

# Talking Back to the Future: Anatomy of Reflection as Collective Practice

Alfredo Jornet, University of Oslo, a.g.jornet@iped.uio.no

**Abstract:** Reflection is recognized as crucial for deep learning to occur; yet how it is involved in learning is less understood and often taken for granted as an individual cognitive process. Building on Vygotsky's methodological insights on *unit analysis*, I elaborate on an approach that studies reflection as a collective, social and material phenomenon. I define the *joint production of accounts of prior experiences* as the unit of social interaction that contains all the essential features of anything we may ascribe to reflection as a cognitive process. Drawing from empirical (interaction) analyses conducted as part of a larger multi-data project on debriefing and retrospective situations, I describe *constitutive* features of reflection as collective practice. I show how this kind of analysis contributes to an explanation of reflection as learning process in its own right, and not just as a factor that "affects" learning. I conclude discussing theoretical and practical implications.

**Keywords:** accountability, conversation, reflection, unit analysis, Vygotsky

## Introduction

Research in the learning sciences has consistently shown that reflecting upon prior experiences is a crucial feature of how people learn and a requisite for deep learning to occur (Sawyer, 2006). Students who engage in reflective tasks significantly outperform students who do not (Etkina et al., 2010) and specific forms of prompting learners to reflect upon their performance have been found to positively impact learning outcomes (Davis, 2003). Less is known, however, about *the mechanisms* involved in these outcomes. Most often, reflection is treated as an individual mental process without further critical analysis. Yet, if reflection is a private process that goes on within the individual mind, how can researchers and educators unproblematically identify instances of reflection? More importantly, if reflection cannot be directly observed, how can learners ever learn it in the first place?

The purpose of this paper is to examine reflection as a process that is publicly available for those already competent to recognize it, and for those not yet competent to engage in reflective practice even if they had never done so before. This study thus aligns with recent calls in the learning sciences to consider the larger communicational space constituted by several participants as the minimal unit of analysis (Greeno & Engeström, 2014). Although assumptions that learning is social have become commonplace, we do not yet have a conceptualization of reflection as collective practice and its implications for learning research and practice. Taking a Vygotskian perspective, and drawing from experiences gained during ongoing research on debriefing and retrospective situations, in this paper I contribute to a methodologically and empirically sound conceptualization of reflection as collective practice.

## Reflection as collective practice

In much research about learning, the term *reflection* is used unproblematically to designate particular designed or observed activities, without necessarily engaging in a critical discussion of the concept or the processes it denotes. Thus, it is not difficult to find instances where the term reflection is used to define the very process that it is supposed to describe. This happens when researchers define "scaffolding ... reflection" as "helping learners ... *reflect* on their solutions in ways productive for learning" (Reiser & Tabak, 2014, p. 48, emphasis added), or when metacognition is defined as "the ability to ... *reflect* on what and how one learns" (Nathan & Sawyer, 2014, p. 32, emphasis added), only to subsequently find that reflection and metacognition come to be treated interchangeably in several other parts of the same volume. When conceptualizations are provided, these tend to be articulated in terms of individual cognition. Thus, Piagetian notions of *reflective abstraction*, which describe reflection as the learners' formation of internal (mental) representations of their own activity, are present in the literature along with emphases on the need to consider social and situated aspects (Lobato et al., 2012). A recent review shows that reflection has mostly been studied with regard to different types of knowledge and measures of individual variables such as motivation, beliefs, expectations, or self-regulation (Winne & Azevedo, 2014).

Though often conceptualized as individual competence, the fact that learning scientists are able to use *reflection* unproblematically already suggests that, whatever is designated by the term, it is objectively present as a witnessable feature of the situations and designs being so named. In fact, and perhaps not surprisingly, reflection is most often characterized in terms of tangible public actions. It is, for example, described as the learners' ability "to pause and evaluate their progress" (Nathan & Sawyer, 2014, p. 32), and as enabling learners "to compare their own problem-solving processes with those of an expert, another student, [or] an internal cognitive model of expertise" (Collins & Kapur, 2014, p. 114). A similar description was also given by American pragmatist John Dewey, who defined reflection as "the postponement of immediate action," a "stoppage of the immediate manifestation of impulse until that impulse has been brought into connection with other possible tendencies to action" (Dewey, 1938/1997, p. 64). Unlike the cases cited above, however, the philosopher is clear that these actions are not individual or mental. Instead, they comprise "a co-operative enterprise" that constitutes a form of "social intelligence" (p. 72). Rather than internal mental process, reflection consists of observable, public social actions that lead to the possibility of turning (prior, current) experience into the object of individuals' experiences. A methodological implication, therefore, is that reflection does not have to be assumed but can be directly studied in and as conversational process.

Conceptualizations of reflection as involving conversation exist in the literature. Donald Schön's (1983) work *The Reflective Practitioner* emphasizes that professionals shape work situations "*in conversation*" (p. 73) with them, a process he coins as *back-talk*. More recently, a view has been advanced that discourses' *recursivity*, language's property of *being about* or *referring to itself*, is foundational to individuals' competence to think and reflect. Accordingly, reflection could be thought of as a form of communication, a *commognitive act* (Sfard, 2008). However, the few studies that focus on reflection as social phenomenon still maintain the duality between the social and the individual, where, even if the role of community practices is acknowledged, "it is the individuals who reflexively monitor and discipline themselves" (Ovens & Tinning, 2009, p. 1126).

Reflection as collective practice is consistent with Vygotsky's thesis that "every function appears on the scene twice in the child's cultural development, i.e., on two levels, first the social, and then the psychological, first between people as an interpsychological category, and then within the child" (Vygotsky, 1989, p. 58). Vygotsky further cites Piaget as one of the first scholars "to confirm the thesis that thinking in preschool children does not appear before the debate appears in their collective" (Vygotsky, vol. 3, p. 95). The thesis that cognitive functions first exist as social relations has been taken up in the literature, a growing body of studies having empirically substantiated and validated it (Mercer, 2008). Accordingly, researchers have begun to investigate reasoning as a feature of the collective that exists in conversational forms (Michaels, O'Connor, & Resnick, 2008). Yet, here too the focus tends to be on finding *what works*, with less attention given to conceptual considerations of reflection as learning *practice* in its own right, and the implications to research and practice. If all possibility for individual reflection exists first *as* a social relation, a study of the collective achievement of reflecting bears not only promise to improve our understanding of how to help learners become more reflective, but also makes empirically available the mechanisms by means of which we come to learn from prior experiences—a foundational task in the learning sciences.

## Methodological approach

For the purpose of developing a functional and empirically grounded conceptualization of reflection as collective practice, in the remainder of this paper I present findings derived from an ongoing multi-data project on debriefing and retrospective practices. The research, itself a collective endeavor, involves a variety of data sets and the development of a particular methodology inspired by ethnomethodology and cultural-historical psychology. Central to this methodology is the premise that cognitive functions exist first in the form of social relations, that is, as *talk-in-interaction*. However, not any stretch of talk-in-interaction constitutes an instance of reflection. It is necessary to first establish a *unit* that captures the basic features of the cultural phenomenon as a whole.

## Joint production of accounts of prior experience as the unit of analysis

The research reported here follows a methodology based on Vygotsky (1987), who distinguishes between *analysis by elements* and *unit analysis*. Analysis by elements proceeds "with the decomposition of the complex mental whole into its elements" (p. 35). This treatment is exemplified with the chemical analysis of water, which takes the elements hydrogen and oxygen as the minimal units. The elements, however, "lack the characteristics inherent in the whole" (p. 35). For this reason, "the man who resorts to the decomposition of water into hydrogen and oxygen in his search for a scientific explanation of the characteristics of water, its capacity to extinguish fire ... will discover that hydrogen burns and oxygen sustains combustion" (p. 35). This form of analysis, which tends to rely on inductive approaches, reduces complex dynamic phenomena into

abstract categories or variables (e.g. motivational, social), thereby missing the integrity of psychological phenomena as living wholes.

By contrast, unit analysis aims to preserve the details and richness of the empirical whole under analysis, while still being able to derive general laws. The term unit “designates a product of analysis *that possesses all the basic characteristics of the whole*” (Vygotsky, 1987, p. 46). Studying the relation between thinking and speech, Vygotsky found such a unit in *word meaning*. In word meaning, both thinking and speech are united objectively and intrinsically: “Word meaning is a phenomenon of thinking only to the extent that thought is connected with the word and embodied in it” (p. 244). It is in the *concrete act* of speaking that thinking and word are united. Accordingly, unit analysis aims to find analytical objects that are, at once, both an immediate situation and the whole basis of the cultural phenomenon. In this regard, as Vygotsky (1971) notes paraphrasing K. Marx, unit analysis constitutes a form of *microscopic anatomy*, where general constitutive features are empirically found in their real and dynamic connection.

To achieve a functional anatomy of reflection as collective practice, the question needs to be asked, *what is the social unit that retains the whole of what reflection can be as a cognitive learning process in its own right?* Dewey defines reflection as stoppage of action to connect whatever has been done with other possible tendencies to action. If any higher psychological function *was* first a social relation (Vygotsky, 1989), then the social situation where an account of a prior event or experience is demanded and produced in conversation for the purpose of re-orienting action is that unit that exhibits all the properties of reflection as a whole. In such situations, reflection is not achieved individually, but is jointly and publicly accomplished. Individuals hold and are held accountable to what has happened, and it is then when one’s own experience can become the object of one’s own experience. Rational accountability has in fact been identified as a crucial aspect for learning (Suchman, 2003) and discussed as a desirable goal for learning (Greeno & Engeström, 2014). The pertinence of examining cognitive phenomena as conversational accomplishments is also well established, some researchers admitting that, to study cognitive (reasoning) processes, “it [is] necessary to take into account structures of conversation and then attempt to detect the logic within them” (Michaels et al., 2008, p. 287). These authors have identified *accountable talk* as crucial for productive learning, and have described three dimensions as normative models to develop in instruction. The research presented here expands on these findings empirically and methodologically by focusing on and describing reflection as a social, public process, and revealing not just its social nature, but also its nature as teaching/learning mechanism.

## Data and participants

The research reported in this paper is part of a larger project investigating the social, material, and developmental aspects of debriefing practices designed to learn from prior experience in school and workplace settings. For the purpose of presentation, here I use excerpts from a database on science education. The database consists of 220 hours of video and other ethnographic materials recorded during two consecutive iterations of a design-based technology-rich research project aimed at connecting inquiry activities in the school lab, a science museum, and the classroom. As part of the intervention, inquiry activities alternate with sum-up sessions in which recordings and other products of inquiry are debriefed in plenum. A total of 64 students from an upper-secondary school and their science teacher participated in the studies, which were run across 2 academic years.

## Analyses

Analyses are performed in individual and collective data sessions employing *interaction analysis* (Jordan and Henderson 1995). Collective data sessions include scholars and practitioners with experience in the learning sciences, computer sciences, engineering, and other domains of relevance depending on the nature of the data. The analyses aim to capture and reproduce the integral dynamics of social events, which involves investigating the turn-taking and tool-facilitated conversational practices of the participants. The analysts do not attempt to interpret what the participants’ utterances mean or what they individually think, but follow the means and consequences of social actions as these become relevant to the participants. Observations should lead to what has been termed *ethnographically adequate descriptions*, where “the ethnographer’s adequate account of what natives do together must follow from the way in which the natives structure a situation to allow their participation” (McDermott, Gospodinoff, & Aron, 1978, p. 246). In this way, and taking the joint production of accounts of prior experiences as unit, the form and function of reflection is examined as it is endogenously produced in practice. The resulting descriptions are therefore rigorous with respect to the empirical details but, in that they describe cultural possibilities of social interaction, they also have general character. Transcripts follow Jeffersonian transcription conventions, the level of detail being adapted to the corresponding analyses.

## Findings: Anatomy of reflection

In this section, I report on three general moments of reflection as collective practice that have emerged in the course of investigations on debriefing and retrospective situations. These moments are not detachable from each other and describe general features that exist united not abstractly but contingently, in actual social situations. Because the methods do not fall on either side of the inductive/deductive dichotomy, the presentation retains both conceptual and empirical aspects. The goal is to summarize, in the space available, phenomenal properties of reflection as collective practice that might be useful for guiding future research and practice.

### Jointly stopping/troubling action

A first important moment in reflection concerns, as thematized in Dewey's definition, stoppage of what otherwise may be described as *absorbed coping* (Dreyfus 2002). In absorbed coping, the person is so familiar with the means-consequence relations that her actions go on seamlessly, without having to *think about* them. To reflect involves stepping out of that absorbed coping and make salient otherwise undifferentiated aspects of what one is doing. That *doing* may be one that is now happening and is interrupted, or may be a happening that took place in the past. In either case, there must be work to make the situation such that whatever has been done needs to be looked upon again.

Consider the following excerpt, where a group of upper-secondary students are experimenting with a spray can of compressed air as part of their inquiry-based curriculum on energy, which includes computer prompts to help them reflect.

#### Excerpt 1

- 01 S1: ARG:: ((shakes hand)) look at my skin, ((laughing)) it gets cold.  
it gets freaking cold.  
02 S2: let me feel it ((touches base of the spray can))  
03 S1: it becomes freaking cold. just feel it (.) feel up there, ((touches  
upper part)) it becomes cold on the top, kind of.

In the excerpt, a student (S1) produces interjections after having pressed the valve of the spray can, releasing the air and drastically decreasing the can's temperature due to (a) a drop in the pressure, and (b) the associated phase transition from liquid to gas, which draws from the heat around. This scientific account however is not available to the students; such account is precisely what the students are supposed to learn. A second student (S2) then requests to "feel it" and S1 instructs him where to touch to feel what he felt. The students' talk is mostly about their sensuous experience and is closely connected to the material situation by means of indexical gestures and touching. At stake is the making present of a presence, which can be equally accessed by the students given they provide each other tutorials on how to touch so as to feel it in specific ways. Although the students already *talk about* the event, the nature of their actions is such that actions go on seamlessly. This, however, is about to change as the students read the computer-provided prompt, "feel, observe and discuss," and wonder "what happened?"

#### Excerpt 2:

- 19 S1: I don't know what happened. I think it happened down there and  
suddenly it happened something cold up there  
20 S3: no, there is much pressured air inside, which makes it to come out  
at once  
21 S2: pressure makes it to become cold, perhaps, I don't know

An event that first is treated as unproblematically present is now accounted with doubt. Their descriptions now include qualifiers such as "I think" and "I don't know." Although the event is the same, its mode of orientation has completely changed: Something that was immediately apparent to the students now becomes uncertain. A description that still preserves sensuous features of the event no longer is accepted and leads to descriptions that resemble scientific talk (turns 20–21). This shift does not come immediately but requires (practical, social) work. Thus, the prompt is attended for the first time several turns prior to Excerpt 2, when S2 visibly orients gaze and body towards the screen where the prompt is displayed, reads the task "feel, observe, and discuss," and asks, "what happened?" as if anything the students had said or done so far were not adequate accounts. S1 then responds by inviting S2 to "try and press," which he does, leading to emphatic exchanges that S3 formulates as "funny" (turn 14), laughing as the students spray over each others' hands. There is a new visible orientation

towards the task's prompt, however, which re-states the question again, "what happened?" (turn 15). S2's repeated orientation to the task's prompt becomes visible bodily and verbally, standing out against the background of laughing as an invitation to return to the seriousness typically associated with science and science classrooms.

#### Excerpt 3:

- 12 S1: just try and press yourself.  
(3.8) ((S2 sprays, all touch the cold can and laugh))
- 13 S1: LOOK AT MY SKIN- ((laughing)) LOOK At my hand, IT feels like-  
(2.0) ((all laughing))
- 14 S3: SO funny,
- 15 S1: yeah=you are smart. well. ok. ((gazes towards prompt in screen))  
what happened?

### Jointly orienting prior events

Excerpts 1–3 exhibit how an initially unproblematic situation comes to stand as problematic and as requiring revision. But mere stoppage of action is not yet reflection. The latter requires that the prior event becomes not just salient, but does so *in a new light*. Reflection as collective practice, thus, is not mere *retrieval* but requires *work to orient towards* and make a prior experience present again in a way in which it has not been experienced before. We already see part of that work in the excerpts above, where making salient certain perceptual features already brings a new orientation and form of accounting for the event. The first and second moments of reflection therefore are not sharply divided phases. Rather, they are interconnected *constitutive* moments that, together, begin to distinguish reflection from other possible functions, such as recollection.

The reader may better appreciate the work involved in making a prior event present again when considering what it takes to get a child to tell what they did earlier during the day. Parents with school-age children know the time and energy (work) that it takes to get them *orient to* and *talk about* what has happened at school in a way that the parents can accept as appropriate responses. In such situation, rather than some given or "natural" form of retrieval there is *instruction* on how a prior experience must be recollected. The work is joint (social, irreducible to the individual) precisely because requests need to be posed in such a way so as to provide with the necessary hints that will elicit adequate answers. The resulting recollection—the child's telling—then is not product of the child's mind but rather results from the social relation that leads to its production. We observe orienting work in the excerpt below, which takes place as part of the same curricular unit but during a next iteration two academic years later. Prior to this situation, the students have already conducted their hands-on tasks during a previous lesson, when they had produced digital videos of their observations and explanations of "what had happened," among other things, with the spray can of compressed air. In the current situation, the students' video-recorded accounts are being presented in plenum, where the teacher leads a reflective discussion concerning the students' accounts. There has been one video clip projected and the teacher picks up on the students' "last sentence" in the video, namely that "the temperature is higher in the room than in the can."

#### Excerpt 4

- 01 T: and THEN my QUESTION to you Is; (1.1) I::::S It, SO:. (1.5) that;  
BASically; (1.4) the temperature is higher in the room than in the  
can?
- 02 (3.8) ((complete silence first, then murmuring))

The teacher poses the question whether the student's observation corresponds to what actually had happened during the event. He produces the question in such a way that culturally competent listeners can hear it not just as a genuine request of information, where the inquirer asks in order to gain some information she currently does not have, but rather as questioning the adequacy of the students' account from the perspective of someone who already knows the answer. This hearing is made possible not just because of the teacher's institutional role but also in and through the teacher's emphasis in accenting, intonating, and lengthening parts of the question, as shown in the transcription conventions. The question is not responded to, and the teacher repeats the question, this time addressing a particular student in the classroom, namely the student that had produced the assertion in the displayed clip. Here we observe a work similar to that reported in excerpts 1–3, where S2 reformulates the question "what happened?" which marks whatever has been produced as inadequate response. In the current situation, the student being addressed responds in the negative, and the teacher asks,

“why not?” There is again a long silence, and the teacher reformulates once more, but this time changes also the lexical content of the question.

#### Excerpt 5

- 15 T: if the temperature would have been ... higher in the room than in the can, what should one have as well?
- 16 S4: nitrogen?
- 17 T: ye::a::?
- 18 S4: no=no=no, I mean, you know, liquid nitrogen-
- 19 T: yes; it is in a way almost the same as- almost the same as what we have here. it is liquid air. it's the same principle as fluid nitrogen.
- 20 S5: are you thinking of a gas now?

The teacher reformulates his question now so that what is requested concerns what should be observed if the account given had been so, namely that the temperature outside of the can was higher. One student responds “nitrogen,” which the teacher takes up in a way that invites repair (turns 17–18). The student then clarifies, he means “liquid nitrogen” and the teacher acknowledges that that is almost the same as what they “have here” (turn 19). Another student then asks what the teacher is thinking. In this sequence thus we observe that the work to achieve the production of the account of what happened does not fall to one single participant. The teacher is performing work to formulate his questions in ways that elicit adequate answers. But we also observe the students performing work to understand how they have to hear the question so that they can provide a successful answer, which here involves asking whether the adequate account has to do with “a gas”. The teacher then performs further work, which anchors the account to the event being reflected upon.

#### Excerpt 6

- 21 T: yea: is it so that-it- (.) when one has the gas container standing on the table; (.) ((*gestures as in figure*)) is the temperature higher inside the gas-can, than in the room then; ((*points from side to side*))
- 22 S: no;
- 23 T: no::hh;



The teacher acknowledges the student’s query, but offers a new reformulation. This time he makes present, by means of talk and bodily performing, the original situation in which the spray can lies on a table. He draws on the gestural set up to make salient the verbal distinction of “inside” and outside the can, which this time elicits an appropriate response, which he evaluates as such by emphatically repeating it (turn 23). Few lines later, the classroom will achieve a new account of the event, where it becomes articulated and visible to all that there was no temperature difference at the starting point. If there had been, the difference would have balanced somehow, allowing for further discussion on thermodynamics. Important to our analyses is the work that is performed so that a prior event is oriented to in particular ways, which here is not reduced to verbally eliciting one or other aspect of the event. If that had been enough, we would not have observed the repeated reformulations, which shift not only lexically but also prosodically and gesturally. Most centrally, the orienting work involves a form of *framing*, where what changes is not content but *context*. The event is not oriented to in and of itself precisely because it was not available in the form that would allow for learning to happen. To make the situation present again in a way so that learning something from it is possible, the event needs to be brought back so that it can be experienced again differently, where the crucial features that were missed become salient now.

### Jointly orienting to the future

In the prior fragments, I show how reflecting on a (distantly or immediately) prior event involves first a stoppage of action, which requires work so as to make something salient and so no longer seamlessly tied to one’s own action; and also an orientation so that that which becomes salient is approached as part of some whole, as text within a context, that gives it a new sense that was not available before. This context is not achieved in the abstract workings of individual minds, but requires joint work. Thus, reflection, as practical

achievement, always involves a relation between what has been done and the what-for of ongoing action. This third moment is necessary in the constitution of reflection as a function that is different from recollection (in its direction to the past) or prediction (in its direction to the future). It is not the later because its function is to find out things that had not been found in the original event. But this orientation is not initially a property of the individual mind, but of collective activity, which always implies a motive (Leont'ev, 1978). It is this collective motive what, in and through participation, comes to shape whatever is refracted in the individual's experience [*perezhivanie*] (Vygotsky, 1994).

In the sequences described above, part of the work of making the prior event present and intelligible in a new light concerns looking for that frame of action within which a (a) different account can be produced and (b) be accepted as adequate to that frame of action. We have seen how that work is performed in and through conversation and the back and forth of requests and provision of accounts, a *field of expectations* emerges as a visible and accountable feature of the setting that now allows the students new forms of reflective participation. Thus, several turns into the lesson described in excerpts 4–6, the teacher will request one student to summarize the account of the spray can event that they have arrived at. As part of this account, the student states that, when the liquid air is released “[the can] takes in energy from the environment with high temperature.” The teacher then asks what heat is, and the students respond, “energy that moves,” which the teacher completes, “from higher temperature to lower temperature.” At that point, a student raises his hand and asks, “but is not the can at room temperature?” The former question is taken up by the teacher, who rather than responding, evaluates it positively, “good, good, good”, and throws the question back to the classroom. In this situation, there is not just a new opportunity for the whole classroom to further develop a scientific account of the event, but we observe how one student now marks as problematic and demands an account of what has just been said and done, precisely in the same manner that the teacher had done before for the students. A reflective function that was organized collectively is now observed in the individual, who exhibits new orientations and expectations towards the prior event and how it is to be accounted for in the present, and in the future.

## Conclusions and implications

In this paper I discuss and examine reflection as collective practice. Although social aspects are often acknowledged in the literature, *what* is social about reflection has not been elaborated. Building on Vygotsky's unit analysis, I identify the joint production of accounts of prior experience as the (social) unit that exhibits all the properties of reflection as cognitive process. One influential constructivist analysis of reflection begins with a formal description of the operations that are involved in reflective situations such as when one, “having just eaten an apple, takes a bite out of a second one, and is asked which of the two tasted sweeter” (von Glasersfeld, 1991, p. 24). In his formal description, E. von Glasersfeld describes the following sequence: “the sensations that accompanied the eating of the first apple would have to be remembered... then they would have to be re-presented and compared ... with the sensations accompanying the later bite from the second apple” (p. 24). Glasersfeld, taking the individual mind as the point of departure, admits that his is only a hypothesis, as “we cannot observe how such a judgment is made” (p. 24). A similar approach is observed in contemporary literature, where analyses of reflection build on formal descriptions of the tasks, different typologies of being derived, e.g., with respect to the types of knowledge involved (Winne & Azevedo, 2014).

The formal analysis presented here is not based on formal abstractions or elements, but describes actual, irreducible social phenomena. Although formalisms, the three moments presented here describe concrete work that the participants make visible to each other and to the researchers alike. Unlike other (important and needed) studies that look at reflection in terms of “what works”, the present study focuses on features that are *constitutive* of reflection as a unitary and recognizable phenomenon, which distinguish it from other cognitive functions such as memory. The connection between the three moments is not externally imposed, but exist in as a real connection. Furthermore, whereas constructivist analyses assume that whatever is to be reflected upon (sweetness in the apples' example) must appear within the intellectual horizon of the individual, in the cases analyzed here I show how students achieve accounts of their prior experience that are beyond their current intellectual competence. Reflection thus is here observed not as an external factor, but as *a learning process in its own right*. Learners reflect not because they find in their mind what they need, but because the making present of prior experience develops in and through public, visible conversational relations. In *addressing* and making talk about prior experiences intelligible to each other, participants develop new expectations and ways of relating to their own actions. It is the public work of posing and answering questions what allows learners to participate in reflective practices about aspects of events that otherwise are not within their reach. This work involves not just talk but also the material transformation of the situation so as to become an intelligible *context*. Reflection thus emerges here not as an internal cognitive competence that somehow matures with age, but as a artifactual, *cultural* process through and through. The analyses presented here thus make salient aspects of

bodily and affective engagement that remain uncovered in current conceptualizations, and which may potentially expand our understanding of how to better design for reflective practices.

## References

- Collins, A., & Kapur, M. (2014). Cognitive Apprenticeship. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences (2nd Edition)* (pp. 109–126). New York, NY: Cambridge University Press.
- Davis, E. A. (2003). Prompting middle school science students for productive reflection: Generic and directed prompts. *Journal of the Learning Sciences, 12*, 91–142.
- Dewey, J. (1997). *Experience and education*. New York: Touchstone. (Originally published in 1938)
- Dreyfus, H. L. (2002). Refocusing the question: Can there be skillful coping without propositional representations or brain representations? *Phenomenology and the Cognitive Sciences, 1*, 413–425.
- Etkina, E., Karelina, A., Ruibal-Villasenor, M., Rosengrant, D., Jordan, R., & Hmelo-Silver, C. E. (2010). Design and reflection help students develop scientific abilities: Learning in introductory physics laboratories. *Journal of the Learning Sciences, 19*, 54–98.
- Greeno, J. G., & Engeström, Y. (2014). Learning in activity. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences (2nd Edition)* (pp. 128–147). New York, NY: Cambridge University Press.
- Jordan, B., & Henderson, A. (1995). Interaction analysis: Foundations and practice. *Journal of the Learning Sciences, 4*, 39–103.
- Leont'ev, A. N. (1978). *Activity, consciousness and personality*. Englewood Cliffs, NJ: Prentice Hall.
- Lobato, J., Rhodehamel, B., & Hohensee, C. (2012). 'Noticing' as an alternative transfer of learning process. *Journal of the Learning Sciences, 21*, 433–482.
- McDermott, R.P., Gospodinoff, K., & Aron, J. (1978). Criteria for an ethnographically adequate description of concerted activities and their contexts. *Semiotica, 24*, 245–275.
- Mercer, N. (2008). Talk and the development of reasoning and understanding. *Human Development, 51*, 90–100
- Michaels, S., O'Connor, C., & Resnick, L. B. (2008). Deliberative discourse idealized and realized: Accountable talk in the classroom and in civic life. *Studies in Philosophy and Education, 27*, 283–297.
- Nathan, M. J., & Sawyer, R. K. (2014). Foundations of the learning sciences. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences (2nd Edition)* (pp. 21–42). New York, NY: Cambridge University Press.
- Ovens, A., & Tinning, R. (2009). Reflection as situated practice: A memory-work study of lived experience in teacher education. *Teaching and Teacher Education, 25*, 1125–1131.
- Reiser, B. J., & Tabak, I. (2014). Scaffolding. In R. K. Sawyer (ed.), *The Cambridge Handbook of the Learning Sciences (2nd Edition)* (pp. 44–62). New York: Cambridge University Press.
- Sawyer, R. K. (2006). Introduction: The new science of learning. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (pp.1–18). New York: Cambridge University Press.
- Schön, D. A. (1983). *The reflective practitioner*. New York: Basic Books.
- Sfard, A. (2008). *Thinking as communicating: Human development, the growth of discourses, and mathematizing*. New York: Cambridge University Press.
- Suchman, L. (2003). Writing and reading: A response to comments on plans and situated actions. *Journal of the Learning Sciences, 12*, 299–306.
- von Glasersfeld, E. (1991). Abstraction, re-presentation, and reflection: An interpretation of experience and Piaget's approach. In L. P. Steffe (Ed.), *Epistemological foundations of mathematical experience* (pp. 45–67). New York: Springer.
- Vygotsky, L. S. (1971). *The psychology of art*. Cambridge, MA: MIT Press.
- Vygotsky, L. S. (1987). *The collected works of L. S. Vygotsky, vol. 1: Problems of general psychology*. New York: Springer.
- Vygotsky, L. S. (1989). Concrete human psychology. *Soviet psychology, 27*(2), 53-77.
- Vygotsky, L. S. (1994). The problem of the environment. In R. van der Veer & J. Valsiner (Eds.), *The Vygotsky reader* (pp. 338–354). Oxford, UK: Blackwell.
- Winne, P. H., & Azevedo, R. (2014). Metacognition. In R. K. Sawyer (ed.), *The Cambridge Handbook of the Learning Sciences (2nd Edition)* (pp. 63–87). New York: Cambridge University Press.

## Acknowledgments

The research reported here is jointly funded by the Research Council of Norway and the Co-funding of Regional, National, and International Programs (COFUND) – Marie Skłodowska-Curie Actions under the EU Seventh Framework Programme (FP7), grant number 240246/F10. I thank Wolff-Michael Roth, Chris Campbell, and the anonymous reviewers for their critical comments and suggestions.