what they had read in that text, so that's probably the biggest difference. Or maybe even have a discussion about it. This is something I perhaps wouldn't have done before I went through the dialogic teaching. And yet the enrichment is enormous.

Interviewer: And what is the essence of the enrichment?

T: That they can formulate for themselves, come to realize something themselves, and by doing that they also teach the others.

First, a greater diversity of teaching in individual subjects was achieved. While grammar remained the subject intended for grammar practice, composition, literature and history contain large discussion blocks with students. Second, the teacher changed her attitude towards the share of students in instruction, which was also reflected in her behavior. The teacher now deliberately strives for her students' active involvement. Third, the teacher emphasizes that students should behave decently in the discussion, which she believes to be a prerequisite for a safe climate during the discussion. Fourth, students are encouraged by the teacher to use argumentative reasoning. The teacher repeats several times during her class that everyone can say their opinion, but they have to do so by way of argumentation. Fifth, the teacher developed a new belief that, through argumentation, students learn to formulate their opinions, and they can also learn from each other more efficiently than if all the knowledge was passed on to them by the teacher. Sixth, in the interview, the teacher expresses her belief that it is essential that students practice not fearing failure. The teacher says she wants to guide students to drop the fear of saying something wrong. This is, in the students' words, a liberating moment that allows them to break through the fear and to present their arguments. Seventh, the teacher insists that the students be "*humble about correcting themselves*". The teacher's aim is that students should use argumentation to seek correct theses and that argumentation is not merely a logical exercise as an end in itself.

If we look at these points through the lenses of epistemic cognition, the epistemic goals associated with knowledge, understanding, and truth cannot be ignored. Teacher Daniela emphasizes that students must understand the text in order to argue, that they should seek to produce true propositions with the help of argumentation and that they should be humble about correcting their mistaken arguments.

Data analysis

We examined micro levels of argumentative moves, including single speech acts with an argumentative function (see Gronostay, 2016). We used video recordings of the lessons that we subjected to ethnographic microanalysis (Snell, 2011) as our central data material. We also worked with an extensive data corpus obtained from the students themselves and their teachers. As for students, we have their grades in Czech language arts, their reading literacy test results, data on their socioeconomic status, sociometric questionnaires, and interviews with selected students. As far as teachers are concerned, we have semi-structured interviews with teachers and their assessment of students in several categories, including aptitude, effort, and motivation. We can therefore find out in detail when students speak, but also which students speak and whether they were called on by the teacher or what the quality of their utterances were.

For the purposes of data analysis, we transcribed the video recordings and interviews with the students and teachers verbatim. We inserted the text data corpus into ATLAS.ti (ver. 8), which we primarily use for open coding and inductive categorization (Corbin & Strauss, 2014).

In further analysis, we used methodological tools of linguistic microanalysis (Snell, 2011) and social linguistics (Gee, 2012). Our goal was to focus on those data sequences that contained student arguments and teacher's pedagogical practices related to the epistemic climate. We analyzed the students' arguments according to the levels of epistemic cognition (Kuhn, 1999) as well as their length and quality (Walton, Reed, & Macagno, 2008; Walton & Macagno, 2016).

The analysis also included a simple quantitative analysis of the number of students' arguments and constant triangulation of all data sources, especially interviews and video recordings.

Ethical aspects

All participants agreed to participate in the research project and they were able to leave the project at any time. All teachers, students, and parents agreed to video recordings. Teachers and students also agreed to audio recordings of the interviews. All data were anonymized; names used in this study are pseudonyms.

Findings

Epistemic level 3.5

Daniela says in the interview that she first wants to get the students to formulate several arguments so that she can then handle them in order to improve their quality, introduce a new topic, or encourage students to react to one another's arguments. However, she believes that giving students the feeling of a safe climate, achieved through her teaching practice, is essential.

Excerpt 1, interview with a teacher

Teacher: Well, I think that this is because I learned in the course that a good way of asking is formulating a question in a way that makes it clear that several answers may be correct. So they, they gradually learned that they do not need to try to give an answer to meet some requirements, but that they can really formulate their opinion if they have an argument to support it with.

Interviewer: To get it right, if someone said: "I cannot have discussions with students because they are not capable of that", what would you say to that?

T: That it's not true. That they are capable of discussing, but like they need to feel that the environment is safe. They need to, I find it tremendously important that the students feel that what they say is correct... or that it is not assessed as wrong. This in fact, seemed to me the very defining moment of why they stopped being afraid to speak.

In the interview, the teacher describes how her teaching style changed after completing a professional development program aimed at dialogic teaching. The teacher gained theoretical support and practically learned to ask open-ended questions of higher cognitive demand. She learned to ask students questions in a discussion in a way such that, first of all, they feel they are in a safe environment in which they will not receive negative criticism of their own ideas.

Secondly, the teacher says that she wants the safe climate to lead students to express any opinion as long as it is supported with arguments. From a theoretical point of view, it is worth noting the teacher's wording: "*to formulate their opinion if they have an argument to support it with*".

Kuhn (1999), in her levels of epistemic understanding, differentiates between opinions (level 3) and judgments (level 4). Teacher Daniela distinguishes these two terms and says that an opinion is less valuable than an opinion with an argument. Unlike Kuhn, she inserts between the third and the fourth level of epistemic understanding an intermediate level of opinion with argument. Daniela's system contains opinion (level 3), opinion with argument (level 3.5), and argument (level 4). How is the difference among these levels applied in Daniela's teaching?

The discussion begins, according to the teacher, when she is preparing for the lesson. The key element for her is to choose a literary text that will be, first of all, part of the curriculum, and second, difficult to read. For example, *Jane Eyre*, *The Diary of Anne Frank*, and *Sophie's World* are texts that the teacher finds demanding. When determining the difficulty of the texts, Daniela is looking for the element of "going beyond" and providing an opportunity to discuss more general issues, such as the Holocaust, racism, the emergence of the world, or reincarnation.

Excerpt 2, discussion in lesson on Jane Eyre

T: Do you think so? Like we know it from the context that she is dying. But do you think that when a person is lying there this sick and the end is coming. That they really feel it? That they know that the end is somehow coming?

Martin: I also think they do.

Veronika: Well, they probably feel that they are kind of weak or so, like, they do have some feelings.

Petra: I have a cold so I also feel like.

T: (*laughing*) You also feel like you're dying! (*talking to Petra*)

Radek: When I think about it... What we see in the book is that this poor girl could not live without talking to her [dying friend] for the last time and she has to see her. And here in this classroom when one for instance coughs, everyone looks like they'll croak.

T: Hmm. (*laughing*) Well, it is quite interesting what you've said. Because it also occurred to me while we were reading it. What is the crucial difference between Helen [character from the book] being ill sometime in the mid-nineteenth century and somebody coughing in 2018 in this 9 A class?

Zuzana: Because they might not have known exactly what it was and therefore they did not have to, like, exactly cure it. And now almost everything can be cured.

In the above excerpt we encounter the form of feedback that the teacher mentions in the interview in Excerpt 1. The teacher's feedback dramatically differs from elaborate feedback (Hattie & Yates, 2014) and is closer to unspoken feedback (Svaricek & Sedova, 2012).

The excerpt begins with the teacher's open call to the students asking whether they think that a fatally ill person knows when the end is coming. The literary text serves as a foundation for posing a real question that the students should think about, as the teacher invites them to do twice. Immediately in the first answer a student states "*I think they do*". We interpret this answer as an opinion, not a judgment based on argumentation (level 3).

The teacher is waiting for the next response, which comes from Veronika who is introducing the argument that a person knows their physical state through feelings. The third replica may seem incomprehensible in the context, but Petra in her utterance reveals that she herself has a cold at the moment and feels in a way like the literary character in the book who is dying. The student is reacting with humor to her own feelings, to the previous response of her classmate, and to the teacher's question whether it is possible to know that the end is coming.

The teacher, like most students in the classroom, responds by laughing and reformulating Petra's response. Her reaction can hardly be seen as a reaction of a neutral observer, but rather as one of a direct participant in a discussion showing her emotions. As we will see in the excerpts that follow, Daniela often uses her comments to draw the students' attention to the non-cognitive aspect of an issue, to the emotions that the issues discussed may stir up in students. In her utterance, the teacher does not evaluate the appropriateness or inappropriateness of the student's feelings, but by her proclamation "*You also feel like you're dying!*" emphasizes the core of the student's utterance.

This is immediately followed by the reaction of Radek, who claims that he has also thought about the teacher's question, but shifts the original question in a different direction. This move deepens the connection between the story of Jane Eyre, who had to go and see her fatally ill friend, and the present time when Petra said she felt similar having a cold.

For our analysis, the response of the teacher who first laughs and then declares that it is very interesting and that it had also *occurred* to her is significant. The teacher not only takes the position of a participant in the discussion when she admits that she is thinking about the topic in a similar way as the students, but also raises the question of argument ownership. She demonstrates that arguments do not have a single owner and that several participants can put forward the same argument. Students can thus share the same arguments with other students as well as with the teacher.

Defense of epistemic rules

The teacher in the interview (see Excerpt 1) states that it is difficult for the students to distinguish the personal level of point of view from the factual side of the argument. In the following excerpt from a literature lesson devoted to the philosophical questions posed by Socrates and Plato at the dawn of the history of philosophy, students read aloud extracts from Jostein Gaarder's book *Sophie's World* and then discuss the text. The excerpt below follows in the lesson after Plato assigns Sofie four tasks, of which the fourth causes the greatest excitement among the students. This task was to find out whether men and women are equally sensible. The debate began with Jakub's statement that they had a different common sense, but his idea was not clear.

Excerpt 3, discussion in lesson on Jostein Gaarder Sophie's World

T: In other words, Jakub, that a woman is creative, while a man needs to have a precise procedure to follow, or what did you mean, Jakub?

Jakub: ((*Jakub nods his head, but Petra takes the floor*))

Petra: Well, boys are terribly complicated (.) Well they aren't able to behave like us. A woman is for instance (.) able to do anything, but a guy (.) he simply needs to have a woman behind him to tell him (.) what to do. Boys are incompetent.

T: ((*towards Petra*)) Really? Is it like you are generalizing (1) ((*indicates a horizontal surface with her hand*)) Do you mean like all boys?

Petra: Well, like yeah. BE QUIET, OK? ((*shouting at her classmates*)) (3) I can see it during football training sessions. Run straight and they keep going sideways. (.) It's like a bunch of thickheads (.) like disabled (.) but it's really terrible with them ((*clutching her head*)).

T: ((*the teacher has her hand in front of her mouth, popping her eye*)) Does it make you completely frustrated?

Mirek: Well, Mrs. Daniela can you see it? Mrs. Teacher, we say here with calmness that nobody is better than somebody else and then suddenly (.) "ALL BOYS ARE BAD ((*slaps his hands*)), GET STUFFED"

Petra: ((*turning to Mirek*)) But I did didn't say that you are bad, I said that you are complicated.

Eve: But she's right.

Petra: You're impractical.

T: So ((*she resolutely steps in and indicates with her hand the end of the discussion*)) I will tell you one mistake which is fundamental that you are making in this discussion (.) Petra takes up a position that she is alone against all men...

In the excerpt that captures a debate about a simple philosophical question, we encounter a highly emotional contribution from student Petra, who repeatedly emphasizes that boys are complicated and incompetent. The teacher first enters the discussion as its participant when she clarifies the thesis of Jakub, then explicitly identifies an epistemic mistake Petra makes ("*Is it like you are generalizing?*"), and finally, with non-verbal gestures and facial expressions, she reacts to Petra's emotional replica. From the perspective of examining the role of the teacher in creating an epistemic climate, Mirek's response is

fairly significant, because it refers to the discussion rules that the teacher had been establishing over a long period of time and that include the rule of avoiding attacking any other participant of a discussion. Student Petra not only generalizes, but uses an ad hominem argumentation fallacy. In his reaction, Mirek refers to the rules (“*we say here with calmness that nobody is better*”), but he calls for the teacher’s response twice (“*Mrs. Teacher, can you see it?*”).

Teacher Daniela does not respond to Mirek’s appeal immediately; she lets the students speak three more times before she vigorously ends the discussion and identifies the mistake that Petra made in the discussion. The teacher takes up the role of a defender of epistemic rules in the discussion. The excerpt illustrates how difficult it is for the students to conduct dialogic argumentation in accordance with all the rules. This is particularly so when students show a strong personal interest in the discussion. On the one hand, the emotional charge associated with a student’s personal opinion is a factor leading to the student’s participation in the learning dialogue (Petra is repeatedly able to react and defend her position), but on the other hand, it threatens adherence to epistemic rules of dialogic argumentation.

The unique personal motivation of each student can thus be challenged not only by the fact that creating arguments is cognitively demanding, but also by the requirement for students to respect the shared norms of their social context when producing their arguments (Reznitskaya et al., 2001). Specifically, these norms concern both argumentation and epistemic rules.

This situation represents an opposite issue to what Matusov and others describes (2016, p. 429) when he points out that students need to be encouraged to discuss curricular topics that students find “boring”. However, while student Petra is highly motivated by her personal attitude to the matter, she does not respect the basic rules of dialogic argumentation. This phenomenon also disrupts the discussion and the teacher stops the discussion to explain to the students once again which epistemic rules they had broken.

The emotional charge associated with a student’s personal opinion is therefore in conflict with adherence to epistemic rules of dialogic argumentation.

Depersonalization of arguments

As the previous excerpt has clearly demonstrated, dialogic argumentation can be highly emotional. The teacher relates that as soon as she succeeds in dispelling students’ fear of speaking in a discussion, she is faced with the issue of the personal attacks that students engage in.

Excerpt 4, interview with a teacher

Teacher: A very typical problem for a discussion is that the kids start by accusing each other. Whenever I start to teach how to discuss, they never use an argument, but they always attack the one who discusses with them.

Interviewer: And how do you make them unlearn that?

T: I keep pointing this out. That a discussion is not about attacking the adversary, but that it is about convincing the adversary of your opinion or trying to convince him or her of your opinion. In the beginning they take it very personally when someone has a different opinion than they do. But gradually they just get used to the fact that it does not matter at all that someone has a different opinion.

When teaching the art of discussion, the teacher first has to repeatedly address the issue of personal attacks with students. While the students are able to participate in a discussion, the discussion has an undesirable quality of students' personal attacks against one another. These attacks do not contain any arguments according to the teacher, only opinions.

However, the teacher's strategy is not to forbid students from expressing their emotions; on the contrary, there are situations in which she is also emotionally involved in the discussion (Excerpt 2). Her strategy is for the students to formulate their views with the support of an argument. Thus, an opinion with an argument is, according to the teacher, the epistemically highest level she requires from the students, because it contains both the emotional component indicating the author's view (opinion) and the rationale for that view (argument).

Paradoxically, after the students express their opinion with an argument, the teacher tries to depersonalize or nationalize their argument. What do we mean by that? The teacher, assuming the role of the one who collectivizes arguments, seeks to make the argument jointly owned by everybody in the classroom so that it is possible to discuss the nature of the argument and not the student's personal opinion. Teacher Daniela emphasizes once again to the students that opinion and argument are epistemically qualitatively different concepts, and she also tries to "clean" the argument of the owner's opinion.

We have already seen an example of this strategy in Excerpt 2, when in response to Mirek the teacher literally says "*it also occurred to me*", pointing out that the arguments are not exclusively the property of those who uttered them. The second example of the depersonalization of an argument is given in the excerpt below.

Excerpt 5, discussion in a lesson on Jostein Gaarder's Sophie's World

T: I would like to ask all of you, not just Karel, I don't want to engage in a debate just with Karel. But in fact, Karel hinted a little that when someone is educated, he does not need faith. Do you think that faith is related to how educated or intelligent a person is?

Pavel: No (*(shaking his head)*).

T: Why do you think so?

Pavel: Well, an educated person can also believe.

The excerpt captures the routine of depersonalization of arguments by the teacher: the teacher first deprives Karel of ownership of the argument (“*I don’t want to engage in a debate just with Karel*”), and then brings the argument that he originally introduced to the open discussion arena through a question for all students in the classroom. (“*I would like to ask all of you, not just Karel; Do you think that...*”).

Through depersonalization, the argument is presented to all students for discussion, which dramatically reduces the possibility that students will attack the author of the argument and increases the possibility that they will stick to discussing only the essence of the argument.

Epistemological provocation

In addition to epistemic rules, the teacher during discussions also draws students’ attention to different epistemological systems. In this case, her input into the discussion does not concern either the content and form of arguments or the rules of the discussion; it is pointing directly to the core of epistemology. In this role, teacher Daniela acts as thought-provoking Socrates, who does not question the factual side of knowledge, but its epistemic component, as we can see in the excerpt below.

Excerpt 6, in lesson on Jane Eyre

Karel: [Reincarnation is] a silly idea, because there are so many theories how reincarnation works. But the problem is that none of the people who claim it has any factual evidence. When I look at the function of the body, then you only need some smart scientist to explain to me everything that happens like in thinking through chemistry. But when I ask any kind of expert *What is the soul?* Well, that’s that, you know. And how do I prove that? Well, I don’t know, I simply believe it. So these are the kind of arguments, like, I believe it, therefore it is so. Just like when I say that there is God. I also cannot prove that in any way; what you can prove with enough arguments, you can also disprove with arguments.

T: Thank you. And is it necessary, is it really necessary to have arguments to believe something?

Denis: Yes.

Jiri: No.

Karel: In a discussion yes. If I want to convince anybody in a discussion, I need to have arguments.

Jiri: (*reacting to Karel*) In a discussion you do, but if you want to believe something. Mirek: Yeah, that’s clear but a reasonable argument can also disprove your opinion, right.

T: And when we go back to the excerpt, now Helen was actually dying there, you defined it this way yourselves. That she was dying in peace, dying reconciled, because she believed she would get somewhere to God who would take care of her and, moreover, she believed that she would meet her loved ones there. So (.) would it be easier for her to die if she thought: “my body is a chemical reaction, nothing else will happen”?

The discussion was sparked by the text of *Jane Eyre*, in particular by a passage in which Helen on her deathbed believes that God will take her to heaven after her death. The students discussed what faith is, how faith helps one, and whether reincarnation exists.

The excerpt begins with the utterance of Karel, who responds to several of his classmates describing reincarnation. Karel disagrees with their claim that there is evidence of reincarnation and argues that one cannot believe these theories. Karel concludes with an epistemologically valuable assertion that “*what can be proved with enough arguments can also be disproved with arguments*”. It is an analogy of the ancient principle of isostheneia—our reason can formulate both arguments and counterarguments concerning the same phenomenon.

By asking the students whether it is necessary “*to have arguments to believe something*”, the teacher draws their attention to two epistemologically different discourses, faith and reason. The same point is repeated in the teacher’s second reaction “*would it be easier for her to die if she thought: ‘my body is a chemical reaction, nothing else will happen?’*”. With her question, Daniela brings students to the essence of epistemology, which deals with thinking, cognition, and the possibilities of human knowledge.

Daniela thus takes on the role of a provoking epistemologist by encouraging the students to think about the metacognitive and epistemological limits of human thought. It is precisely by doubtfully questioning the conditions of faith that she draws attention to the conditions of reasoning and argumentation. This role does not seem to correspond to the common idea of a teacher who is supposed to teach students unquestionable knowledge.

The teacher’s provocation is based on discussion with students and stimulates students to think as if they were being initiated into science (Nokes, 2014). The last excerpt illustrates the challenging epistemic climate in teacher Daniela’s lessons when students arrive in the discussion sparked by an extract from *Jane Eyre* at the formulation of the principle of isostheneia. This principle refers to the characteristics of human reason and can also be seen as a skeptical view of the possibilities of human knowledge.

Discussion

In this study, we looked at how teachers work with the students’ individual motivation and personal opinions and how teachers support students’ epistemic thinking in dialogic argumentation. The case study presented here is a new contribution to the discussion of levels of epistemic understanding. In contrast to Kuhn (1999) and Nokes (2014), the teacher Daniela inserts an intermediate stage between the third and fourth level of epistemic

understanding: opinion with argument. Teacher Daniela distinguishes three different epistemic levels: opinion (level 3), opinion with argument (level 3.5), and argument (level 4). This hierarchy has a strong didactic potential for linking the level of motivation and epistemic thinking with dialogic argumentation.

Researchers often refer to Kuhn's thesis (1991) that argumentation skills are latent within students and require only minimal classroom teaching to develop. Our case study shows that students are able to make arguments, but it is considerably more difficult for them to participate in dialogic argumentation in conformity with epistemic rules, and often there is a situation in which students attack one another because of their personal views rather than pursue a line of argument. Although many researchers correlate the number of students' arguments with their level of development of epistemic thinking (Bendixen, 2002; Mason & Scirica, 2006; Nussbaum & Bendixen, 2003), our case study brings a slightly different perspective. Argumentation, as a specific kind of social practice, reflects the shared norms of the social context (Reznitskaya et al., 2001), and consequently the epistemic rules imposed by the teacher fundamentally determine the form of student talk. It may well be that students produce arguments not because they are at the highest level of epistemic thinking, but because their strong personal opinion is not restrained by a teacher's established epistemic rules.

We draw critical attention to the fact that the emotional charge associated with a student's personal opinion may be in sharp conflict with adherence to epistemic rules of dialogic argumentation. Excessive personal interest, strong attitudes, and an emotional charge can lead students to attack other classmates, break argumentation rules, and violate epistemic rules. Paradoxically, increasing student engagement can lead to closing of the debate, as in our example when the teacher ended the dialogue. If the teacher did not encourage students to respect the epistemic rules, the students would engage in dialogue but without employing argumentation.

The results of the study show, as a reflector, a possible new area of research shedding some light on the importance of epistemic rules of dialogic argumentation in relation to the nature of student moves.

The essential elements for engagement are student motivation and, above all, the ability of the teacher to align each student's personal motivation with the curricular goals and plans (Matusov, 2011). Research by Gronostay (2018) is in line with our findings that students argue more when they can defend their own position. Through her original approach, teacher Daniela allows students to defend their position if their opinion is supported by an argument. This motivates students to engage in the debate and discuss ideas with the teacher and other classmates. At some point, the teacher separates the student's personal opinion from the argument so that other students can join in discussing the

essence of the argument and avoid mutual attacks. The process of argumentation is extremely difficult for the students because they have to understand the other student's argument to be able to use it to support their own argument. They also need to identify and challenge weaknesses in their classmate's argument (Walton, 1989). Consequently, students show better involvement in dialogic argumentation if they can defend their own position and not a position assigned to them, although many authors have provided evidence that dividing students into two groups based on holding contradictory positions (e.g., for or against introducing tuition) results in improving their explicitness (Leitão, 2000) and improving their reasoning (Dam & Volman, 2004).

An original technique that combines levels of epistemic thinking with the management and support of dialogic argumentation by the teacher is depersonalizing the argument. Depersonalization has several steps: students first produce their opinions (level 3), then the teacher urges them to formulate opinions with arguments (level 3.5). The next elevation is made by the teacher by pointing out that she also had the same argument (see Excerpt 2) or clearing the argument of the author's personal aspect (Excerpt 5). Through depersonalization, the argument is presented to all students for discussion, which reduces the possibility that students will attack the author of the argument and increases the possibility that the participants will publicly discuss the substance of the argument.

The depersonalization of arguments is also a technique that can eliminate the well-described phenomenon of students tending to externalize reasons for their own position and failing to build on the arguments of others (Felton et al., 2009, 2015; Kuhn & Udell, 2007; Simonneaux, 2001).

Nokes (2014) considers the criterialist stance the highest level of epistemic understanding. This level can be characterized by the existence of criteria that scientists (historians in particular) use to evaluate, accept, or reject interpretations. In order for students to reach this level, it is not enough to present different interpretations and historical context to them; it is necessary to get them to reflect on the epistemic context of knowledge. This means to think about how and by whom the facts are created and what the nature of the individual components of knowledge is. This element can be traced in the epistemological provocation of teacher Daniela, who guides students to discuss not only the content of literary works, but also the principles of human cognition. Matusov (2011) considers dialogic provocations by the teacher a successful technique that encourages students to engage in discussion and give an answer. The teacher works with canonical literary texts in such a way that texts that are not deliberately provocative suddenly offer students provocative or even controversial theses. Controversial topics are important because they are often seen as a fundamental resource for practicing democratic discussion at school (Hess, 2009).

The situation is further complicated by the fact that teachers should aim for more arguments per hour and should also make sure to take into account the epistemic qualities of argumentation, such as goals and values (Chinn et al., 2014). The arguments produced by students should relate to the subject matter of the lesson, and students should, for example by using argumentation, seek truth, although it may not be easy and enjoyable.

The results of the study showed that the teacher followed the epistemic qualities of argumentation, such as goals, rules, and values (Chinn et al., 2014), as well as whether students' arguments related to the subject matter of the lesson (Alexander, 2008). For example, the students argued in a discussion about an excerpt from a book published in 1847 that did not contain controversial topics, and they discussed philosophical questions posed by Plato, historical perceptions of events, the essence of faith, and epistemology itself. These topics were inspired by literary texts, but the key element contributing to argumentation, which is a cognitively, emotionally, and socially challenging task for students, was the interconnection of several elements: their personal motivation with the curriculum and epistemic thinking with dialogic argumentation.

Argumentation is a demanding activity, as many interventional research studies have indicated (Zohar & Nemet, 2002), and it is therefore necessary to show ways to achieve this desired goal.

Limitations of the study

The case study of teacher Daniela that we conducted allowed us to obtain rich and detailed data, which is why we chose this design, much like many colleagues examining the behavior of one teacher (Cohen, 1990; Feucht, 2011). At the same time, the chosen method raises methodological questions. One of the limitations of our study is the impossibility of drawing conclusions of a causal nature. Therefore, we cannot argue that the outlined teacher roles in creating an epistemic climate are the only way leading to an increase in epistemic cognition in students. Nor can we argue that the monitored students will be equipped for their further educational journey with a profound insight into epistemic understanding.

We need an intervention study to identify causal connections and all related mechanisms associated with epistemic cognition, beliefs, and climate. Based on our findings, we are planning an intervention study that will combine an examination of these concepts with an investigation of students' achievements.

The present study is based on an in-depth examination of the teacher and the behavior of students in one ninth-grade classroom. Our findings are therefore specific to the subject taught, language arts, as well as to the

interactions between the selected teacher and her students. For example, we cannot generalize our findings to all teachers teaching this group of students, or to all students taught by teacher Daniela. Nor can we generalize the findings of the study to apply to all Czech students, because the students in Daniela's class produced on average a much higher number of arguments. Daniela's students generated 8.47 arguments in an average lesson, while students in the other 31 classes observed produced 0.57 arguments per lesson (see Sedova et al., 2019).

However, we believe that, given the detailed and long-term research of teacher Daniela's practice, which we also examined in a previous study (Sedova, 2017), this study provides rigorous results fruitful for the study of epistemic climate.

Funding

This article is an output of the project *On the Relationship Between Characteristics of Classroom Discourse and Student Achievement* (GA17-03643S), funded by the Czech Science Foundation.

References

- Alexander, R. J. (2008). *Essays on pedagogy*. London: Routledge. Berlin.
- Alexander, R.J. (2017). *Towards dialogic teaching: Rethinking classroom talk*. Cambridge: Dialogos.
- Asterhan, C. S. C., & Schwarz, B. B. (2016). Argumentation for Learning: Well-Trodden Paths and Unexplored Territories. *Educational Psychologist*, 51(2), 164–187.
- Barzilai, S., & Zohar, A. (2014). Reconsidering Personal Epistemology as Metacognition: A Multifaceted Approach to the Analysis of Epistemic Thinking. *Educational Psychologist*, 49(1), 13–35.
- Bendixen, L. D. (2002). A process model of epistemic belief change. In B. K. Hofer & P. R. Pintrich (Eds.), *Personal epistemology: The psychology of beliefs about knowledge and knowing* (pp. 191–208). Mahwah, NJ: Erlbaum.
- Bendixen, L. D., Schraw, G., & Dunkle, M. E. (1998). Epistemic beliefs and moral reasoning. *The Journal of Psychology: Interdisciplinary and Applied*, 132(2), 187–200.
- Bendixen, L.D. & Feucht, F. C. (2010). (Eds.). *Personal epistemology in the classroom: Theory, research, and implications for practice*. NewYork, NY: Cambridge University Press.
- Berland, L. K., & Reiser, B. J. (2011). Classroom communities' adaptations of the practice of scientific argumentation. *Science Education*, 95, 191–216.
- Billings, L., & Fitzgerald, J. (2002). Dialogic discussion and the Paideia seminar. *American Educational Research Journal*, 39(4), 907–941.
- Bromme, R., Pieschl, S., & Stahl, E. (2010). Epistemological beliefs are standards for adaptive learning: A functional theory about epistemological beliefs and metacognition. *Metacognition and Learning*, 5, 7–26.

- Bruner, J. (1978) The role of dialogue in language acquisition. In A. Sinclair, R. J. Jarvella & W. J. Levelle (Eds.), *The child's conception of language*, (pp. 241–256). New York: Springer-Verlag.
- Cavagnetto, A. R. (2010). Argument to Foster Scientific Literacy: A Review of Argument Interventions in K-12 Science Contexts. *Review of Educational Research*, 80(3), 336–371.
- Chinn, C. A., O'donnell, A. M., & Jinks, T. S. (2000). The structure of discourse in collaborative learning. *The Journal of Experimental Education*, 69, 77–97.
- Chinn, C. A., Rinehart, R. W., & Buckland, L. A. (2014). Epistemic cognition and evaluating information: Applying the AIR model of epistemic cognition. In D. Rapp and J. Braasch (Eds.), *Processing inaccurate information*. Cambridge, MA: MIT Press.
- Cohen, D.K. (1990). A Revolution in One Classroom: The Case of Mrs. Oublier. *Educational Evaluation and Policy Analysis*, 12(3), 311–329.
- Corbin, J., & Strauss, A. (2014). *Basics of qualitative research. Techniques and procedures for developing grounded theory*. Thousand Oaks: Sage.
- Dam, G., & Volman, M. (2004). Critical thinking as a citizenship competence: teaching strategies. *Learning and Instruction*, 14(4), 359–379.
- Duschl, R. A., & Osborne, J. (2002). Supporting and promoting argumentation discourse in science education. *Studies in Science Education*, 38, 39–72.
- Felton, M., Garcia-Mila, M., & Gilabert, S. (2009). Deliberation versus dispute: the impact of argumentative discourse goals on learning and reasoning in the science classroom. *Informal Logic*, 29, 417–446.
- Felton, M., Garcia-Mila, M., Villarroel, C., & Gilabert, S. (2015). Arguing collaboratively: argumentative discourse types and their potential for knowledge building. *British Journal of Educational Psychology*, 85, 372–386.
- Feucht, F. C. (2011). The epistemic underpinnings of Mrs. M's reading lesson on drawing conclusions: a classroom-based research study. In J. Lunn Brownlee, G. Schraw, & D. Berthelsen (Eds.), *Personal epistemology and teacher education* (pp. 3–21). New York, NY: Routledge.
- Gee, J. P. (2012). *Social linguistics and literacies: ideology in discourses*. New York: Routledge.
- Gronostay, D. (2016). Argument, counterargument, and integration? Patterns of argument reappraisal in controversial classroom discussions. *Journal of Social Science Education*, 15(2), 42–56.
- Gronostay, D. (2018). To argue or not to argue? The role of personality traits, argumentativeness, epistemological beliefs and assigned positions for students' participation in controversial political classroom discussions. *Unterrichtswiss*, 6, 1–19.
- Hattie, J., & Yates, G. C. R. (2014). *Visible learning and the science of how we learn*. Abingdon, New York: Routledge.
- Hess, D. (2009). *Controversy in the classroom. The democratic power of discussion*. New York, NY: Routledge.
- Hofer, B. (2004). Exploring the dimensions of personal epistemology in differing classroom contexts: Student interpretations during the first year of college. *Contemporary Educational Psychology*, 29, 129–163.
- Hofer, B. K., and Pintrich, P. R. (1997). The development of epistemological theories: Beliefs about knowledge and knowing and their relation to learning. *Review of Educational Research*, 67(1): 88–140.
- Kuhn, D. (1991). *The skills of argument*. Cambridge, UK: Cambridge University Press.

- Kuhn, D. (1999). Metacognitive development. In L. Balter & C. S. Tamis-LeMonda (Eds.), *Child psychology: A handbook of contemporary issues* (pp. 259–286). Ann Arbor, MI: Psychology Press.
- Kuhn, D. (2005). *Education for thinking*. Cambridge, MA: Harvard University Press.
- Kuhn, D. (2009). Adolescent thinking. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology: Individual bases of adolescent development* (p. 152–186). John Wiley & Sons Inc.
- Kuhn, D. (2010). Teaching and learning science as argument. *Science Education*, 94(5), 810–824.
- Kuhn, D., & Udell, W. (2007). Coordinating own and other perspectives in argument. *Thinking and Reasoning*, 13(2), 90–104.
- Kuhn, D., & Weinstock, M. (2002). What is epistemological thinking and why does it matter? In B. K. Hofer & P. R. Pintrich (Eds.), *Personal epistemology: The psychology of beliefs about knowledge and knowing* (pp. 121–144). Mahwah, NJ: Lawrence Erlbaum Associates.
- Kuhn, D., Cheney, R., & Weinstock, M. (2000). The development of epistemological understanding. *Cognitive Development*, 15(3), 309–328.
- Kuhn, D., Zillmer, N., Crowell, A., & Zavala, J. (2013). Developing norms of argumentation: Metacognitive, epistemological, and social dimensions of developing argumentative competence. *Cognition & Instruction*, 31(4), 456–496.
- Kuhn, T. (1968). *The Structure of Scientific Revolutions*. University of Chicago Press, Chicago.
- Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*. Cambridge, MA: Harvard University Press.
- Lave, J. and Wenger, E. (1991) *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press.
- Lefstein, A., & Snell, J. (2014). *Better than best practice: Developing teaching and learning through dialogue*. London: Routledge.
- Leitão, S. (2000). The Potential of Argument in Knowledge Building. *Human Development*, 43(6), 332–360.
- Mason, L. (1996). An analysis of children's construction of new knowledge through their use of reasoning and arguing in classroom discussions. *Qualitative Studies in Education*, 9, 411–414.
- Mason, L., & Scirica, F. (2006). Prediction of students' argumentation skills about controversial topics by epistemological understanding. *Learning and Instruction*, 16(5), 492–509.
- Mason, L., Boscolo, P. (2004). Role of epistemological understanding and interest in interpreting a controversy and in topic-specific belief change. *Contemporary Educational Psychology*, 29, 103–128.
- Matusov, E. (2011). Authorial teaching and learning. In E. J. White & M. Peters (Eds.), *Bakhtinian pedagogy: Opportunities and challenges for research, policy and practice in education across the globe* (pp. 21–46). New York: Peter Lang Publishers.
- Matusov, E., von Duyke, K., & Kayumova, S. (2016). Mapping Concepts of Agency in Educational Contexts. *Integrative Psychological and Behavioral Science*, 50(3), 420–446.
- McNeill, K.L., Pimentel, D.S. & Strauss, E.G. (2013). The Impact of High School Science Teachers' Beliefs, Curricular Enactments and Experience on Student Learning During an Inquiry-based Urban Ecology Curriculum. *International Journal of Science Education*, 35(15), 2608–2644.
- Means, M. L., & Voss, J. F. (1996). Who reason well? Two studies of informal reasoning among children of different grade, ability, and knowledge levels. *Cognition and Instruction*, 14, 139–178.

- Mercer, N., & Littleton, K. (2007). *Dialogue and the development of children's thinking: A sociocultural approach*. New York, NY: Routledge.
- Muis, K. R. (2007). The role of epistemic beliefs in self-regulated learning. *Educational Psychologist*, 42(3), 173–190.
- Muis, K. R., Bendixen, L. D., & Haerle, F. C. (2006). Domain-generality and domain-specificity in personal epistemology research: philosophical and empirical reflections in the development of a theoretical framework. *Educational Psychology Review*, 18(1), 3–54.
- Muis, Krista R., Duffy, Melisa C. (2013). Epistemic Climate and Epistemic Change: Instruction Designed to Change Students' Beliefs and Learning Strategies and Improve Achievement. *Journal of Educational Psychology*, 105(1), 213–225.
- Nassaji, H., & Wells, G. (2000). What's the use of 'triadic dialogue'? An investigation of teacher-student interaction. *Applied linguistics*, 21(3), 376–406.
- Newton, P., Driver, R., & Osborne, J. (1999). The place of argumentation in the pedagogy of school science. *International Journal of Science Education*, 21(5), 553–576.
- Nokes, J. D. (2014). Elementary Students' Roles and Epistemic Stances During Document-Based History Lessons. *Theory & Research in Social Education*, 42(3), 375–413.
- Norris, S. P., & Phillips, L. M. (1994). Interpreting pragmatic meaning when reading popular reports of science. *Journal of Research in Science Teaching*, 31, 947–968.
- Nussbaum, E.M., & Bendixen, L. D. (2003). Approaching and avoiding arguments: the role of epistemological beliefs, need for cognition, and extraverted personality traits. *Contemporary Educational Psychology*, 28, 573–595.
- Nystrand, M., Gamoran, A., Kachur, R., & Prendergast, C. (1997). *Opening dialogue. Understanding the dynamics of language and learning in the English classroom*. New York: Teachers College Press.
- Perry, W. G. (1970). *Forms of intellectual and ethical development in the college years: a scheme*. New York: Holt, Rinehart and Winston.
- Rapanta, C., Garcia-Mila, M., & Gilabert, S. (2013). What is meant by argumentative competence? An integrative review of methods of analysis and assessment in education. *Review of Educational Research*, 83,483–520.
- Reznitskaya, A., Anderson, R., McNurlen, B., Nguyen-Jahiel, K., Archoudidou, A., & Kim, S. (2001). Influence of oral discussion on written argument. *Discourse Processes*, 32, 155–175.
- Reznitskaya, A., Kuo, L. J., Clark, A. M., Miller, B., Jadallah, M., Anderson, R. C., & Nguyen-Jahiel, K. (2009). Collaborative reasoning: A dialogic approach to group discussions. *Cambridge journal of education*, 39(1), 29–48.
- Sadler, T., & Fowler, S. (2006). A threshold model of content knowledge transfer for socioscientific argumentation. *Science Education*, 90, 986–1004.
- Schommer, M. (1990). Effects of beliefs about the nature of knowledge on comprehension. *Journal of Educational Psychology*, 82(3), 498–504.
- Schommer, M. (1993). Epistemological development and academic performance among secondary students. *Journal of Educational Psychology*, 85(3), 406–411.
- Schommer, M., Calvert, C., Gariglietti, G., & Bajaj, A. (1997). The development of epistemological beliefs among secondary students: *A longitudinal study*. *Journal of Educational Psychology*, 89(1), 37–40.
- Schwarz, R. (2005). Using facilitative skills in different roles. In R. Schwarz & A. Davidson (Eds.), *The skilled facilitator fieldbook: Tips, tools, and tested methods for consultants, facilitators, managers, trainers, and coaches* (pp. 27–32). San Francisco: Jossey-Bass.

- Sedlacek, M., & Sedova, K. (2017). How many are talking? The role of collectivity in dialogic teaching. *International Journal of Educational Research*, 85, 99–108.
- Sedova, K. (2017). A case study of a transition to dialogic teaching as a process of gradual change. *Teaching and Teacher Education*, 67, 278–290.
- Sedova, K., Sedlacek, M., & Svaricek, R. (2016). Teacher professional development as a means of transforming student classroom talk. *Teaching and Teacher Education*, 57, 14–25.
- Sedova, K., Sedlacek, M., Svaricek, R., Majcik, M., Navratilova, J., Drexlerova, A., Kychler, J., & Salamounova, Z. (2019). Do those who talk more learn more? The relationship between student classroom talk and student achievement. *Learning and Instruction*, 63.
- Sedova, K., Svaricek, R., Sedlacek, M., & Salamounova, Z. (2016). *Jak se učitelé učí: Cestou profesního rozvoje k dialogickému vyučování*. Brno: Masarykova univerzita.
- Sfard, A. (2016). Ritual for ritual, exploration for exploration or What the learners get is what you get from them in return. In J. Adler & A. Sfard (Eds.), *Research for educational change: Transforming researchers' insights into improvement in mathematics teaching and learning* (pp. 53–75). London: Routledge.
- Simonneaux, L. (2001). Role-play or debate to promote students' argumentation and justification on an issue in animal transgenesis. *International Journal of Science Education*, 23, 903–927.
- Snell, J. (2011). Interrogating video data: Systematic quantitative analysis versus micro-ethnographic analysis. *International Journal of Social Research Methodology*, 14(3), 253–258.
- Stahl, S. A., Hynd, C. R., Britton, B. K., McNish, M. M., & Bosquet, D. (1996). What happens when students read multiple source documents in history? *Reading Research Quarterly*, 31, 430–456.
- Svaricek, R., & Sedova, K. (2012). Feedback in educational communication in Czech secondary schools. *Educational Assessment, Evaluation and Accountability*, 24(3), 239–261.
- Toulmin, S. E. (1972). *Human understanding: The collective use and evolution of concepts*. Princeton: Princeton University Press.
- van Eemeren, F. H., Grootendorst, R., & Snoeck Henkemans, A. F. (2002). *Argumentation. Analysis, Evaluation, Presentation*. Mahwah: Lawrence Erlbaum Associates.
- Venville, G. J., & Dawson, V. M. (2010). The impact of a classroom intervention on grade 10 students' argumentation skills, informal reasoning, and conceptual understanding of science. *Journal of Research in Science Teaching*, 47(8), 952–977.
- von Aufschnaiter, C., Erduran, S., Osborne, J., & Simon, S. (2008). Arguing to learn and learning to argue: Case studies of how students' argumentation relates to their scientific knowledge. *Journal of Research in Science Teaching*, 45(1), 101–131.
- Vygotsky, L. (1970). *Thought and Language*. Cambridge: MIT Press.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge: Harvard University Press.
- Walton, D. N. (1989). Dialogue theory for critical thinking. *Argumentation*, 3, 169–184.
- Walton, D. N. (2008). *Informal logic: a pragmatic approach*. New York: Cambridge University Press.
- Walton, D. N., Reed, C., and Macagno, F. (2008). *Argumentation schemes*. New York: Cambridge University Press.
- Walton, D., Macagno, F. (2016). A classification system for argumentation schemes. *Argument & Computation*, 6(3), 219–245.
- Wegerif, R. (2007). *Dialogic education and technology: Expanding the space of learning* (Vol. 7). Berlin: Springer Science & Business Media.

- Wells, G., & Arauz, R. M. (2006). Dialogue in the Classroom. *Journal of the Learning Sciences*, 15(3), 379–428.
- Wilkinson, I. A. G., Murphy, P. K., & Binici, S. (2015). Dialogue-intensive pedagogies for promoting reading comprehension: What we know, what we need to know. In L. B. Resnick, C. S. C. Asterhan, & S. N. Clarke (Eds.). *Socializing intelligence through academic talk and dialogue* (pp. 37–50). Washington, DC: American Educational Research Association.
- Wood, D., Wood, H., & Middleton, D. (1978). An experimental evaluation of four face-to-face teaching strategies. *International Journal of Behavioral Development*, 1, 131–147.
- Yin, R. K. (2009). *Case study research: Design and methods*. Los Angeles, CA: Sage.
- Zohar, A., & David, A. Ben. (2008). Explicit teaching of meta-strategic knowledge in authentic classroom situations. *Metacognition and Learning*, 3(1), 59–82.
- Zohar, A., & Nemet, F. (2002). Fostering students' knowledge and argumentation skills through dilemmas in human genetics. *Journal of Research in Science Teaching*, 39(1), 35–62.

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