

## Personal and shared experiences as resources for meaning making in a philosophy of science course

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Received: 9 March 2011 / Accepted: 16 November 2011

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**Abstract** The aim of this case study was to explore health education students' personal and collaborative meaning-making activities during an online science philosophy course in the higher education context. Through applying the dialogical perspective for learning, the focus was on studying how different contextual resources were used in building understanding within the philosophy of science and what kind of understanding the students constructed and reflected through these resources. The study focused especially on exploring how the students' life experiences and fellow students served as resources in their meaning-making activities. The results showed that prior work and discipline-related knowledge and experiences provided the students with resources for understanding the philosophical texts by applying, forming conceptions, or critically evaluating the philosophical knowledge presented in the texts. In their discursive activities, the students used fellow students as resources in elaborating the theoretical conceptualizations further, or they were engaged in sharing their similar work or discipline-related experiences and conceptions. These different resources offered tools for understanding, conceptualizing, and critically evaluating both the philosophical themes studied and the practices of one's own work and those of the scientific community.

**Keywords** Collaborative learning · Contextual resources · Dialogicality · Intercontextuality · Intertextuality · Meaning-making

### Introduction

In studying interaction in technology-enhanced settings, there has been a strong focus on gaining understanding about the nature of productive joint activities and identifying interactional features important for collaborative learning. In general, this 'interactions paradigm' involves categorizing students' interaction and correlating the frequencies of categories with learning outcomes (Baker 2010). The underlying assumption of this approach

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is that the cognitive processes and the individual cognitive gains are related. Baker (2010) calls this approach a 'standard approach' and argues that the problem with this approach is that it does not take into account collaboration as a process of collective thinking manifested in and by dialogue. The view of learning that focuses only on changing representations in people's heads not only fails to see how knowledge is situated and distributed in the discursive activity among different participants, but also fails to recognize how knowledge is mediated by the material and sociocultural aspects of situations (e.g. Black 2007; Grossen 2009; Stahl 2002). It can be argued that the 'standard approach' more broadly reflects a view where language is isolated from its environment and a dichotomy is created between the mind and world (Edwards 2005; Grossen 2009). However, as Linell (2009) states, human sense making is always in interdependence with others and environments. It is therefore argued here that exploring the situated and mediated nature of learning calls for the dialogical approach. According to Linell (2009):

[...] dialogicality is an attribute of human sense-making, that is, the dynamic processes, *actions* and practices in which meanings are *contextually* constituted in the *interactions* of human beings with others and environments. (p. 30)

Therefore, instead of studying individual minds, the focus of the study should be in interaction and discursive processes that emerge between people and is mediated by their social, material, and sociocultural context. The emphasis in this paper, in particular, is to explore how contexts mediate students' meaning making activity. The contexts involve *potential* contextual resources—such as semiotic, material, social, cognitive, and cultural resources—that may become *actual* and *relevant* through the participants' discourse (Linell 1998; Linell and Korolija 1997). In this paper, discourse is approached as a means of reflecting these different resources that the students use and make relevant in their personal and collaborative meaning making activities. The main interest of this study is to recognize different resources as potential for enhancing understanding of new concepts and new areas of knowledge that the students meet in their learning assignments on the philosophy of science.

In the study, students' learning activities are framed (Engle 2006) in a particular way to enhance their learning. Framing is enhanced through promoting intertextual and intercontextual connection building in the students' meaning making activity (Engle 2006; Gee and Green 1998). Intertextual and intercontextual ties are connections that the students discursively make to different resources or aspects of a situation outside the current interaction or activity. Framing in this study is accomplished by promoting the students to use their personal life experiences and past knowledge (such as work-related experience and knowledge) as resources and contexts for understanding abstract phenomena in the philosophy of science (Goodwin and Duranti 1992; Linell and Korolija 1997). Using one's own life experiences as resources for learning can be seen as promoting student agency (Lipponen and Kumpulainen 2011) through giving personal meaning to learning activities (Paakkari et al. 2011). This also enhances boundary crossing between different communities the students belong to (Akkerman and van Eijck 2011). Boundary crossing in the context of this study refers to establishing continuity across socioculturally different sites (such as work and study) through the discourse. According to Zittoun (2011), classroom interaction usually focuses on socially shared (institutionalized) meaning. This is supported by, for example, institutionalized resources such as textbooks. However, by giving opportunities to make personal sense through personal lives can act as a connector through the different spheres of experiences, e.g. institutionalized and personal knowledge. In this study, therefore, meaning making and understanding in the context of the philosophy of science is promoted through connecting learning activities to contexts and discourses that



are personally meaningful and 'exist' outside the current activity, thereby using one context to make meaning in another context.

In collaborative interaction, fellow students—with their ideas, thoughts, and actions—can be considered as resources for one another. In the study, fellow students are approached as resources for examining the philosophical phenomena collaboratively. This can be seen as another frame supporting learning (Engle 2006). Supporting and stressing the value of other students as resources for learning can be seen to promote relational agency:

Relational agency is a capacity which involves recognizing that another person may be a resource and that work needs to be done to elicit, recognize and negotiate the use of that resource in order to align oneself in joint action on the object. (Edwards 2005, p. 172)

According to Edwards, a wider range of different resources is deployed in joint activity than in individual action and, therefore, the object of discussion is expanded and, as a result, conceptual tools are refined. This reflects the cohesive conception of collaborative learning according to which learning through discussions can be conceptualized as developing, challenging, and re-conceptualizing ideas (Ellis et al. 2006). This is manifested in different epistemic activities (e.g. critiquing, explaining) that show what takes place in discourse while being engaged in understanding and meaning making (Zenios 2011). Participation in epistemic activities can then be equated with the engagement in collaborative improvement of ideas or, as one may say, conceptual artifacts (Goodyear and Zenios 2007; Zenios 2011).

This case study aimed to explore health education students' personal and collaborative meaning making activities during an online science philosophy course in the higher-education context. Particular focus was placed on studying how the students' past work and discipline-related knowledge and experience, and their fellow students, provided resources for understanding and making sense of the philosophical phenomena under study. In the next section, the dialogical perspective for learning is introduced more thoroughly. Especially, the notion of 'contextualism' is opened up, and the connected concepts, contextual resources and aspects of a situation, are discussed in relation to meaning making activities in discourse. After this, dialogical approach for analyzing students' meaning making activities is presented in the methods section. Finally, the findings, illuminating dialogicality in the students' personal and collaborative meaning making on the philosophy of science, are presented and discussed.

## The dialogical perspective for learning

The dialogical perspective for learning proposed here takes meanings of different theoretical approaches: both the sociocultural theory of learning (Vygotsky 1978; Wertsch 1991) and theories of dialogism (Linell 1998; 2009; Linell and Korolija 1997) and discourse (Gee and Green 1998). Bringing these different perspectives together provides conceptual resources for studying and understanding the relationships among discourse, learning, and context that neither perspective can provide alone. These theoretical approaches share the common view of the social construction of knowledge and the focus on material, semiotic, and sociocultural aspects of this process (Gee and Green 1998; Mercer 2008). The sociocultural approach, building on the Vygotskian framework (1978), emphasizes the meaning of social interaction and the mediative role of tools in learning. According to Wertsch (1991), it is not possible to study thinking and cognition independently of the social, interpersonal, cultural, and historical settings in which they



occur. Cognition is a public, social process embedded within a historically shaped material world (Goodwin 2000) in the sense that it relies on conceptual and material resources, tools, and artifacts that originate in our culture (Bliss and Säljö 1999). In a similar vein, dialogism deals with processes in human meaning making consisting of cognitions (such as ideas, thoughts), communicative processes, and meaningful actions, all of which are anchored in both a sociocultural and a physical world (Linell 2009). Both of these conceptions show how humans' sense making processes are thoroughly interactional and contextual in their nature. Interaction in Linell's (2009) sense comprises not only talk-in-interaction, but also interaction 'with the world'. Therefore, solitary activity, such as thinking, writing, reading, and sense making in general, is also interactional in its nature. According to dialogism, then, it can be argued that humans have a social mind (Valsiner and van der Veer 2000).

## Contextual resources and aspects of a situation in meaning making discourse

As sociocultural theory is a theoretically framed approach to the study of learning and development as social constructions (Wertsch 1991), it can be used in alignment with theories that build on the notion of (learning) contexts and situations as being socially constructed (Erickson and Shultz 1981; Gee and Green 1998; Goodwin and Duranti 1992; Linell 1998). These perspectives on discourse direct attention to the dynamic and interpretive nature of participants' discourse, and how—through the discourse—the participants shape and are shaped by the context being constructed. Thus, context is not a predefined or objective environment, but is discursively constructed. This *contextualism* means that sense making processes and discourse are always interdependent with contexts (Linell 2009). Those aspects of the potential contexts that are made communicatively relevant in situ can be called *realized context*. Therefore, the participants themselves create the context through discourse by reflecting and relying on the contextual resources (Linell 1998) or aspects of the situation (Gee and Green 1998) that they perceive to be relevant in a particular situation.

Linell (1998; 2009) divides contextual resources into three major classes of phenomena: the concrete situations, co-text, and background knowledge. Linell's categories have similarities with Gee and Green's (1998) notion of aspects of situation, which are divided into material, activity, semiotic, and sociocultural aspects. Contextual resources and aspects of a situation can be used as a description of the possible resources that participants may use in their personal and shared sense and meaning making processes. The focus in this study is to explore how (and what) different contextual resources or aspects of a situation actualize as relevant in the students' meaning making discourse on the philosophy of science. *Immediate and concrete contextual resources or material aspects of situation* refer to, for example, physical spaces, persons, objects, and artifacts (e.g. philosophical texts) that are referred to within discourse and mediate discourse. Linell's (1998; 2009) notion of *co-text*, in turn, consists of the participants' previous actions and discourse that are actively used in the "new act of sense making" (p. 132). What is made into relevant context for the new contribution is dependent on prior contribution(s) (co-text). Co-textual referencing in discourse shows how discourse emerges and how speakers are dependent on each other in meaning making and act as 'coauthors' of each other's contributions. In this situation, the ideas and thoughts that others bring into discourse are recognized and interpreted, and one's actions are aligned with others (Edwards 2005). In studying collaborative knowledge construction Arvaja (2011) has used co-text as an indicator of *co-constructed* knowledge. In this study the focus is on exploring how the fellow students' contributions are used as resources for meaning making manifested in different epistemic activities.



*Mediated and abstract contextual resources or aspects of a situation* include personal, social, and sociocultural resources such as background knowledge, experiences, assumptions, or beliefs about the things dealt with in the discourse or about other persons involved in the discourse (Gee and Green 1998; Linell 1998). For example, people may draw on some past experience or prior knowledge that is used as a resource for meaning making in the present situation. In their discourse people may reflect and lean on knowledge, experiences, values, and norms of various groups or communities (of practices). Consequently, discourse may also reflect different identities applied in the situation Castanheira et al. (2007); Gee and Green 1998; Wells 2007). According to Wells (2007), in new situations, people might apply multiple identities coming from different communities of practice whose values and scripts define their identities. In discourse this is manifested in different *I-positions*, which are part of person's identity and thereby allows taking on varying perspectives in the meaning-making processes (Akkerman and van Eijck 2011). *I-positions* are connected to peoples' cultural and historical experiences and social relationships. For example, in this study the students are especially prompted to lean on knowledge and experiences of their work, study, and science communities in studying the philosophical phenomena. Linell (2009) adds that even though a person's experiences are socially and culturally interdependent, they are unique to the individual and his/her life course. Therefore, in meaning making there is always a *biographical perspective* involved. In addition, "one's life is subject to dynamically changing interpretations" (Linell 2009, p. 113). Therefore, the *I-positions* or identities should not be seen as socially and culturally determined and stable, but rather as negotiated and changing (Akkerman and van Eijck 2011; Wells 2007).

According to Gee and Green (1998), one function of discourse is *connection building*, which refers to the intertextual and intercontextual ties that are constructed by participants in their meaning making activities. Intertextual and intercontextual ties are those connections that the participants discursively reflect on and make to different aspects of a situation outside the current 'on-going' activity or interaction; connections to previous or future interactions, other people, texts, contexts, discourses, and activities, for example. These ties can also be seen as connections that are made between immediate and mediated contextual resources in discourse. *Intertextuality* (Castanheira et al. 2007; Gee and Green 1998; Kleine Staarman et al. 2003) and *intercontextuality* (Floriani 1993; Gee and Green 1998) show that any discourse or activity, in which the individuals are involved, takes its meaning also with respect to other discourses or activities, in which they have been involved or have some representation of (Grossen 2009). All moments of meaning making, then, are intertwined with other (past and future) situations that enable the subjects to make sense of the present situation. These intertwined situations make up the context for meaning making. The process of meaning making can be described through the concepts of context and object (content of meaning making) (Goodwin and Duranti 1992), where the context is a familiar aspect, for example a previous experience, through which the present object (content) of discourse can be described or understood. Furthermore, according to Linell and Korolija (1997), a new topic (object of discourse) is always understood and contextualized in relation to something (context). In the context of this study, for example, using prior knowledge and experiences as resources for interpreting new philosophical concepts provides a context for meaning making and understanding. The 'products' of connections between these different resources for meaning making can be called *situated meanings* (Linell 2009). The process of meaning making, in turn, can be seen as manifested in different epistemic activities (Zenios 2011).

The aim of this case study was to explore health science students' personal and collaborative meaning making activities during an online science philosophy course in the



higher-education context. The particular focus was on studying how the students' life experiences and fellow students were used as resources in meaning making and building understanding within the philosophy of science, and what kinds of epistemic activities this was manifested in. The focus was also on studying what kind of understanding the students constructed and reflected through these resources.

## Methods

### Participants and context of the study

The participants in the study were 11 health science students (all female) studying the philosophy of science in an online course in the context of higher-education. Nine of the students were involved in working life, as physiotherapists and action therapists, for example. They were completing additional studies on health sciences, e.g. aiming to qualify as a teacher in health-education. Therefore, they were studying part-time by distance and working full-time. The other two students were engaged in their master's studies on health sciences full-time. This course was targeted to provide the students the basics on the philosophy of science. It was an obligatory course preceding methodological studies in the field of sport and health sciences. The course took place in an Open University context, but it was conducted in collaboration with the faculty of sport and health sciences and according to their curriculum. The students participated in the course from all over the country, and they met only virtually. The course utilized a web-based learning environment called Discendum Optima (<http://www.discendum.com/english/>), consisting of an asynchronous discussion tool, a tool for making text documents, and folders containing course material.

The course consisted of five tasks, all of which dealt with historical approaches in the philosophy of science. The time for completing each of the tasks was 1 week. Each task was a reasoning task where the students were first supposed to read a philosophical text/s dealing with a philosophical approach within the philosophy of science, such as positivism, realism, and constructivism. The texts assigned for the course were different types: general reviews of the philosophy of science or introductions to different themes in the philosophy of science. They were thematic articles or chapter of books in the area, or extracts from the classical works in the philosophy of science (e.g. Heikkinen and Laine 1997; Kiikeri and Ylikoski 2004; Niiniluoto 1984; Raatikainen 2004; Varto 1992).

In reasoning about the task, the students were asked to use their prior experiences or conceptions about their own field of science or work as resources in interpreting the texts. Based on these tasks, each of the students was first supposed to write an *individual reasoning text*. For each task, the teacher offered two or three options from which the students were able to choose one to work with. In the next list, *one* example from each of the tasks is presented. All examples (task descriptions and data examples) are translations from Finnish to English.

- Task 1: What differentiates science from non-science? In the philosophy of science, this question is named as a demarcation problem. [...] The starting point of scientific thinking is that the scientific method and theory that originates from research are based on observation, and this connection must be proved as truth. In this way, two relevant criteria are fulfilled: objectivity and criticalness. Are these bases and criteria suitable for describing all kinds of scientific research? Are the boundaries built through these criteria too narrow? Do they exclude other perspectives or research methods that are



reasonable? If you have examples of these other kinds of phenomena or research perspectives, describe those and think if the line between science and non-science could be defined differently and on what grounds? If you are familiar with qualitative research, you can also think about the theme from that perspective: does the qualitative research fulfill the basic criteria of science?

- Task 2: What is the view of science from the perspective of realism? How is this realistic approach criticized and how can it be defended? You can think if you recognize the realistic view of science and thinking in your own science or work field.
- Task 3: So far, the focus has been on the traditional view of science. What problems relate to this approach? Why is it reasonable to think that this approach is insufficient? Consider this from the perspective of your own science and/or your work practice.
- Task 4: Read Juha Varto's introduction chapter. Explain how Varto differentiates "exact" sciences (= natural sciences) and "strict" sciences (= human sciences). How does the author give grounds for the differences of the types of researchers in these different sciences? Do you recognize this division in your field of science? How does it show? Think especially about what the knowledge about meanings is and about its relation to the knowledge in natural sciences.
- Task 5: The basic idea of this last task is to think of earlier themes from the perspective of human sciences and qualitative research. Familiarize yourself with Heikkinen and Laine's research. Based on this text or based on other experiences you have on qualitative research, how do you perceive researchers' study approach in qualitative research? How are phenomena under research conceptualized? How do researchers discuss their own roles in the research? You can focus your perspective on aspects that are of your personal interest.

In the next phase, the students posted their individual writings onto a shared web-based (asynchronous) discussion forum, and their task was first to read one another's writings and finally to have a *shared discussion* based on these writings. The shared asynchronous discussion was intended to enhance collaborative exploration of the themes under study as follows:

The main aim of the discussion is to explore together the questions under reasoning. [...] When the shared discussion begins, it would be worthwhile for each of you to choose those postings/thoughts that are the most interesting from your perspective in their similarity and/or difference. You are free to comment on anything that is brought under discussion, but it is worthwhile to ask yourself and also others what would be the most relevant as regards to understanding and making clearer the problem under discussion and focus your thoughts on these perspectives (extract from working instructions in the asynchronous discussion forum).

#### The role of the researcher

The researcher did not act as a teacher in the course. The collaboration between the teacher and the researcher was part of the broader collaboration conducted between the researcher and a group of Open University teachers aiming to develop pedagogical activities in the virtual learning contexts. The teacher of the course had many years of experience in teaching the course for philosophy students. However, this was the first course he held for health education students, and his concern was how to engage the students to explore phenomena often regarded as difficult and abstract. The researcher and the teacher together discussed the pedagogical idea of making use of the students' work, study, or discipline-



related experiences and knowledge as resources for understanding and interpreting the philosophy texts. However, the teacher alone planned the reasoning tasks and the way he triggered earlier experiences in those tasks. The basic structure—individual writing tasks combined with the thematic discussions—had always formed the basis of the course. The students were notified that there was a researcher who followed the students working in the online context, but the researcher did not interact with the students in the course.

## Data collection and analysis

One type of data consisted of students' individual writings the students wrote based on the reasoning tasks. There were 55 writings altogether, 11 writings per each of the five tasks. Individual writings were posted as discussion postings to the shared asynchronous discussion forum. The other data consisted of shared asynchronous discussion postings. There were 45 discussion postings altogether that commented on other's writings or discussion postings in the five tasks.

In analyzing the individual writings and discussion postings, Linell's (1998; 2009) dialogical approach to communication provided the main perspective and orientation to the data. Individual writings and discussion data were analyzed separately. In analyzing the *individual writings*, first those work, study, and discipline-related experiences and knowledge resources (generally called life experiences) that were discursively made relevant in interpreting and making sense of the philosophical texts were extracted from the data. The references were manifested in explicit discursive references to *texts, people, discourses, contexts, practices, activities, values, norms, and conceptions* related to the students' work, study, or discipline. These were intertextual and intercontextual connections that the students constructed in order to construct meaning and interpret the philosophical texts (Gee and Green 1998). This 'first-level coding' was targeted towards providing the key segments of data (Miles and Huberman 1994). These data segments, consisting of thematic meaning units or episodes (Linell and Korolija 1997) varying from one sentence to several sentences, were separated upon further analysis.

As Bazerman (2004, p. 94) states, "intertextuality [or intercontextuality] is not just a matter of which other texts [or contexts] you refer to, but how you use them, what you use them for [...]." Therefore, in the second step of the analysis, the connection between the philosophical texts and life experiences was explored in the data segments to find out how the students used their past work, study, or discipline-related knowledge and experiences to interpret and make sense of the philosophical texts; in other words, how they used their experiences as context for understanding the matters in the philosophy of science (Linell and Korolija 1997). However, the focus of the analysis at this point was not on *what* the students constructed through the resources, but more on *how* and *in what way* the students constructed meanings through connecting resources in their texts. In this study, meaning making is conceptualized as a kind of epistemic activity (Goodyear and Zenios 2007; Zenios 2011) aimed at advancing interpretation and building understanding or meaning about the themes being studied. Epistemic activities are not approached in this study as a means of representing higher-order thinking (see Ohlsson cited in Goodyear and Zenios 2007), but more as a means of representing the different ways of making sense through connecting resources. In this second phase, the data segments were worked through by 'pattern coding' as a means to group the separated segments into themes or codes (Miles and Huberman 1994) that represented different epistemic ways of connecting resources in the individual writings. Three types of meaning making activities were identified from the data. These were named *applying, supporting or forming conceptions, and critiquing*.



These are discussed and interpreted through data examples in the following findings section.

In analyzing the *discussing postings*, each posting was explored in relation to connected posting(s) or writing(s). The analysis of the discussions focused on studying how the other students' preceding texts or discussion postings were used as resources for developing or enhancing understanding about the theme discussed. The analysis focused on what was made into relevant context (co-text) through the discourse and into what kind of meaning making activity this resulted in on the students' part. In the first phase of the analysis, interrelated discussion postings were separated as units of analysis. Interrelated postings were identified based on the co-textual references made into preceding (or prospective) postings or writings. These were manifested in general references to others' postings or writings (e.g. *...like you wrote; Great text, Krista*), redeployment of other's concrete expressions or phrases in the dialogue (e.g. A: *Couldn't we then think that truth could be subjective*, B: *If truth could be subjective, how...*), prospective invitations (e.g. *What do you mean by that?*), acknowledgement of an idea (e.g. *Yes indeed, this is how I see it; I agree with you*), or a situation where an idea, theme, or conception stated at the previous posting or writing was taken up in "the new act of sense making" (e.g. *Another perspective came into my mind...*) (Linell 1998; 2009). The interrelated postings formed thematically and/or communicatively whole unit.

The interrelated postings were first explored to find out if there were any general communicative activity types (Linell 2009) representing different meaning making activity. The focus in exploring these general types of meaning making was to identify what was the *purpose or function* of related communication. Two general discourse types characterized the data. These were named *elaboration* and *sharing discourse*. The main function of elaboration discourse was to develop the theme or object of discussion further, whereas the main function of sharing discourse was to build an agreement on the themes discussed or share similar conceptions and experiences. Another third communicative activity was found, which did not 'advance' the general discussion, but rather expressed and acknowledged the meaning of others' writings and discussion postings to one's own understanding.

In the second phase of the analysis, each of the individual postings was analyzed in relation to those posting(s) or writing(s) that were used as a co-text to identify the ways of meaning making within the context of elaboration and sharing discourse. The purpose was to analyze what kinds of epistemic activities characterized these two general discourses. In the context of the interrelated discussion, epistemic activities can be described as moves that participants take within a discussion "that helps advance inquiry in reflective, indexical, and contextual ways" (Zenios 2011, p. 266). Therefore, as in the case of analyzing individual writings, the focus in analyzing discussion postings was more on *how* the students built their contributions on one another's ideas and thoughts and *by what means* they advanced shared meaning making and understanding of the phenomena under discussion rather than on *what* they constructed through the discourse. These epistemic activities characterizing ways of meaning making within elaboration and sharing discourse are presented and discussed in the findings section.

Finally, the writings and discussion postings as a whole were explored to find whether there were any 'continuities' at the thematic level of discourse (Nikander 2008); that is, whether any recurrent themes emerged across individual writings and shared discussion within all five tasks. At this point, the aim was to explore what the students reflected and constructed in and through their discourse. In the study, the students' written feedback of the course was also used as complementary data in interpreting the findings.



## Findings

Life experiences as resources for meaning making

Using one's life experiences as resources in meaning making discourse shows how another context is used for understanding the present context of the activity. From the individual writings, three different epistemic ways of using prior work, study, or discipline-related experience and knowledge as resources in interpreting philosophical texts were identified. These were named *applying*, *supporting or forming conceptions* and *critiquing*. Next, these are demonstrated and interpreted through empirical examples.

### *Applying*

In applying discourse, the students used their work and discipline related experiences or knowledge as resources in understanding and interpreting theoretical knowledge and concepts in the philosophical text(s) or vice versa. In the following example, the student *applies* knowledge of the development of the philosophy of science presented in the text (*natural sciences—hermeneutic approach*) to her own discipline. This serves as a tool for making sense of the development of science from her own perspective, that of health sciences:

#### Example 1

Nowadays, one talks about a positive conception of health, which emphasizes experiencing health in its different forms. We have moved from the illness-centered conception of health created by natural sciences toward a more holistic positive conception of health [...] Biomedical research can be criticized for its mechanistic conception of the world, yet more room has been given to the hermeneutic approach. Health and illness are also culturally constructed after all. (Tiina\*)

\*=all names are pseudonyms

Knowledge of one's own field of science or work was also applied in order to understand theoretical concepts. In the next example, the theoretical concept of causal explaining is applied to the student's own work and discipline, ergonomics:

#### Example 2

In ergonomics [...] Causal explaining, in turn, is explaining the relationship between the cause and effect. In this way, you can anticipate some events. Causal explaining necessitates the anticipation. [...] In ergonomics, causal explaining can be thought of, for example, like this: Static work position or a worktop that is too high causes upper limb workload. You search for an answer by asking why this has happened. The main task of work healthcare is to prevent work-related disadvantages. For this reason, causal explaining is made use of in everyday work, and on this knowledge base we ground our own activity, that is, why you should take notice of right lifting techniques, healthy ways of living, etc. (Niina)

In applying theoretical knowledge of causal explaining to her own work, Niina is reflecting the norms and practices of her work community, occupational healthcare. Thus, in interpreting the philosophical text, she 'brings along' her community (of practice) and related practices (Akkerman and van Eijck 2011); "the main task of work healthcare... made use in everyday work... on this knowledge base we ground our activity." Through applying discourse, it seemed that, on the one hand, the students were able to conceptualize their practical knowledge and, on the other hand, they were able to make theoretical



knowledge practical. In a way, the students were able to make tacit knowledge explicit (externalization) and explicit knowledge tacit (internalization) through relating their own experiences with concepts introduced in the philosophical texts (Stahl 2004; Tee and Karney 2010). Thus, their own experiences served as a context and framework for understanding the philosophical phenomena (Goodwin and Duranti 1992; Linell and Korolija 1997).

### *Supporting or forming a conception*

In supporting and forming conceptions, the philosophical texts either supported the students' prior conceptions or contributed to forming or stating conceptions related to their work or discipline. The following example demonstrates how something the student read in the philosophical text *supported* her prior conception about the issue:

#### Example 3

Heikkinen's and Laine's text is based on phenomenologic-hermeneutic philosophy [...] both the client's and therapist's idea of man and life-world strongly influence the content and experience of "the encounter." I'm fully acknowledging that the dialogical relationship influences the outcome of the treatment/therapy. (Krista)

In the above example, Krista recognizes the meaning of "the encounter" ("acknowledging") presented in the text through her own work experiences as a physiotherapist. Thus, the text supports the beliefs guiding and influencing her activity as a physiotherapist, and at the same time serves as a tool to conceptualize those beliefs through theoretical concepts, such as "encounter." In the example, the notion of "encounter" is also contextualized in Krista's own words—"dialogical relationship"—indicating understanding. In the next example, the student is *forming and stating a conception* about the relationship of human and natural sciences from the position of her own field, health and social sciences:

#### Example 4

I think that in health and social sciences, it's well-grounded to study phenomena that affect the reasons of people's health/illnesses and participation (from a natural science perspective), but on the other hand, it is important to pay attention to people's experiences, meanings, and qualities from the perspectives of health, illness, and participation. (Anita)

Example 4 shows how the text again serves as a tool for conceptualization. When formulating her conception about the need for both natural and human sciences in her field of science, Anita uses the knowledge on natural ("affect the reasons") and human ("people's experiences, meanings, and qualities") sciences as resources in her formulation. The ideas, phenomena, concepts, and conceptions presented in the texts seemingly helped to "put into words" and externalize the (tacit) conceptions the students held relating to their work or field of science (Tee and Karney 2010). In one form, this is illustrated in Krista's feedback: "You really get a new perspective, although some new ideas also support your old beliefs and conceptions."

### *Critiquing*

In critiquing, the students expressed a *conflict* between something they had read in the philosophical text(s) and the conceptions they held through their own work experiences or



scientific field. This conflict was manifested in different forms of critique. For example, the students took a *critical stand* from their own perspective toward something stated in the philosophical text:

#### Example 5

The traditional view of science seems too rigid and too general an approach from the perspective of a health science student. (Tiina)

In Example 5, Tiina is taking a critical stand toward the traditional view of science from the perspective of a health science student. Thus, she *evaluates* the knowledge in the philosophical text from the point of view of health sciences and the conceptions and values she relates to that field. In addition, some theoretical concepts were *questioned* and *evaluated critically*:

#### Example 6

Looking from the perspective of my own field of science and its history, reductionism clearly narrowed the view of the human and his activity and clearly cannot explain a human's action competence or the meaning that functionality has to humans. In reductionism, one also feels that a human is only seen as an activity of a nervous system, muscle system, and skeletal system (mechanistic) and not as an active, unique, mental, personal, cultural, social human who has his own history, experience, point of view, values, and aims, which all influence a human's action competence. (Anni)

Example 6 shows how Anni is questioning the principle of reductionism based on her own implicitly and explicitly stated conceptions and values she relates to her field of science. In another type of discourse, a *critique* was targeted *toward practices* in the student's own work or perceived research practices, as the following examples demonstrate:

#### Example 7

In my own field, gerontology, I have understood that quantitative research is much more valued than qualitative, because of its nature as a 'strong medicine'. Everything cannot, however, be observed and measured completely unambiguously, which is why qualitative research definitely has its place in human sciences. (Nea)

#### Example 8

The basic thought of sympathetic human science is that a human actor and community have to be studied from their own perspectives. [...] Unfortunately, I have the conception that qualitative research is not published in the leading journals of the field [physiotherapy]. We still lean on, and believe only in, quantitative research and research knowledge that is based on it. (Tia)

Examples 7 and 8 reflect the perceived 'cultural models' (Black 2007; Gee and Green 1998) in the students' fields of science. Cultural models are like theories of action situated in social and cultural experiences (Black 2007). In the discourse, the students reflect the dominant research practices—emphasis in quantitative research—that guide research activities in their disciplines. However, those valued practices contradict what the students value.

Altogether, most of the students stated in their feedback that using prior knowledge and experiences as resources enhanced understanding about the philosophy of science: "I agree with many of the course members in that understanding about the grounds of philosophy of science was enhanced by linking the things under discussion to one's own area of knowledge." (Emma). In this way, the object of discourse was contextualized in relation to one's own area of knowledge, which served as a resource for understanding (Linell and Korolija 1997).



Some of the examples presented above reflect identities applied in the situation (Akkerman and Van Eijck 2011; Castanheira et al. 2007; Gee and Green 1998). These identities, such as that of a physiotherapist, action therapist, health science student, or 'representative' of one's own field of science were manifested in different positions or perspectives from which the knowledge at hand was evaluated and interpreted. Through their discourse the students reflected the values, norms, conceptions, or expectations related to different communities, such as work, study and field of science. These values and conceptions served as resources in (critically) evaluating and interpreting philosophical texts or the texts served as resources in (critically) evaluating and interpreting values and conceptions of one's own work or field of science. Thus, the students constructed understanding of philosophical knowledge through their everyday knowledge, and the philosophical knowledge let the students see their everyday knowledge differently. In this way, the philosophical knowledge seemed to serve as a mediating resource *through* which the students learned also about their own 'lives' and not only *about* the philosophical knowledge content (Paakkari et al. 2011).

Other students as resources for meaning making

From the data, three different ways of building on one another's ideas and thoughts were identified. Firstly, two general types of discourse illustrated the data. These were named as *elaboration discourse* and *sharing discourse*. These two different discourses characterized the nature of the meaning making connections constructed between different messages and/or writings. Secondly, in the third way of meaning making, ideas and thoughts presented in the other students' writings and discussion postings were explicitly pointed to as resources for enhancing one's personal understanding. Next, these different ways of meaning making are discussed and presented with empirical examples.

### *Elaboration discourse*

The most frequent way of using others as resources in meaning making was related to the type of activity, where the students were developing the philosophical knowledge or ideas presented by others (in individual writings or discussion) further by offering a different perspective, critique, or new knowledge, thus elaborating others' thoughts and ideas. This elaboration discourse can be conceptualized as developing, challenging, and re-conceptualizing ideas (Ellis et al. 2006). The next example dealing with the theme subjective-objective truth represents the elaborative discourse:

#### Example 9

Tiina: When science is objective, doesn't it then mean that knowledge and truth aren't dependent on context and person, but there is one truth? This seems logical and meaningful, especially in natural sciences, but how about in human sciences? I somehow consider the thought that there wouldn't be subjective truth, and truth based on one's own personal experience, which is constructed contextually as odd. In my opinion, hermeneutics, in particular, takes a stand against a traditional conception of science, as it tries to interpret people's activity and meanings. And, on the one hand, couldn't we then think that truth could be subjective, everyone's personal experience about what happened or self-given meaning to some things...? [...][*Individual text*]



Krista: If truth could be subjective, how could we find proper everyday solutions from among many subjective truths? In that case, science and research would lose their meaning, isn't that so? [...] *[Challenging other's ideas, thought-provoking questions]*

Tiina: I stayed myself as well to think for a longer time about the essence of this traditional view of science, from the perspectives of objectivity and truth among other things. Now, when I read the texts from the next theme, it turns out that the opposite of natural sciences is in human sciences; you don't assume there is an objective truth, but rather you are aiming at understanding subjective meanings. *[Reasoning further, new knowledge]*

Example 9 shows how Tiina (in her individual text) is reasoning about subjective-objective truth in human and natural sciences. Krista questions Tiina's view by presenting a counterargument and asking a thought-provoking question. Even though Tiina does not give a direct answer to Krista's questions, Tiina reasons the theme subjective-objective truth further and gives new knowledge by leaning on a new philosophical text. In this situation, Krista's elaboration triggers Tiina to think further about the themes of objectivity and truth, and Tiina uses another text as a resource for clarifying the issue. Tiina is able to re-conceptualize and develop the object of discussion further (Ellis et al. 2006) based on Krista's challenge and, as a result, she clarifies her point of view from subjective truth to subjective meaning.

Generally, in elaborative discourse, the students were not engaged in long discussion threads (interrelated postings). The longest discussion thread on the same theme of discussion consisted of four interrelated postings. Example 9 represents the most typical case of elaborative discourse, where the student is responding to another student's writing and the student whose writing is commented on responds back. From this perspective, Krista and Tiina can be seen as resources for one another (Edwards 2005). Tiina's writing prompts Krista to question Tiina's reasoning and, in turn, Tiina reasons the issue further as a reaction to Krista's counter-argument. However, this does not lead to further joint development of the object, which questions reciprocal alignment to 'expand the object' (Edwards 2005). Therefore, the *shared* improvement of conceptual artifacts resulting in building together new knowledge (Goodyear and Zenios 2007) was not necessarily widely accomplished through the discussions. However, reflecting on one another's thoughts surely contributed to improving students' personal understanding (Goodyear and Zenios 2007) as is demonstrated in Example 9, where Krista's counter-argument triggers Tiina to reason on the issue of subjective-objective truth further.

There were altogether six different epistemic activities or ways of developing, challenging, and re-conceptualizing other students' ideas further identified in the elaborative discourse. In the context of elaboration discourse, these epistemic activities can be characterized as a kind of 'difference-building processes' in the sense that the student took up the other's (or own) previous contribution(s) and made *new* use of it (Linell 2009, p. 73). In the first type of elaborative activity, the students *asked for clarification or presented thought-provoking questions* that developed the theme of discussion further (see Example 9). However, sometimes when the students asked thought-provoking questions, these were by nature self-directed reasoning types of questions, which were triggered by the other students' ideas, but were not necessarily meant to be answered by the other students (see Example 10). Clarification questions were, on the contrary, directed at gaining clarification from the other students. The second type of elaboration was *answering* other students' *clarification and thought-provoking questions*. In the third type of elaboration, the students *gave a new perspective*



for a particular theme of discussion and in the fourth type *reasoned* the theme of discussion *further*, thereby enhancing knowledge building. When giving a new perspective, the students continued reasoning on the same phenomenon or idea under discussion, but gave a new perspective for discussion:

#### Example 10

You reasoned about the relationship between perceptions and theory [based on Niiniluoto's text] in a fine way. I have also been reading Niiniluoto's text, and another perspective came into my mind; that if the hypothesis is tested through perception and through examining its perceptual consequences, doesn't the hypothesis work as some kind of pre-assumption? If the hypothesis is guiding our perceptions, can you then find perceptions and testing of the hypothesis reliable? [...] (Emma)

In the example, Emma compares another student's interpretation of Niiniluoto's text to her own, and provides another perspective for consideration. The above example also illustrates how the thought-provoking questions that Emma asks in bringing a new perspective reflects her own reasoning 'aloud'. In reasoning further, the students developed or re-conceptualized the object of discussion further, as was demonstrated in Example 9. In the fifth type of elaborative activity, the students referred to *new*, usually *theoretical knowledge* based on another text that they brought into discussion to continue or complement the other students' ideas:

#### Example 11

Fine ideas Emma! I got lots of ideas from your text about health education and its relation to strict and exact sciences [...]. The other night, I read about the ontology and epistemology of health promotion. According to that, a human is seen as an active and intentional actor; in other words, intentionality of the activity and understanding of meanings also play a central role in the research activity. The knowledge relating to health promotion is emphatically human, subjective, and first of all value-bonded. So, at least this emphasizes health promotion and health education as a part of it, as belonging to the strict sciences. However, health promotion cannot be considered as an isolated, separated field of science. It is connected with other fields of science (like natural sciences, medicine); therefore, exact sciences also play an important role. (Tiina)

The above example shows how Tiina builds an intertextual connection to text from her own field of science to interpret Varto's philosophical text about the strict and exact sciences, and to continue Emma's ideas about health education and its relation to strict and exact sciences from the (new) perspective of health promotion. The sixth way of elaboration was *challenging other's ideas*, which is considered an important feature of exploratory talk (Mercer and Littleton 2007). The students were, however, rarely challenging others' ideas (see Example 9). However, in reasoning further or bringing a new perspective or knowledge to the theme of discussion, the students sometimes used critiquing even though the critique was not directed towards the other students' ideas (counter-argument) but was, instead, a critical reflection, for example towards something stated in the philosophical text, as is seen in Example 10.

#### Sharing discourse

In the second type of meaning making discourse, the students shared experiences or conceptions on some phenomena in the philosophy of science or on their work or



discipline-related experiences with the other students. The discussion was built on an agreement and on supporting others' conceptions. In sharing experiences, students often built their thoughts on several students' thoughts, as the following example demonstrate:

#### Example 12

Anita: You're both [Satu and Tia] reasoning about applying both human sciences and natural sciences in your work based on Raatikainen's article [...] as an action therapist, I see it in the same way. However, at work you often come across, for example, what the doctors value and appreciate (research based on natural sciences; unfortunately) [...] *[Agreeing on conception, giving new perspective (dominance of natural sciences)=elaboration discourse]*

Aino: Yes indeed, this is how I see it through my own work in physiotherapy. The problem is that in work you value the views from the natural sciences too much. One thing at work is compilation of statistics. If I spend my time with the patient by talking about the goals and motivation without doing exact physiotherapy, can I mark the visit as physiotherapy? [...] I didn't give any physiotherapy, but after discussion the patient is more motivated to be rehabilitated and willing to cooperate. [...] The problem is that I cannot write on the patient's health report that we have been discussing about therapy. Then, we cheat and do, for example, some stretches or something at the end. This is what it's like; the focus is too much on natural sciences. *[Sharing criticism, giving own example, reasoning theme of discussion (dominance of natural science) further= elaboration discourse]*

The above example demonstrates how the students share an understanding about the nature of their work and its relationship to different scientific approaches. They all share the view that they need the views of both natural and human sciences in their work. The students take the positions of an action therapist and a physiotherapist in grounding their arguments. Thus, they are reflecting their work identities in the situation by expressing the conceptions and practices that guide their work. The example is a good example of how the students take up the identities, which are in relationship to the content of the discussion and the activities of the other students. In the discussion, they then rely on situated meanings about what identities or I-positions are relevant in the situation. Furthermore, the example demonstrates that the students experience a contradiction between their own values and the values ("what the doctors value") and practices ("compilation of statistics") of the work community. Thus, the students also share the view of the dominance of the natural sciences through describing work practices that support that domination. Even though their discourse is based on agreement and sharing a point of view, they share the same critical position toward their work practices. Example 12 highlights how the students drew upon a variety of resources to construct meaning: Philosophical text ("Raatikainen's article"), theoretical conceptions ("human sciences and natural sciences"), context outside the current interaction (i.e. intercontextual reference "at work"), other people outside the current interaction (i.e. intercontextual reference "doctors"), identity (positioning oneself "as an action therapist"); practices, activities, and values of work community ("compilation of statistics", "physiotherapy", "focus too much on natural sciences"), and co-text ("Yes indeed, *this* is how I see it through my own work in physiotherapy.").

Example 12 demonstrates how sharing and elaborative discourse were sometimes connected. First, Anita agrees with Satu and Tia's conception about applying both human and natural sciences in their work, but also provides a new perspective in a form of critique of the dominance of natural sciences in her work community. Aino shares this criticism, but



at the same time develops the idea of dominance of natural science further by providing a more concrete example of work practices that support the dominance.

From the sharing discourse, three epistemic ways of sharing experiences or conceptions were identified. The first way, *giving one's own example*, was the most frequent way of sharing conceptions and experiences:

#### Example 13

Hi Tia,

You wrote that when you are working as a physiotherapist, you have to also make use of human sciences in order to better understand the patient you are treating. The same is true for me, as I work as a midwife. I have to be able to make use of nursing science, medicine, and human sciences. So, all are tightly intertwined in my hands-on work.

Emma

When the students were giving their own examples, they shared similar, but separate, experiences or conceptions with the other students. In the above example, Emma identifies herself with Tia's experience of the connection of human and natural-related sciences as a basis of practicing their different professions. The second way of sharing experiences and conceptions was manifested in *agreeing*, where the students agreed with other students' conceptions and experiences by repeating, rephrasing, or summarizing those conceptions or experiences. In the following example, the student agrees on a conception regarding the relationship of human and natural sciences:

#### Example 14

Hi Tiina,

You had reasoned well about the differences between human and natural sciences.

You had also put into words partly the same ideas I had about this theme. I think that what was especially good was your insight about the issue that knowledge on meanings in a certain way completes and colors knowledge produced by natural sciences! And a good insight was also the issue that in order to understand meanings, you also have to understand the natural circumstances.

Emma

Even though the above example highlights Emma's agreement on conceptions, rephrasing and summarizing Tiina's 'good ideas' also indicate that these ideas had impact on her thinking. Therefore, through these expressions, the student reflects that the other one has served as a resource in providing perhaps new ideas or perspectives to the theme under discussion ("what was especially good", "and a good insight was") even though this does not necessarily lead to the shared development of the topic. A third epistemic activity was *sharing criticism*, where the students agreed on criticism stated by other students' by repeating, rephrasing, or summarizing it (see Example 12).

Overall, it seemed that the sharing discourse served as a resource for confirming, strengthening, and supporting conceptualizations that the students had made through their individual writings or shared elaboration. It reflected the *shared or collective understanding* that the students (had) constructed through the different resources (see Example 14). Through sharing discourse, the students also acknowledged and reflected a common sociocultural knowledge and experience base that they shared through their similar backgrounds. In shared discourse, this was expressed through *collective experience* that reflected the actual work, study, or discipline-related activities or practices (see Example 12).



Even though sharing experiences and conceptions cannot be considered as productive interaction in terms of engaging in shared development of conceptual artifacts, sharing similar experiences and ‘the sense of similarity’ can be seen as signs of *togetherness* (van Oers and Hännikäinen 2001). The sense of togetherness creates and maintains the positive social and emotional atmosphere that also enables productive interaction to occur during the discourse. Positive feedback that the students constantly gave about each other’s writings also created and maintained a positive orientation and a sense of togetherness throughout the course. The challenges that the students shared during the course—mostly difficulties in understanding some philosophical texts—also contributed to the creation of togetherness in a manner of ‘we’re in this together,’ as this example from the first task demonstrates:

#### Example 15

Tiina: I admit that when I read the texts most of the time I’m “out”. I have been reading Niiniluoto’s text for a couple of days trying to figure out the concept of science, the essence of truth [...] This is challenging, but not impossible.

Marjo: Tiina, it is great that you were brave enough to talk about your “being out”. I have waited for others to act, because I’ve not been able to understand either. But I believe, as you do, that you can figure out something about the philosophy of science [...] and you can try to gain understanding through your fellow students.

The last clause of Example 15 also indicates the tendency towards relational (Edwards 2005) or collective (Lipponen and Kumpulainen 2011) agency showing the willingness to act as a resource for one another.

#### *Others as resources for enhancing one’s personal understanding*

In the third type of discourse, students explicitly stated that reading others’ writings or postings had helped them better understand some philosophical conceptions, ideas, or theories.

#### Example 16

Hi Tia, I think you write in a fine way through your own work about sympathetic human science. I also read Raatikainen’s article, and when I read your text I got a new perspective and it made my thoughts clearer, too. (Satu)

#### Example 17

Great text, Krista. I got concrete help for myself. You talked in a fine way about the conceptualization, which was not easy to understand. (Tiina)

In the above instances, the students explicitly express that the other students’ individual writings or postings had helped their own understanding by giving them a new perspective or clarifying their thoughts, for example. Sometimes, these statements also resulted in elaborating the subjects further (see Example 11). These statements implicitly stand for the students’ conceptions of learning from others. They represent a cohesive conception of learning (see Ellis et al. 2006), which indicates that the value of reading others’ texts or postings is in enhancing understanding as opposed to checking the accuracy of ideas, for example. These conceptions were also supported in the students’ feedback after the course: “Reading others’ texts broadened my own perspective” (Satu) or “The others’ texts and discussions aroused many perspectives that you hadn’t thought about yourself. Others’ examples and reasoning also helped to perceive some things better.” (Anni)



All three different ways of using others as resources represent different ways in which others' texts or text-based discussion were used as a co-text, as resources in the "new act of sense making" (Linell 1998, p. 132). Through these different ways, the students had become cognitive, social, and emotional resources for one another. The students not only built or strengthened together an understanding about the philosophy of science and different historical approaches, but also shared personal, social, and cultural knowledge and experiences. From the dialogical perspective, these different discourses can be conceptualized as the personal and collective process of interpretative reproduction of knowing and believing through different resources and their connection, in other words, as building situated meanings (Gee and Green 1998; Linell 1998; 2009).

Next, Table 1 summarizes the meaning making activities found from the data.

Recurrent thematic discourse

'Constructing contrasts' was a recurrent thematic discourse (Nikander 2008) in the students' discourse throughout the individual writings and discussion postings. It was supported through the reasoning tasks, whose aim was to introduce the students to different perspectives in the philosophy of science. Throughout the discourse, it became apparent that the students held a common conception of the need for both *human and natural, strict and exact*, and *soft and hard* sciences, as well as *qualitative and quantitative* research in their work and field of science (Examples 4, 11, 12 and 13), even though it conflicted with some students' perceived work (Example 12) and research practices (Examples 7 and 8). The 'constructing contrasts' discourse generally served as a resource for understanding (the history of) the philosophy of science and its different approaches. It also served as a resource for critically evaluating the experienced contradictions in their work and science practices, and as a resource for conceptualizing their work and discipline-related knowledge and experiences. At the same time, it created the possibility for learning manifested in

**Table 1** Meaning making activity in individual writings and discussion postings

Data source	Meaning making activity
Individual writings	Applying
	Forming or stating a conception
	Critiquing
Discussion postings	Elaboration discourse
	Asking for clarification or presenting a thought-provoking question
	Answering clarification or thought-provoking question
	Giving a new perspective
	Reasoning or developing ideas further
	Giving new knowledge
	Challenging other's ideas
	Sharing discourse
	Giving one's own example
	Agreeing on conception or experience by repeating, rephrasing, or summarizing
	Sharing criticism by repeating, rephrasing, or summarizing
	Others as resources for enhancing one's personal understanding



understanding or seeing something in a different way (Marton et al. 1993), as some of the students stated in their feedback of the course:

Example 18 906

This course has given me a whole new perspective about doing research and broadened my perspective about science in general. [...] I started from Strict positivistic thoughts and ended up with a wide and open model of thinking, for example, about the importance of human sciences and qualitative research. (Aino) 908 910 911 912 913

Example 19 914

The course awoke a desire to think about things from different perspectives without agreeing to one right perspective given above. Through the course, this was manifested in thinking about the differences between human and natural sciences. (Nea) 916 918 919 920 921

Example 20 923

My own conception and understanding about science and research changed to a more critical and "healthier" direction during this course. The whole world of science appears in a whole new light than before this course. Now I feel that I can take a more critical and diverse view towards science. (Krista) 924 926 927 928 929

As can be demonstrated based on the recurrent thematic discourse and the students' experiences (Examples 18–20), the power of learning arises from the 'encounter' of the different perspectives, which lead to contradictions between old and new, and comparing and contrasting different perspectives (Grossen 2009). These, in turn, can be considered as a means of providing opportunities and sources for learning and for producing new knowledge and understanding by uncovering a space for alternatives to taken-for-granted knowledge, beliefs, or actions (Sins 2010). 930 931 932 933 934 935 936

## Discussion and conclusions 937

Taking one's everyday knowledge as a resource for learning implies agency (Lipponen and Kumpulainen 2011). Supporting the students' agency by acknowledging their own lives and experiences as resources for learning can lead to a learning situation where the (institutional) knowledge provided by the teacher becomes a mediating tool for understanding those lives rather than the end of itself (Paakkari et al. 2011). This study particularly focused on exploring how the students constructed and reflected their personal and shared understanding of the themes addressed during the philosophy course by using their life experiences as well as one another as resources. The results provided insights into immediate and mediated resources or aspects of a situation (Gee and Green 1998; Linell 1998) that guided and framed the personal and shared meaning making. Prior work and discipline-related knowledge or experiences provided the students with resources for understanding the philosophical texts through applying, forming conceptions, or critically evaluating the philosophical knowledge presented in the texts. In their discursive activities, the students used other students as resources by leaning on the other students' writings or discussion (co-text) in elaborating the theoretical conceptualizations further. They were also engaged in building a common understanding in sharing their similar work or discipline-related experiences and conceptions or sharing 'collective criticism' toward their own work practices or practices related to their own scientific fields. Sharing experiences with other 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955



students and building on one another's thoughts, as well as using one's own experiences as resources in the interpretation of the texts, thus, seemed to offer tools for understanding, conceptualizing, and critically evaluating both the philosophical themes studied and the practices of one's own work and science community. In addition, reading others' writings and postings enabled the students to get to know and learn from one another's thoughts, even though it did not necessarily lead to co-construction of knowledge or sharing of experiences. This clearly highlights the value of online discussion and texts, which on the one hand provide a means to improve conceptual artifacts together, and on the other hand, provide a permanent way of representing them (Goodyear and Zenios 2007). This permanency also provides opportunities for 'vicarious learning' (Gudzial and Carroll 2002). When learning vicariously, the students recognize their own understanding in others' postings or, as in this study, the students learn from others' postings, and therefore may not feel the need to engage in *shared* knowledge-building discussion.

In their personal and collective discourses, the students reflected values, conceptions, norms, and practices related to their personal, social, and cultural knowledge and experiences outside the institutional context in which they participated. This highlights well the connection-building nature of discourse (Gee and Green 1998). Consequently, this demonstrates how the students were crossing boundaries between different discourses and contexts by 'bringing along' other communities to the present context of activity (Akkerman and van Eijck 2011). This in turn promotes transfer and mobilizing knowledge across different sites in a sense that one context (work) is used to understand the other context (study) and vice versa (Engle 2006; Zittoun 2011). The study demonstrated how a personalization of the learning task, through promoting the students to use one's past history as a resource, resulted in different ways of meaning making that helped the students to understand the philosophy of science and their own experiences. By drawing on their own experiences and relating these experiences to the concepts introduced in the philosophical texts (Goodwin & Duranti), the students became engaged in the processes of externalization and internalization both at the personal and collaborative levels (Tee and Karney 2010). Based on these results, it is suggested that the design of the learning activities should be more personalized through also acknowledging the importance of personal everyday knowledge as a resource for (meaningful) learning.

It is also assumed that the personalization of the learning task enhances the motivation for engagement (Crook 2000). Furthermore, the engagement might be affected by the efficient use of resources guaranteed by the course design (Hämäläinen 2011). In this study, the students were first supposed to generate their own understanding of the themes studied through individual writings by using texts and past knowledge and experiences as resources. As was evidenced in the study by Jeong and Hmelo-Silver (2010), the requirement to build one's own understanding from the available resources, instead of merely providing students with resources, was essential for learning. In this study, writing individual texts, therefore, guaranteed that the students processed the texts carefully by forming conceptualizations, and applying and critically evaluating the texts through their life experiences. This in turn provided a content space for discussion, and for developing and reflecting the themes further in the collaborative part of the work. However, as could be critically stated, the course design as such seemed to serve the purposes of improving and strengthening the students' personal understanding partly with the help of the other students more than enhancing collaborative knowledge-building in the sense of truly engaging in shared construction of new knowledge. Therefore, it represented more of a 'weak version' of a knowledge-building activity (see Goodyear and Zenios 2007), where the students learned more *from* the others than *with* the others.



Methodologically, this study aimed towards a more dialogical approach in the study of learning. This meant both studying collaboration as a dialogue and exploring how material and sociocultural aspects mediate students' personal and collective discursive activity. Often, the analysis of collaborative interaction, e.g. in the socio-cognitive research tradition, is interested in analyzing the interaction based on individual speech acts, e.g. through communicative or strategic functions of utterances, leaving out the dynamic and historical nature of discourse. By analyzing the co-textual references as well as the intertextual and intercontextual ties constructed between different resources or aspects of a situation, the study was able to open up the mediated and situated nature of discourse and helped to understand how the students drew on past texts, contexts, and discourses in constructing the present ones (e.g. Gee and Green 1998; Grossen 2009; Linell 2009; Mercer 2008).

In spite of the strengths of using the dialogical approach for studying learning activities from the sociocultural perspective, it also has its limitations in this study. One criticism is that the studies of collaborative learning have focused on limited temporal time-scales; e.g. short learning sequences (Grossen 2009; Mercer 2008). Therefore, instead of just tracing connections within short data excerpts, as was done in this study, it is also important to study what connections are made across long stretches of the interaction, and across time and events (Castanheira et al. 2007). Mercer (2008) argues for dialogic trajectory focusing on the temporal development of the dialogue itself. The temporal history of the long-term discussion helps to identify how students' ideas and knowledge develop and change through the extended process of interaction in the group, and how new concepts and ways of thinking are appropriated. Keeping this in mind, our future work with more long-term data (one year) will focus on studying how the group members are engaged in different 'construction' processes—knowledge, identity, and activity building—in the groups' long-term learning activities and how these building activities are connected to different communities outside the group's activity.

**Acknowledgements** I wish to thank three anonymous reviewers and Professor Gerry Stahl for their valuable comments and constructive criticism that helped me to revise the earlier version of this paper. I also wish to thank the philosophy course teacher, University Lecturer Petri Kuhmonen (University of Jyväskylä, Finland) for his collaboration in conducting this research, as well as the students who participated in the study. The research was supported by the Academy of Finland (project no. 7121097).

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