

# Argumentation as a pathway to critical thinking

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**ABSTRACT:** Based on insights from the field of educational psychology, we designed and implemented an eight-week, small-scale intervention for first year university students in educational sciences. Critical thinking and argumentation skills were fostered through small-group classroom discussions. Tentative findings from focus-group interviews suggested that students benefited from our approach. Theoretical and educational implications are also presented.

**KEY WORDS:** Argumentation, arguing to learn, critical thinking, epistemic cognition, inquiry dialogue, internalisation, reasoning, thinking skills.

## 1. INTRODUCTION

Critical thinking is a core competence that enables 21st century citizens to navigate multiple streams of information and make informed decisions about increasingly complex issues (OECD, 2016); critical thinking is also more necessary than ever due to increased access to (diverging) information of varying degrees of reliability (Goldman, Braasch, Wiley, Graesser, & Brodowinska, 2012), social responsibility to act on available information (Murphy, Firetto, Wei, Li, & Croninger, 2016), and the prevalence of phenomena such as Fake News in the so-called “post-truth era” (Sinatra, 2018). However, while it is a national goal of education systems internationally (e.g. National Governors Association Center for Best Practices, 2010; Norwegian Ministry of Education and Research, 2016), teaching students to think critically remains a challenge; students at upper-secondary level feel unprepared for the academic demands of tertiary education and teachers in higher education view students’ critical thinking skills as “underdeveloped” (Lødding & Aamodt, 2015).

We addressed the issue of developing critical thinking by designing and instructing a course with a focus on argumentation and critical thinking skills that was situated in the domain of education. We adopted a view of critical thinking as “purposeful, self-regulatory, judgment that results in interpretation, analysis, evaluation, and inference, as well as explanations of the considerations on which that judgment is based” (Abrami et al., 2015, p.275), and built on theoretical and empirical knowledge from research on educational psychology; specifically, the interrelated fields of epistemic cognition, critical thinking and argumentation.

In this paper we present the critical thinking class that was designed and taught in Norway. We begin by presenting the theoretical framework upon which the class rested, before describing main elements from the teaching, including an overview of the topics, methods and class environment, as well as tentative findings from focus group interviews, that form the basis of theoretical and educational implications, and suggestions for future research.

## 2. THEORETICAL BACKGROUND

In this section we briefly present three interrelated bodies of knowledge that provide our theoretical background: epistemic cognition, critical thinking and argumentation.

Educational research on epistemic cognition mainly focuses on students' beliefs and cognitions about knowledge and the process of knowing (Greene, Sandoval, & Bråten, 2016). We view epistemic cognition as a particularly important point of departure for our research in light of theoretical and empirical relations between academic achievement (Greene, Cartiff & Duke, 2018), comprehension of single and multiple texts (Bråten, Strømsø & Ferguson, 2016), written argumentation (Bråten, Ferguson, Strømsø & Anmarkrud, 2014) and disciplinary learning (Sandoval, 2016), which we view as pertinent for the development and practice of critical thinking. There are several approaches to educational research on epistemic cognition (Hofer, 2016), including developmental views outlining a general progression in individuals' understanding and views of knowledge (Kuhn, 1999); systems of beliefs views of epistemic beliefs as a set of independent-but-related beliefs about knowledge and knowing (Hofer & Pintrich, 1997; Schommer, 1990), and situated views of epistemic cognition (Chinn, Buckland & Samarapungavan, 2011). Notably, each of these approaches can be related to critical thinking and argumentation (Greene & Yu, 2016; Kuhn, 1999).

According to developmental views, epistemological understanding develops over time, as a result of experience and education (Kuhn, 1999). Accordingly, individuals may progress through general stages from *realists'* with faith in one true reality, to *absolutist* epistemological views, where knowledge is objective and resides in external authorities, to *multiplist* assertions that equate all knowledge claims with equally valid opinions, irrelevant of knowledge claimant, and finally, some individuals will adopt *evaluative* epistemologies, after realising that some claims are more valid and justified than others (Kuhn, 1999). With respect to developmental epistemological views, Kuhn (1999) suggests that absolutist and multiplist knowledge views are necessary precursors to engagement in critical thinking, but individuals that adopt such stances are unlikely to engage in critical thinking, since knowledge claims are either right or wrong and can be resolved through appeal to authorities, on the one-hand, or everything is correct and equally valid, rendering the need for critical thinking obsolete, on the other. Meanwhile, individuals that develop evaluativist understandings may engage in critical thinking in order to appraise or justify claims, based on scientific thinking or standards. Kuhn (1999) also relates views of knowledge to views of self and agency in relation to knowledge construction and metacognitive development, which may further influence engagement, as well as learning approach.

Educational researchers have also identified specific dimensions of beliefs about the nature of knowledge and the nature of knowing: specifically, beliefs about the relative certainty (or tentativeness), simplicity (or inter-relatedness), and source of knowledge (from personal, to external sources of knowledge), as well as ways of justifying knowledge claims (from personal experiences to testimony by alignment with external authorities), with each of the these four belief types existing on a continuum of more-or-less availing beliefs (Hofer & Pintrich, 1997; Muis, 2004). Systems-of-beliefs views of epistemic beliefs have identified relations between specific dimensions of epistemic beliefs and higher order thinking, including critical thinking (Chan, Ho & Ku, 2011), multiple documents literacy (Bråten, Britt, Strømsø & Rouet, 2011) and argumentation (Bråten et al., 2014). For example, students that believe that knowledge develops over time (rather than being static), is inter-related (rather than "chunks" of independent facts) and must be cross-checked with other sources, are more likely to engage in deeper processing and corroboration (Bråten et al., 2011), and produce more integrated (coherent) written arguments (Bråten et al., 2014).

The third strand of educational research on epistemic cognition that is relevant for our approach has its basis in philosophical literature and focuses on individuals' epistemic aims and values, ideals, and reliable processes for achieving said epistemic aims (Chinn, et al., 2011; Chinn, Rinehart & Buckland, 2014; Chinn & Rinehart, 2016). Thus, individuals are said to adopt certain aims, such as gaining knowledge and understanding or avoiding false beliefs in relation to different topics. These aims, as well as the values attached to them further influence cognitive processing, and their achievement will be judged in light of epistemic ideals, or standards, such as fitting with existing knowledge or evidence, or lack of counter-evidence. Lastly, the processes invoked by or relied upon by individuals to achieve epistemic aims, such as scientific experiments, replication or argumentation, may be more or less reliable for achieving the aims that have been set (Chinn et al., 2014). Inspired by this line of thinking, we view epistemic cognition as cognition aimed at developing knowledge, understanding and other epistemic aims. Further, we view reasoned argumentation as a reliable process towards developing deeper understanding, and a prerequisite for critical thinking.

Despite increased research focus on critical thinking, a long and interdisciplinary history have resulted in a construct that is neither well-defined nor understood (Alexander, 2014; Siegel, 2010). This paper adopts a working definition of critical thinking that consists of a skills and a will component; prominently featured skills have included interpretation, analysis and evaluation, and will components have varied from everything from dispositions and virtues, to metacognition and self-efficacy (Greene & Yu, 2016). Already in the first paragraph of the introduction to the Handbook of Epistemic Cognition (Greene et al., 2016), readers' attention is brought to a need for "critical reflexivity" and "critical thinking" (p.1), underlining strong theoretical links between the cognitive processes. Moreover, Greene and Yu (2016) assert the need for epistemic cognition in critical thinking, further highlighting links between analysis and evaluation (in critical thinking researchers' terms) and "discipline-specific epistemic practices" (p.48). Relations between critical thinking and argumentation are implied in the research areas' definitions and operationalisation (Cottrell, 2011), though their boundaries are often unclear.

In sum, there are complex relations among epistemic cognition, critical thinking and argumentation that we wished to further investigate. In this study, we focused primarily on critical thinking skills, in particular, evaluation and appraisal of others' arguments through critical reading and source evaluation, and production (composition and synthesis), or *reasoned argumentation* (see section below on Intervention). In light of the centrality of reasoned argumentation in learning and thinking generally and critical thinking specifically (Alexander, 2014), as well as our view of reasoned argumentation as a reliable process for learners to gain deep understanding and discipline-specific knowledge, we aimed to adopt a view of argumentation that aligned with Reznitskaya and colleagues (Bråten, Muis & Reznitskaya, 2017; Reznitskaya & Gregory, 2013; Reznitskaya & Wilkinson, 2013; see below), who emphasize the way that individual cognition is shaped by social interactions and the role of verbal dialogue in this process. We see this as aligning with Kuhn and colleagues' ideas on the importance of teaching the thinking skills underlying argumentation (Kuhn, Hemberger & Khait, 2016), which we further equate with evaluativist views of knowledge (Greene & Yu, 2016; Kuhn, 1999).

An important premise of this paper is that critical thinking skills and epistemic cognition can be improved through domain-specific interventions (Abrami et al., 2015; Greene & Yu, 2016). Recently, Murphy and colleagues (Murphy, Rowe, Ramani & Silverman, 2014; Murphy et al., 2016) suggested that critical thinking can be fostered by small group discussions, scaffolding and gradual release of control from teacher- to student-led discussions in classroom contexts where knowledge building and evaluation processes are cultivated and valued. This line of thinking is further supported by Reznitskaya and colleagues (Bråten, et al., 2017; Reznitskaya & Gregory, 2013; Reznitskaya & Wilkinson, 2013): In a program of research

examining the role of dialogic teaching in teacher and student thinking, Reznitskaya and colleagues have found that embodied sociocultural and constructivist theories of learning help students develop higher order thinking and deeper understanding. Specifically, having teachers involve students in collaborative construction of meaning and control in the classroom, focusing on use of open questions, persuasion and inquiry dialogue has been associated with increased epistemological understanding, argument skills and disciplinary knowledge in students.

### 3. CONTEXTUALISING THE INTERVENTION

On the basis of this theoretical and empirical framing, we set out to design and teach a critical thinking skills class that focused on argumentation and encouraged development and internalization of an evaluativist epistemology.

Teaching took place at the faculty of education of a relatively large university in Norway. The course was eight weeks long and there were initially 10 students and three staff members following the course. Due to the voluntary nature of the class, and its impractical teaching time, attrition levels were high. The final sample therefore consisted of two students and three faculty, and the class was taught by both authors, collaboratively. In terms of the students' 'critical thinking starting points', we viewed both their tendency to engage in, and knowledge of critical thinking as low. This is based on research findings in Norway (Lødding & Aamodt, 2015), as well as students' responses to Frederick's (2005) three-item Cognitive Reflection Test and the open question "What is critical thinking?".

We, the teachers, had a specific focus on creating and maintaining an epistemic climate of inquisitiveness and open-mindedness, and the students were constantly reminded that the "threshold" for participation should be as low as possible. The small group of faculty and students (or experts and novices) provided opportunities for small-group discussions, explicit modelling, as well as scaffolding by attending staff and the class-teachers.

In the preliminary lessons (1-3) there was extra focus on getting students used to the class ethos and working methods. Also, we explicitly taught aspects of argumentation theory based on an adapted version of Toulmin's model of argumentation (Felton, 2005). Thereafter students had to decompose short arguments in pairs, for example, by identifying claim and evidence. We also drew on longer, syllabus texts from educational sciences and interrogated these critically with the students. In lessons three and four we had students consider clarity, coherence, as well as underlying assumptions in texts. Source evaluation and reading strategies are intimately linked to epistemic cognition and critical thinking (Bråten et al., 2011). These were therefore addressed in subsequent lessons before more attention was given to argument construction. Our focus on argument deconstruction and production was mainly on short popular science texts with educational themes (e.g., relating to gender differences in education). Source evaluation was taught using a contrasting case approach that makes students explicitly consider ways of thinking about document features (Braasch, Bråten, Strømsø, Anmarkrud & Ferguson, 2013). The reading strategies lesson also drew on research on text comprehension. This teaching plan was inspired by Cottrell (2011).

Also, in keeping with inquiry dialogue principles, we worked with debatable issues throughout the class. Each class started with a brief introduction and there were ample opportunities to use the hands-on skills and ways of thinking that we were teaching. There was an explicit expectation that students attending the class should participate verbally. Following Halpern and Reggio (2003), we also intended to leave room for written reflection after every class, that we could collect and use as an empirical data source. However, this proved to be more challenging for the students than envisaged, with very few students engaging in the task beyond short generalized and largely positive evaluations on the usefulness of the class. We did not pursue this beyond the second class.

#### 4. METHOD

After the intervention, we conducted semi-structured interviews with both students and staff. The purpose was to provide both groups with a springboard to reflection on the content and format of the intervention. We interviewed two students and three members of staff as two separate focus groups. We followed an interview guide in each case which revolved around two inter-related issues: 1) teaching and instruction and 2) learning gains and value of the course.

The interviews were audio-recorded and transcribed verbatim. Our first analytical step was to conduct a frequency analysis of a selection of evidential expressions used in both interviews. We limited our selection to a set of verbs indicating cognitive states and attitudes (e.g. think, believe) and epistemic adverbs (e.g. maybe, absolutely). The purpose was to gain an insight into the kinds of epistemic positions the two participant groups adopted situationally, particularly how they constructed their access to evidence and the evidential strength of their justification (e.g. “think” versus “feel”). Furthermore, we were interested to see the degree of epistemic support given to propositions (e.g. “perhaps” versus “absolutely”).

We then coded the data thematically in NVivo. The three focal, theoretically-grounded coding areas were: 1) knowledge, 2) critical thinking and 3) learning and instruction. Beyond this, our analysis was data-driven and exploratory, focusing on the participants’ constructions and co-constructions of the key concepts. While some responses were prompted by specific questions that explicitly targeted the key concepts, some emerged spontaneously in the conversational flow of the interview.

Our coding categories were not necessarily discreet: for example, participants may have talked about *learning in a generic sense* but also *learning about critical thinking*. In such instances, the specific excerpt was coded as both. While we were primarily interested to see how the two participant groups chose to construct these concepts and what thematic dimensions they underscored, we also looked at the extent to which the two groups aligned in their views.

#### 5. TENTATIVE FINDINGS

Table 1 gives an overview of the patterns that emerged from analysis of the data<sup>1</sup> in step one (Frequency analysis):

English	Norwegian	Students	% of total	Staff	% of total
Think	Tenker	23	0,73	38	0,51
Believe (personal access to evidence)	Synes	14	0,44	36	0,49
Believe (non-personal access to evidence)	Tror	2	0,06	34	0,46
Know	Vet	5	0,15	17	0,23
Feel	Føler	8	0,25	2	0,02

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<sup>1</sup> Expressions with frequencies below two were excluded. Note also that interviewer turns were excluded from the analysis.

Maybe	Kanskje	13	0,41	35	0,47
Absolutely	Absolutt	7	0,22	5	0,06

Table 1: Frequencies of evidential expressions (total word count - student discourse: 3144; total word count - staff discourse: 7357).

Looking at the word frequencies relative to the total number of words, we see that the verbs “think” and “feel” figured relatively prominently in the student discourse and their relative frequencies of use were higher than in the staff discourse. The students also provided more epistemic support to their propositions through their use of the adverb “absolutely”. The Norwegian non-personal access evidentiality verb “tror”, on the other hand, hardly figured in the student discourse at all. Although the students used evidential expressions that indicate personal sources of evidence, such as the Norwegian “synes”, less frequently than the staff, these expressions were nonetheless among the three most frequently used evidential expressions in the student corpus.

The staff discourse shows a different pattern. They used verbs that indicate personal access to experience (“synes”) almost as much as verbs that indicate non-personal access to experience (“tror”). They also expressed more doubt through their use of the epistemic adverb “maybe”. Of note is also the virtual absence of the perceptually-based evidential expression “feel” and the epistemic adverb “absolutely”.

As will be clear through our subsequent presentation of findings, the frequencies also provide an indication of the wider thematic patterns in the data.

### 5.1 Knowledge

The course participants constructed the concept of knowledge along three main dimensions. The first was related to the notion of the simplicity of knowledge. Knowledge was seen as a human attribute that develops from simple/novice to more advanced/expert forms. In both student and staff interviews, this dimension was further nuanced in terms of two concepts, time and practice, seen as necessary for knowledge to evolve along the novice-expert continuum. This was marked by various temporal expressions, such as numerals denoting a specific passage of time and grammatical aspect, such as in the following examples: “I have had thirty years of practice in this.” (Staff); “They have done this for many more years than I.” (Student).

The second dimension concerns the notion of the certainty of knowledge. This was particularly dominant in the student interviews and emerged as both relational and processual. The relational aspect was constructed primarily as giving right and wrong answers in an interactional context with the staff: “The thing is one is a bit afraid of answering wrong” (Student). The processual aspect transpired in the students’ descriptions of the ways through which one becomes more aware of the uncertainty of knowledge and even the liberating effects this may have. The deictic expressions used in these reflections refer specifically to participation in the intervention:

((Before))<sup>2</sup> I thought, well what is true and what is not... I was more lost, what can I trust in my own understanding? So it has become more - it is fun I think to look at and analyze things now” (Student)

The third dimension revolved round the issue of metacognitive development. Knowledge was here constructed as something that becomes explicit through training. It was particularly the

<sup>2</sup> Mentioned in preceding discourse, words in double parentheses have been added to retain grammatical correctness and ease reading.

intentional effort it takes to be acquainted with the tools for acquiring, systematizing and applying knowledge that was underscored here: “What does ((the text)) aim at, does the article try to trick me or is it realistic?” (Student 1); “Conscious, that’s the key word for me, to be more conscious” (Student 2).

Additionally, our analysis revealed that knowledge was constructed as domain-specific. It was particularly the staff who made this pertinent in their reflections. They constructed educational science as an umbrella field that draws on knowledge of several academic disciplines and hence as challenging for a novice. In relation to domain-specificity, they also constructed knowledge specifically as a precondition for critical thinking. Given that our course was designed to enhance critical thinking in the domain of educational science and our interview questions targeted this domain, the participants were necessarily primed to touch on these issues. In this respect, their thematization was expected. As such, the limited degree to which this occurred in the student interview represents a significant absence.

## 5.2 *Critical thinking*

We see three dominant conceptualizations of critical thinking in the interviews as well as differences in terms of the degree to which each conceptualization predominates in the student versus staff discourse.

Firstly, critical thinking was explicitly constructed as a skill or as a set of sub-skills that can be taught and acquired through practice. The skills dimension revolved around two main themes: critical thinking as an academic skill, relevant in the academic setting, or critical thinking as a life skill, relevant beyond the academic setting. Relatedly, critical thinking was constructed as a methodic skill or as a tool that can be systematically applied in approaching a wide range of issues. Interestingly, the skills dimension was particularly dominant in the staff interview.

Secondly, critical thinking was constructed as something that stretches beyond the skills dimension and represents a way of seeing and approaching the world. De-emphasizing its instrumentality, it was constructed as part of one’s personal development and thus as a broader construct. The following two excerpts from the data illustrate this point:

I think it will be beneficial for whatever you study and in your personal life and it is in a way a personal trait which you can acquire and, how should I say it, internalize. (Student). Critical thinking is something many students struggle with. And to - (it is) a kind of academic bildung - to invite to debate and reflect on theories and concepts, it’s demanding. (Staff)

Thirdly, as with the participants’ constructions of knowledge, critical thinking was seen as a process that takes time and training to develop. This was underscored by both groups throughout the interview, particularly the staff: “This thing with source evaluation and critical reading - practice practice practice and stuff that is, well, I think that is super important” (Staff).

## 5.3 *Learning and instruction of critical thinking*

In reflecting on the dimension of learning and instruction on critical thinking, both groups were preoccupied with the constructivist conception of learning as a collective, interactional achievement. Both groups were particularly concerned with discussing the benefits but also the challenges of the dialogue-based format of instruction. Here again, the novice-expert dimension, particularly in its relational, contextual aspect, featured prominently in the interviewees’ reflections.

Of particular note is the way the two groups positioned themselves as participants in the dialogues. The staff commended specifically the possibilities our instructional approach gave

the students to question, discuss and practice their critical thinking. However, their own participation as discussants in and facilitators of these dialogues was not thematized. This absence was also marked discursively through their pronominal choices, indicating distance and otherness vis-a-vis the students (e.g. they, them, themselves): “I liked that students were supposed to sit in seminars and work and discuss and try themselves because that gave them a chance to really practice” (Staff).

The students too constructed a dichotomous, contextually-conditioned distinction between themselves and the more knowledgeable staff. As already noted above, they clearly positioned themselves as the less knowledgeable and more uncertain party. While they commented specifically on the benefits of the small-group instructional format, such as in providing genuine opportunities to engage in in-depth discussion, their reflections also show that it represented a potentially face-threatening situation where their own uncertainties about how much they know affected the degree of their participation in the class. One of the students voiced her otherness also in prosodic terms by lowering her voice, as if to question her right to speak about these issues: “I notice when these professors have comments and stuff I just “oh right, gee, right, I have not thought about that ((lowered voice))” (Student).

Both groups also thematized the need for balancing theory and practice in critical thinking courses. They underscored the experiential aspect of learning with hands-on exercises, thematically rooted in the domain of educational sciences, and hence the usefulness of the selected exercises, for example in terms of potential improvements on future achievement scores. Finally, a recurrent theme in our interviews, both groups saw the need for allowing for a longer time span before the benefits of participation in critical thinking interventions such as ours could be reaped.

## 6. SUMMARIZING DISCUSSION AND CONCLUSION

In terms of the implications from the study, we note that small-group, dialogue-based instruction focused on understanding and argumentation represents a promising pathway for developing critical thinking in young university students (Murphy et al., 2014; Murphy et al, 2016). In our instructional approach, we focused on making argument structures explicit through combining theoretical insights with hands-on collaborative exercises. Identifying the core elements of short, real-world examples of arguments, discussing their explicit and implicit features, assessing their coherence and evaluating the available sources of evidence were aimed at building the students’ conceptual and methodological familiarity. It was also meant to provide them with a toolbox in approaching longer texts and composing their own arguments. An even greater embeddedness of syllabus-based literature in the instructional material could further enhance the relevance of the course and reduce attrition rates. With sustained efforts, our approach could potentially improve students’ understanding of complex issues in academic argumentative discourse and make them more confident critical thinkers.

Relating to the construct of epistemic cognition, our instructional approach resonates with the aim of encouraging an adaptive, evaluativist approach to knowledge by targeting both generic and specific skills, dispositions and abilities necessary for critical thinking through reasoned argumentation (Alexander, 2016; Chinn et al., 2014; Chinn & Rinehart, 2016). As our interview data show, the students related their participation in our intervention to positive changes in how they viewed and worked with course literature and knowledge emanating thereof, stressing in particular, its value in making textual complexity an object of conscious, critical interrogation. The data also indicate that having explicit tools to engage in such interrogations is a precondition for succeeding in such endeavours, an insight supported by other studies (e.g. Andreassen, 2007, Stang Lund, Bråten, Brandmo, Brante & Strømsø, 2018). However, the complex relation between epistemic cognition and critical thinking requires

further empirical investigation. While this intervention provides interesting insights into students' and staffs' thinking about critical thinking and reasoned argumentation in the domain of educational sciences, scaling-up pilot studies such as ours in the form of interventions is needed to address specific relations among key constructs.

Relatedly, we would like to acknowledge that further research attention is needed to address the issue of how to measure the development and adaptive use of critical thinking skills. Greater use of self-reflection diaries could represent an important source of information for both instructors and researchers and, potentially, form a part of formative feedback for students that they could capitalize on in summative course assessments. Our data indicate that providing students with scaffolded training in how to make use of such tools may be necessary. While summative assessments may provide a static snapshot of students' declarative knowledge of critical thinking, more nuanced and dynamic measures applied in 'contexts that matter' are necessary to investigate actual practices (cf. Chinn et al., 2011). Since critical thinking is cognitively and motivationally demanding this may have to be incorporated in final examinations. Students are unlikely to exert themselves in researcher-administered tests with no consequences for school achievement. We therefore note the need for alignment of teaching and examination methods. If students are to value critical thinking and argumentation in specific domains then they must be tested in their use, rather than being rewarded for superficial engagement such as memorization skills and reproduction of course texts. In other words, the epistemic ethos of instruction, teaching materials and examination need to be aligned in order to avoid sending mixed epistemic messages to students (Greene & Yu, 2016).

As our interview participants underlined, critical thinking skills need time and practice if they are to become well-developed. Indeed, it is an endeavor that stretches well beyond the space of eight weeks that we had at our disposal. We therefore see the need for a lasting engagement in critical thinking through reasoned argumentation across the curriculum, so that it becomes an indelible part of university-level programs. As other research indicates (Murphy et al, 2014, Reznitskaya & Gregory, 2013; Reznitskaya & Wilkinson, 2013), small-group, dialogic instruction where critical thinking skills are nurtured and regularly practiced is a promising instructional approach. In designing such instruction, attention should be paid to reducing barriers for participation by creating an ambience of trust through a low-threshold, scaffolded aid by experienced course instructors (Murphy et al., 2016). Indeed, the novice-expert differential may be a very real one for many freshmen, as our data indicate. This puts instructors in a position of additional responsibility as efficient and responsive dialogue-facilitators.

While research within educational psychology has made important contributions to our knowledge on the importance of small-scale, dialogue-based instructional programs on critical thinking through reasoned argumentation, we see that greater cross-fertilization between this and related fields, particularly argumentation theory, could prove beneficial. In our design, theoretical insights on reasoned argumentation represented an important starting point and inspiration. Beyond this, however, it remained largely underdeveloped. Collecting interactional classroom data and employing argumentation theory to explore in detail student argumentation discourse, including their use of different argumentation schemes, the linguistic tools they employ in argumentation or collaborative efforts at understanding and analyzing argument structures could be fertile soil to explore. Furthermore, philosophical insights from the related fields of argumentation and critical thinking could add conceptual clarity and provide inspiration for further empirical work (cf. Chinn et al., 2011).

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