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Using Peircean abduction to understand teacher mentoring

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ABSTRACT

Lesson observation is frequently used in teacher induction programmes to support newly-qualified teachers in their reflection and classroom enquiry. This article uses an elaboration of Peirce's abduction to illustrate how the post-observation conversation supports a teacher's reflection on her teaching, and in particular, her teaching of language to young children. It shows that abduction involves an expert-like intuition, where the interaction and co-enquiry with the advisor was crucial. The analytical framework used is based on six modes of abductive reasoning or inference that deal with potential or possibility, three modes of induction dealing with actuality, and one mode of deduction focusing on rules and regulations. In a context of lifelong learning, with emphasis on teacher learning across the professional lifespan, the article shows how newly-qualified teachers can be supported in using abductive reasoning and engage in worthwhile classroom enquiry. The article contributes to edusemiotics, a recently developed direction in educational theory that explores the philosophical specifics of semiotics in educational contexts.

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Introduction

There has been much emphasis in teacher education on developing the capacity of teachers for classroom enquiry and reflective practice (Schön, 1983). In their work on teacher learning, Cochran-Smith and Lytle (1999) advocate 'enquiry as stance' as the basis for their conception of teacher knowledge or what they term 'knowledge-of-practice'. In a break with the novice-expert distinction, they recommend that teachers from all career stages should engage in such enquiry, both independently and in collaboration with others:

Implicit in the construct of inquiry as stance is a different conception of teacher learning across the professional life span than that implied by the expert-novice distinction. Learning from teaching through inquiry across the professional life span assumes that beginning and experienced teachers need to engage in similar intellectual work. (Cochran-Smith & Lytle, 1999, p. 292)

According to Tochon (1993), the novice-expert distinction can be explained by the capacity of expert teachers to thinking intuitively, while novices are inclined to adhere to a deductive rationality (Tochon, 1993, p. 146). Tochon identifies Peirce's abduction as a key determinant in enabling novices to become more expert-like. Abduction is one of three interdependent types

of reasoning theorised by Peirce, along with deduction and induction, and collectively 'considered the engine or driving force of semiosis' (Smith, 2005, p. 194).

An understanding of any one of these requires a consideration of all three, each of them derived from the Latin root 'ducere' meaning 'lead'. Peirce uses abduction to refer to the 'logical process by which hypotheses are framed' (Colapietro et al., 2005, p. 167). Following this, deduction enables the investigator to derive the necessary implications so that 'these guesses might be brought to the test of experience through induction' (Colapietro et al., 2005, p. 167). The relationship between all three is explained by Peirce himself as follows:

Induction is an Argument which sets out from a hypothesis, resulting from a previous Abduction, and from virtual predictions, drawn by Deduction, of the results of possible experiments, and having performed the experiments, [which] concludes that the hypothesis is true in the measure in which those predictions are verified [...] (Peirce, 2.96, 1932)

Smith observes that deduction has 'dominated western logic for over 2000 years, while induction has been a feature of philosophy and modern science for almost 700 years' (Smith, 2005, p. 194). More recent is Peirce's 'creation of the third form of inference that he eventually termed abduction, the logic of discovery' (Smith, 2005, p. 194).

Abduction has already been the focus of research into teaching and learning. Rapanta (2018) shows that 'reasoning in pedagogical contexts, especially in the form of scientific argumentation, resembles abductive reasoning more than any other type of reasoning' (Rapanta, 2018, p. 296). Abduction has featured in research on the teaching of science, for example, showing how teachers can use it to elicit and guide student creative reasoning (Ferguson & Prain, 2020). This replaces classical logic with a naturalised logic, and recognises the value of abduction as an inference making process and a 'driver of creativity' (Ferguson & Prain, 2020, p. 528).

While these studies focus on pedagogy, research on abduction has also focused on the role of abduction in the teacher's own reasoning and learning. Schreiber and Moss (2002) examine the role of abductive reasoning in enabling a teacher to change her fixed beliefs about teaching reading. They conclude that the abductive reasoning process has, 'a significant effect not only on what teachers learn, but most importantly on the beliefs that influence their decisions of practice' (2002, p. 39). They also recommend that, 'a more important outcome of professional learning might be to foster an increased comfort with the state of genuine doubt and the abductive reasoning process that allows teachers to use that discomfort to drive sophisticated and deeply personal learning agendas of their own design' (2002, p. 39). Elsewhere, Cunningham et al. (2005) have argued that 'fostering an increased comfort with doubt, abduction, and experimentation is paramount' in order to properly prepare graduates as teachers (Cunningham et al., 2005, p. 188).

This raises the question as to how teachers might be supported in using abductive reasoning, not just in initial teacher education, but also after beginning their teaching careers. In a context of lifelong learning, with greater emphasis on teacher learning and education across the professional lifespan (Cochran-Smith & Lytle, 1999), this article focuses on how newly-qualified or beginning teachers can also be supported in developing this capacity for enquiry. It draws on Peirce's work in logical reasoning, with a particular focus on abduction.

Peircean abduction and education

If abduction had its roots in Aristotle, it is Peirce who theorized it and put it at the heart of the philosophy of pragmatism (Fann, 1970). Peirce believed an education in logic was important for the overall growth of a person, but his notion of logic included much more than the traditional accounts of deduction (Anderson, 1986). According to Peirce, there are three inference

methods at work at different stages of the reasoning process, abduction, deduction, induction, which he developed over time to form an integrated method.

Any reasoning process may begin with abduction where a hypothesis is proposed to explain a certain situation or event, using intuition, imagination and creative insight. This is followed by deduction, which identifies other phenomena that must be the case if this initial hypothesis holds. Through induction, experiments are carried out to verify whether the deduced results are found or not. Where the inferred results are obtained, one embarks on further deduction to draw other consequences and put them to empirical test to increase the strength of the reasoning. Alternatively, where the inferred consequences are not obtained, the return to the abduction stage leads to the possible formulation of a new hypothesis.

As for applying this in education, edusemiotics is 'a recently developed direction in educational theory that takes semiotics as its foundational philosophy and explores the philosophical specifics of semiotics in educational contexts' (Deely & Semetsky, 2017, p. 207). The key idea in semiotics is, as they put it, 'that human experience is always marked by signs, and all thinking and living proceeds in signs' (Deely & Semetsky, 2017, p. 207). Elsewhere, it is noted that, 'this work on a semiotic foundation for education began in the context of, a growing interest in semiotics, in the humanities, in the context of the rediscovery of Charles Peirce's semiotics' (Olteanu et al., 2016, p. 623). A significant event in this movement was the publication of two special issues on Peirce and education in 2005, published in *Educational Philosophy and Theory and Studies in Philosophy and Education*. In their contribution to that work, Cunningham et al. (2005), draw on Peirce's work *The Fixation of Beliefs* (1877) which presents four methods of resolving or 'fixing' beliefs. Peirce contrasts the first three, tenacity, authority, *a priori*, with the fourth which he terms 'the scientific method'. The scientific method provides the basis for intelligent inquiry, a fundamental process for everyone rather than being a privileged activity of some experts. This includes teachers, echoing the call by Schreiber and Moss (2002) for a greater use of the abductive reasoning process in teacher education, as well as the recommendation from Cochran-Smith and Lytle (1999) that all teachers, novices and the more experienced alike, engage in similar high-quality intellectual work for their 'knowledge-of-practice'.

In parallel with this scholarship, the ambiguous nature of abduction as a concept continues to attract attention (Olsen & Gjerding, 2019). Mohammadian (2019) shows how contestation has focused on whether abduction is about instinct/intuition or about inference, in other words, whether it is an 'instinctive process of generating explanatory hypotheses through insight' or a rule-governed procedure for selecting and investigating the worthiest (p. 143). Mohammadian (2019) himself argues for a unified interpretation.

The research being reported here contributes to edusemiotics as it explores the use of abduction in the professional conversation or co-enquiry between a pedagogical advisor or mentor and a newly-qualified teacher following lesson-observation. The article builds on that work by focusing on how the beginning teacher's abductive reasoning can be supported by the advisor.

One difficulty in supporting teacher enquiry, as with any enquiry, is how to initiate meaningful and useful inquiry in the first place, i.e. the classical Meno paradox.

Either you know what you are searching for or you do not. If you do know, you already have it, whence inquiry is pointless. And if you do not know, you would not recognize it even if you stumbled on it accidentally; hence, again, inquiry is impossible, pointless. (Nickles, 1981, p. 89 cited in Paavola & Hakkarainen, 2005, p. 235)

Drawing on the work of Bereiter (1985), Paavola and Hakkarainen (2005) present abduction 'as a way of dissecting those processes where something new, or conceptually more complex than before, is discovered or learned' (Paavola & Hakkarainen, 2005, p. 235). They use Peirce's abduction to present:

three complementary versions of abduction: (1) as a sort of guessing instinct or expert-like intuition, where unconscious clues are important; (2) as a form of inference, where a strategic point of view is essential; and (3) as part of distributed cognition and mediated activity, where the interaction with the material, social, and cultural environment is emphasized (Paavola & Hakkarainen, 2005, p. 235).

Other studies such as that by Semetsky (2005) have also argued that abduction 'is fruitful for overcoming the paradox of new knowledge (2005, p. 227).

With regard to classroom enquiry then, this article asks how might newly-qualified teachers be supported in learning or discovering something that, as Paavola and Hakkarainen (2005) put it, 'goes beyond what they already know, and something that is more complex than [what] they have known' (Paavola & Hakkarainen, 2005, p. 236) This is necessary if teacher enquiry is to be useful and contribute meaningfully to their 'knowledge-of-practice'.

Methodology

The elaboration of Peirce's reasoning types as proposed by Shank and Cunningham (1996), and used by Schreiber and Moss (2002) provides the analytical framework for this research. This identifies six modes of abduction reasoning or inference that deal with potential or possibility, three modes of induction dealing with actuality, and one mode of deduction focusing on rules and regulations. The presentation of the ten modes by Schreiber and Moss (2002) may be summarised as follows:

Abductive reasoning

1. omen/hunch – based on 'a sign whose resolution is in future inquiry and observation' (Schreiber & Moss, 2002, p. 29)
2. symptom – based on a sign in the present that leads to an inference of some more general phenomenon
3. analogy/metaphor – based on a sign that has a resemblance with the phenomenon in question
4. clue – based on 'some past state of affairs' (Schreiber & Moss, 2002, p. 30) that may explain the phenomenon
5. diagnosis/scenario – 'formation of a possible rule' (Schreiber & Moss, 2002, p. 30), hypothesis or scenario based on the clues
6. explanation – formulation of the best and most plausible explanation based on the evidence

Inductive reasoning

7. Identification – verification that what is assumed is actually observed
8. Prediction – observation to test the veracity of the hypothesis
9. Model building – formation of a probable conclusion based on inductive tests

Deductive reasoning

10. Formal reasoning – formation of a necessary conclusion.

It is readily apparent that this analytical framework, as proposed by Shank and Cunningham (1996) does not follow the reasoning sequence presented above, where abduction was followed first by deduction and then by induction. However, as noted, in any semiotic analysis, these

reasoning processes may be understood as three steps in an integrated method (Anderson, 1986), where deduction and induction are happening continuously. In other words, after abduction, deduction can be used to increase the strength of the reasoning before putting the hypothesis to empirical test in induction. As Smith explains: 'semiosis is marked by ever-widening cyclical processes of abduction, deduction, and induction in an ongoing dialectic of development' (Smith, 2005, p. 194).

The setting for the research being reported here is an elementary school in France where a newly-qualified teacher who teaches a class of children aged four and five years, is receiving mentoring support from a pedagogical advisor or 'conseiller pédagogique' as part of her teacher induction. It presents an analysis of a recorded conversation between the teacher and her advisor, following her teaching earlier that morning which the advisor observed. He had already observed the teacher and held post-observation meetings on four previous occasions. This teacher-advisor dyad was chosen on a 'convenience' basis, using no particular criteria apart from the willingness of both parties to participate in the research. A voice recorder was given to the advisor who recorded the conversation. The lessons observed were also audio-recorded in case they were needed subsequently to shed light on any of the exchanges in the post-observation meeting. During the meeting, the teacher and advisor discussed a number of topics which have been categorised into nine different episodes as follows: introduction to the meeting; children's created dance; taught dances; singing the days of the week; teaching of language; language game; reading a story book to the class; resources and professional development opportunities; children's guided writing.

The extracts that are analysed below are taken from two separate episodes, both involving the teaching of language. The first of these related to that part of the morning where the class was divided into small groups of about six children each who moved through a series of five workshops or 'stations'. One of these was based on a 'who am I?' language game, designed to develop the children's use of descriptive language and questioning skills. In the game, one child was invited to mentally select one character from a portrait display, but without revealing which one. The other children then attempted to identify the selected character by asking questions on his/her physical appearance, to which the first child could only reply Yes or No. The other episode was based on a lesson later in the morning where the teacher read a storybook to the entire class. As she read, she stopped occasionally to discuss the story and establish comprehension, and as a consequence did not succeed in finishing the story.

The extracts have been translated into English from the original French by this author. The research draws on an earlier study of teacher induction programmes for newly-qualified teachers in France and Ireland (de Paor, 2012). Following the practice of Kerbrat-Orecchioni (1992), interjections are indicated in italics, i.e. where the listener makes a brief interjection without interrupting the speaker, for example, markers of agreement ('yes', 'hmm') or disagreement or other short remarks. The symbol '/' indicates an interruption, where one person's interjection has caused the other person to stop speaking. Square brackets show when some text has been omitted from the original transcript for the sake of conciseness.

Given the focus of the research, the analysis focuses predominantly on abduction, using the modes of abductive reasoning elaborated by Shank and Cunningham (1996). It examines the extent to which the advisor enables the teacher's construction of new knowledge by helping her develop a better initial hypothesis through abduction, that can then lead to a more productive enquiry.

Results

The presentation of the results is geared towards the manner in which the advisor helps develop the abductive capacity of the teacher, and in so doing her capacity for productive enquiry and for teacher learning.

Teacher's initial reasoning

The advisor begins the meeting by inviting the teacher to share her thoughts on her progress since the previous meeting as well as on the morning's lessons. He uses her initial response, as well as his own observation notes to identify the various issues for discussion.

Although the focus in this article is on one meeting only it is relevant to note that the teacher had during previous meetings raised the issue of language teaching, revealing her disappointment with the progress she was making. This provides an example of the first mode of abductive reasoning (Shank & Cunningham, 1996), an 'omen/hunch', which is worth highlighting. It also features at the start of the conversation when she updates the advisor on her progress, paving the way for other modes of abduction.

The advisor returns to this issue later in the meeting when he focuses on the teacher's decision to present the storybook in a whole-class group arrangement while using smaller groups for the language game. He continues this part of the conversation by asking which arrangement she considered the more effective for teaching, to which the teacher replies 'with a small group'.

45. Advisor:/When do you think is the most effective? In a large group or in a small group?

46. Teacher: Well normally, it's in a small group.

Seeking to develop the teacher's reasoning on the matter, he rephrases his question (47), asking what is the point sometimes of doing things in a large group, as if to generalise to other situations. This could be categorised as the second of the six modes of abduction, 'symptom', defined as, 'a sign whose action is ongoing in the present and we infer from the symptom the presence of some more general phenomenon' (Schreiber & Moss, 2002, p. 29). However, by adding 'if it had to be redone' the advisor immediately refocuses the conversation back to the same lesson, i.e. inviting the teacher to consider what group size she would use if she was to reteach the storybook lesson. The teacher's response shows that time is the key determinant in her decision-making.

47. Advisor: But what is the point sometimes of doing things in large groups? [pause] [...] if you had to do it again? [...] you did your language workshop on the little game of portraits (yes) in the small group, and you did the storybook in a large group.

48. Teacher:/Uh because [...] it's just a matter of time.

In the teacher's reasoning therefore, the choice between the big group and small group is a matter of time, and even though she believes the small group is more effective, the scarcity of time available means there is little option but to use the big group. The teacher has inferred that the storybook lesson was unsuccessful and incomplete because of the class size and insufficient time. In terms of belief fixation, it is based on the 'a priori' method, rather than tested in rigorous experimentation and critical reflection and is rather limiting and unproductive.

Alternative abduction

It is here that the advisor acts to mediate the teacher's thinking in generating an alternative and more sophisticated hypothesis through abduction, leading to a more fruitful way of thinking about group size and time. He begins to probe the teacher's view as to what in particular made the small group language game so successful in contrast to the reading of the storybook – given the intended objectives in both situations. This shifts attention to the advantage of a small group for the development of the children's language – the key learning objectives for that workshop activity. Confining the group to just six children meant that all children were

more likely to use the target vocabulary and learn other important skills such as turn-taking and active listening.

In the extract below, the teacher indicates her agreement about the value of the small group, adding that she has observed how certain children will not ask a question unless they are prompted and that a small group size is needed to allow this (63). This may be considered as an example of the 'analogy/metaphor' type of abductive inference, i.e. 'manipulation of resemblance to create or discover a possible rule' (Schreiber & Moss, 2002, p. 29). In this case, the small group become an analogy for the big group. The insight it provides into the relationship between group dynamic and children's learning, could allow her move forward by thinking more judiciously about the learning objectives suited to a storybook lesson with the whole class.

The teacher's response (63) provides the advisor with the cue to answer the very question he had posed himself at the start (47): 'That's exactly the benefit of the small group' (64). He continues by returning to the storybook lesson, asking if she had noticed any gaps between her intentions and what she achieved. Once again, however, the fixated belief is that the scarcity of time obliges her to use a whole-class arrangement, leaving insufficient time to finish the story (because there were too many children involved in the discussion as she read) (65).

63. Teacher: Yes, yes, because there are some, I know that (*that's it*) when you ask them, they will indeed ask [a question] but left to themselves, they won't.

64. Advisor: That's exactly the benefit of the small group. So then, as for the storybook, um, so you did it in, in a whole-class grouping, so [...] in relation to your intentions, in the story book, um, between what you prepared, and what you achieved? Did you notice any gaps?

65. Teacher: Well, the gap, yes, I noted it, in fact, I saw it straight away as I did it, it's the time (*hmm*). [...].

The advisor then asks how she plans to continue the work on the storybook with this big group arrangement, bearing in mind the intended learning outcomes she had planned for the children which he reads aloud from her lesson plan: 'Anticipate the rest of the story by making predictions'; 'Use the vocabulary of the parts of the castle'. By doing so, he draws attention to how learning outcomes may be differentiated according to whether a small group approach is required, nudging the teacher towards a more productive hypothesis, i.e. that both the big group and small group could be effective depending on the intended learning outcomes. In the final extract below, he follows with a question: 'how am I going to say?' (84). Involving the teacher in the formulation of the question provides space for the teacher to propose a way forward, i.e. where she proposes to 'change the modalities', using two separate occasions to target different learning, one for a whole-class setting and the other for small groups (85). It may be equated with the 'diagnosis/scenario' involving 'the formation of a possible rule based on available evidence, proposing plausible hypotheses or scenarios from the body of clues' (Schreiber & Moss, 2002, p. 30). The teacher has re-constructed the problem through the mediation of the advisor leading to a new hypothesis, i.e. that time can be used effectively when the choice between whole class or small group teaching is determined by the learning outcomes to be pursued, rather than the time available. Her future work on the storybook is not simply a question of time, but rather has to be considered in terms of the specific intended learning outcomes.

The sixth mode of abductive reasoning involves explanation, evident when the advisor summarises (88) what has been established in their co-enquiry – if she wants to develop the children's vocabulary, then she has to think about small group discussion, and can use an entire class lesson to work on comprehension, plot, characterisation, etc. This contrasts with the reading of the storybook that morning where she did some of both, but neither finishing the story, nor giving sufficient opportunity for language development.

84. Advisor: [...] So, you're going to continue having this, this storybook (*hmm*), with these intentions (*yes*) [...] how can I say?
85. Teacher: Uh, change the modalities? [...] let's say, split it in two (*hmm*), do it in two goes instead [...]
86. Advisor: Maybe, to bring out.
87. Teacher: Because there are plenty who did not speak this morning.
88. Advisor: [...] The storybook, it can lend itself to the big group [...] and then the moments [...] confined [...] to a smaller number [...] you can draw [...] the language [...].

In line with the framework from Shank and Cunningham (1996), the teacher would then be in a position to test her hypothesis through induction (identification, prediction, model building) and reach a conclusion through the final mode of formal reasoning in deduction. Or, induction may lead to her revising her working theory and the abductive process begins again as described earlier.

Discussion

The semiotic analysis conducted here illustrates the role of the advisor in enabling the teacher to gain new insight into her practice and to identify new worthwhile lines of enquiry that offer potential for practice. The teacher's thinking was driven by the belief that not achieving the objectives was simply a consequence of the lack of time. The advisor enables the teacher to disrupt this reasoning, through the abduction of a more sophisticated hypothesis. Instead of seeing the incomplete storybook lesson in terms of time and group size, she has broadened her conceptualisation to think about which objectives were conducive to big-group teaching and which required smaller groups. This provides her with the basis for further classroom enquiry on how to use time more effectively. If, as Tochon (1993) states, expert teachers think abductively, then the advisor has enabled the teacher to think about her practice in new more expert ways, mobilising pedagogical knowledge about children's learning and imagining new possibilities in how to make best use of the time available. Using the analytical framework (Shank & Cunningham, 1996) has provided new insight into how beginning teachers might be supported in their reflective practice – through the mediation of another professional such as an advisor or mentor.

This demonstrates how semiotics could be used to understand teacher learning and mentoring, supporting how teachers observe, read and interpret the signs in their practice. Using various modes of abduction, induction and deduction, the advisor has enabled the teacher to open up new lines of classroom enquiry that she had not considered. This recalls the Meno problem discussed earlier, i.e. the pointlessness, as Nickles (1981) explains it, of searching for something that is already known, or the inability to recognise that which is unknown. This is a difficulty that beginning teachers are likely to experience in trying to develop the attitude of enquiry or 'enquiry as stance' proposed by Cochran-Smith and Lytle (1999). An empiricist view would hold that new learning is possible when 'observations and experiences connect together often enough' (Paavola & Hakkarainen, 2005, p. 236). But what if this empiricism serves to close off other fruitful lines of enquiry and inhibits teacher learning as a result? This is in effect what had happened prior to the advisor's mediation. In terms of fixation of beliefs (Cunningham et al., 2005), the teacher already believed that the scarcity of time necessitated the use of whole-group teaching. This could be considered an example of any of the first three methods of belief fixation identified by Peirce that people use to resolve doubtful situations – tenacity, authority or a priori. In tenacity, the strategy is to reassert a belief, 'in the face of doubt even though the belief does not resolve the doubt' (Cunningham et al., 2005, p. 180). Or, secondly, the beginning teacher may have it on, what she sees as the 'good authority' of

her peers, given the widely-held belief that a major problem in teaching is insufficient time. Or, finally, applying the a priori method, as described by Cunningham et al. (2005) the teacher would integrate it within prior knowledge. In the case of the beginning teacher, this had the effect of limiting her capacity to envision new possibilities in her practice, that could lead to improved practice and improved learning outcomes for the children. What the advisor does is crucial therefore, using the fourth method, based on science. And as Peirce himself writes: 'All the ideas of science come to it by way of Abduction' (5.145, 1935). Through hypothesis and co-enquiry, the advisor enables the teacher to gain insight into the beliefs implicit in her practice, to problematize these, and to identify new possibilities that she can think about and investigate.

In the context of initial teacher education, Schreiber and Moss (2002) lament the neglect of this kind of abductive possibility that could develop student teachers' capacity for enquiry:

Unfortunately, we have relied almost solely on induction and deduction in our teacher education programs. Our students are told what they need to know and encouraged to try out their knowledge in the world of their experience or on tasks that we contrive (i.e. student teaching). (Schreiber and Moss, 2002, p. 29)

These authors argue that initial teacher education features an abundance of methods courses, teaching methodology and technique, while leaving graduates less prepared for critical thinking and enquiry. They advocate for greater emphasis on abductive reasoning, 'fostering a disposition toward healthy skepticism and experimentation that could result in teachers investigating and altering their beliefs' (2002, p. 29). The present analysis shows that this should also continue even after teachers become qualified and illustrates how lesson observation and post-observation conversation might contribute to this. It shows how engaging with others in professional dialogue, whether with mentors/advisors or other teaching colleagues from across the life span, novice and otherwise, could make an important difference to teacher learning.

Conclusion

The results show how mentoring can support early career teachers in using hypothesis and the scientific method to reflect on their teaching in a process of co-enquiry. It contributes to the growing body of edusemiotics research, that has, as Olteanu et al. (2016) note, been mostly theoretical. The empirical nature of the research allows for the identification of those actions carried out by the advisor which are important for developing teacher capacity for reasoning and reflection:

- Supporting the teacher's openness to possibility and genuine doubt, using these to gain new insight into practice
- Drawing attention to the body of clues available and observing actuality, for example children's participation and the teacher's own planning
- Helping the teacher creating guiding rules and working theories to drive enquiry and construct his/her knowledge of practice
- Mediating the teacher's enquiry, using active listening, questioning, and summarising

Peirce's semiotics serves as a useful framework therefore for understanding and supporting teacher learning and enquiry in general, as well as in the particular context of teacher mentoring. Using semiotics to better understand the professional dialogue between teacher and mentor reflects Bergman's contention (2005) that the central concepts of Peirce's semiotics are 'inherently communicational' and that a Peircean approach avoids the pitfalls of objectivism and constructivism, as it neither pictures the sign-user as a passive recipient nor as an omnipotent creator of meaning' (Bergman, 2005, p. 213). This should be useful in a context where

mentoring may combine a number of different postures, sometime being directional and even prescriptive, while on other occasions requiring the beginning teacher's own self-direction (Paul, 2004). The results also show how the teacher mentoring reflects the three complementary versions of abduction identified by Paavola and Hakkarainen (2005): as expert-like intuition, as strategic inference, and finally, 'as part of distributed cognition and mediated activity' (Paavola & Hakkarainen, 2005, p. 235).

Disclosure statement

No potential conflict of interest was reported by the author.

Notes on contributor

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