Science teachers’ foreground for continued professional development

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Abstract
There is a lack of studies that are dedicated to qualify our understanding of the significance of lived experiences as well as foregrounds for science teachers’ participation in professional development. Seven Danish science teachers were interviewed and observed. Three of these teachers exemplify how present experience contributes to aspired career foregrounds. Birger’s focus on the academic basis of the in-service program reflects his aspiration to become a teacher educator. Poul is focused on improving his present teaching and aspires to keep on teaching science. Karl is focused on how to help colleagues and aspires to become a science teaching guide.

Key words: Foreground. Lived experience. Science teacher. Continued professional development. Narrative research.

Background
Life history research has established how science teachers experience with teaching, nature and science has significance for their teaching practice as well as their motivation for participation in continued professional development (Daugbjerg, 2014; Day, Sammons, Stobart, Kington, & Gu, 2007; Roychoudhury, 2012). The retrospective approach that founds life history research leaves out a future perspective in understanding science teachers’ present teaching practice and career aspirations. Science teachers’ current aspirations of their future – their foregrounds – are likely to have significance for their commitment in actual professional development. There is however a lack of studies that are dedicated to qualify our understanding of the significance of experiences as well as foregrounds for science teachers’ participation in in-service training. In this study I have listened to narratives regarding science teachers’ motivation and commitment for participating in science education in-service training in Denmark. Seven science teachers participated in interviews regarding their life history, their experience as science teacher and their reasons for participating in continued professional development. Three of the seven science teachers were chosen for closer analysis and their narratives will constitute the core of the discussion of the relation between experience, foreground and participation.

Lived experience and foreground as a conceptual framework
A science teacher brings his or her personal and professional experience with science, nature and teaching into any professional development program he or she participates in. His or her participation is however not only based on the experiences he or she
brings into program, but also based on how he or she aspires that the program will support his or her career foreground.

Lived experience
Teachers’ narratives on their experiences contribute to enriching the understanding of their present teaching and career choices (Day & Gu, 2010; Goodson & Sikes, 2001; Müller et al., 2011). Experiences are often deduced from the stories that life history researchers hear from their research participants. But the relation between the actual life, the lived experience and the stories told about these experiences is not straightforward. Emotions as well as foregrounds influence the way the experience relates to what actually happens and what has happened and how it is retold (Plattner & Bruner, 1984). This calls for reflections on what experience is and how it can contribute to an understanding of the relation between present life and work.

Daugbjerg, de Freitas and Valero (2014) refer to Roth about how teacher experience is always acquired through presence in “this classroom at this time and with these students” (Roth, 2002, p. 21 italics in original). They see that this indicates that teacher experiences are gained in specific teaching situations. Personal experiences can be characterised by temporal, situational and interactional principles (Dewey, 1938), principles that can be aligned along inward, outward, backward and forward directions of experience (Clandinin & Connelly, 1994, p. 417).

The inward direction relates to feelings and moral dispositions. The outward direction relates to the social environment. The backward and forward directions relate to time. Clandinin and Connelly (1994) condense these 4 directions to 2 dimensions, one dealing with inward-outward and one dealing with backward-forward, then they add a third dimension space, which deals with the landscape of inquiry. Based on the work of Clandinin and Connelly, we redefine Dewey’s principles of experience as three dimensions. We see one dimension dealing with the temporal continuity of actions and experiences, another one dealing with the educational settings of the actions and experiences and a third dealing with the social, material and personal relations of the actions and experiences. The three dimensions provide our overall analytical framework for the interpretation of teachers’ lived experiences and their living bodies in the classroom. (Daugbjerg et al., 2014)

Humans’ power to act knowledgeably in their familiar world and settings is inseparably intertwined with their everyday experiences (Hwang & Roth, 2011, p. 2). The fundamental conditions of teacher experiences arise from an irreducible unit of being in the world and everyday knowing (Roth, 2002).

Relations are experienced most intensively in the present, in the immediate now of communicating with a person, or sensing an emotion, or enjoying a landscape, or participating in an event. All these moments of presence in relations and settings are somehow continuously seasoned into general experiences that can be activated when a similar relation or setting is encountered (Daugbjerg et al., 2014).

Teachers’ experiences are contextualised to the teachers’ living bodies based on their bodily engagement in managing classrooms, illustrating scientific principles, setting up
experiments or investigations, guiding field trips, dealing with emotional relations, hunting, fishing, picking berries, gardening, bringing up their own children, feeding their own pets, etc. It is this entanglement of feelings, actions, knowledge and experiences that the teacher uses when (s)he teaches the subject matter of science to the pupils (Daugbjerg et al., 2014). It is the same entanglement that guides him or her in aspiring different career foregrounds.

**Foreground**

Within mathematics teaching it has been empirically established that pupils’ dispositions for engaging in learning and teaching originate from a dynamic relation between their lived experience and their expectations to the future (Skovsmose, 1994). When pupils decide to learn e.g. subject matter concepts, this happens in relation to their individual previous experience and in relation to their individual considerations and interpretations of options for actions in future situations and relations (Daugbjerg, Svejgaard, & Valero, 2014). This significance of expectations of future use and benefit of actual learning is described as foreground by Alrø, Skovsmose and Valero (2009). Learning is not seen as only a prescribed activity but also as a present understanding of a possible future (Daugbjerg et al., 2014).

Within adult education the significance of participants interpretation of the intention of ongoing teaching is well established (Düsterdich, 2009). Adult learning is thus also connected to the participants’ aspirations to the future benefit of the ongoing educational activity.

Conceptualizing this participant interpretation as foreground in professional teacher development offers a coherent operationalization of the teachers lived experience and their aspirations. The participating teachers’ perspective on past, present and future forms the pivotal point of the analysis in the present study.

**Methodology**

A basic principle in narrative research is that each participant must be understood and treated on his or her own terms. This enables a deeper analysis of, among other things, hidden emotional experiences, experiences that hold central turning points and dilemmas of a human life story (Antoft & Thomsen, 2002). Narrative conventions of specific societies, as in this case the teaching profession, contextualise a given narrative. Interpretation of the narratives and the experiences behind them is performed in an existing culture where text, jargon and genre are given cultural resources (Antoft & Thomsen, 2002). The presented narratives can be combined to create many different valid versions of the person’s life story, but always representing the person as a subject in a text (Antoft & Thomsen, 2002). In order to contextualise the participating science teachers’ narratives in the teacher profession and add a perspective on science teaching to their narratives, I had to do more than interview them. Traianou emphasises the importance of studying teachers’ actual teaching practice:

> [...] the assessment of an individual’s knowledge should be based on how this person performs, and not on what this person says about his/her own performance or what he/she can and cannot do in artificial situations. (2007, p.40)
She can be read as though she finds the use of interviews misleading or even unnecessary. Rather she puts her finger on the need to study teachers as closely as you can get to real situations. Thus, rather than simply recounting verbatim the teachers’ own accounts of their practice, nor confining one’s study to their performance in teaching situations, you should apply a research method that brings together diverse field data and presents teachers in all their complexity. This is important in order to saturate our insight in the teacher’s actual practice and his or her background for interpreting participation in in-service training.

Method
In order to have a rich account of a teacher’s professional life I have included interviews, observations and some contextual data regarding the school and local area where they live and work. Such a method has been tried out by Norrie and Goodson (2011) and Brickhouse and Bodner (1992). Norrie and Goodson focused on “educational restructuring and the work lives and professional knowledge of primary teachers in England” (2011, p.11). Their analysis of work life narratives was based on: “two life-history interviews and observations (of two to three days)... First interviews were unstructured and second interviews explored emerging themes.” In the present study interviews have likewise been conducted in two turns. Furthermore the participating teachers were observed and videotaped to saturate their interview description of their science teaching practice.

Research context
In Denmark the pupils follow the same cohort of peers from year 0 (kindergarten class) until year 9. During these 10 years of schooling the pupils meet 4 different science subjects. From year 1 to 6 they - at the time of the study - had a primary science subject called ‘Natur/teknik’ (Nature/Technique) and from year 7 to 9 they had - and still have - Biology, Geography and Physics/Chemistry as three independent science subjects. A science teacher in Denmark can teach one or several of the science subjects depending on the local school organisation and his/her pre-service and in-service education. In Denmark teachers’ normally teach different subjects and different years. The Danish teacher education for primary and lower secondary school is a 4-year bachelor program.

The teachers in this study have participated in four different in-service training programs:
- A) A 6 months full-time subject matter training program within primary science.
- B) A 2 years part-time general science education program with elements of guidance of colleagues.
- C) A 3 year part-time program with focus on school-based collaborative development of science education
- D) A 2-year part-time program with focus on developing primary and lower secondary science.

Teachers who had participated in one or more of these four different in-service programs were asked to participate in the present study. Seven volunteered in having a stranger like me talking with them about their life and being present in their classroom.
Table 1: Basic biographic data of the participating science teachers.

<table>
<thead>
<tr>
<th>Teacher alias</th>
<th>Gender</th>
<th>Birth year</th>
<th>High school or similar finished</th>
<th>Other training or employment prior to teacher training</th>
<th>Start of teacher education</th>
<th>Graduation as teacher</th>
<th>In-service training program</th>
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<tr>
<td>Jane</td>
<td>♀</td>
<td>1954</td>
<td>1974</td>
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<td>1974</td>
<td>1978</td>
<td>A</td>
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<tr>
<td>Simon</td>
<td>♂</td>
<td>1971</td>
<td>1990</td>
<td>Laboratory worker</td>
<td>1997</td>
<td>2001</td>
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The following presentation of data and discussion will be based on primarily data from three of the participating teachers Birger, Karl and Poul. The analysis has been limited to three teachers from the same program to reduce complexity in variables influencing the teachers’ foregrounds. The three teachers illustrate in different ways how their individual foregrounds affect the way they engage with the school based collaborative development in-service training program C.

Teachers’ expectations to school based collaborative development.
The analysis of the interviews and observations were focused on eluding how foregrounds were expressed and on how they reflected lived experience. In the following interview excerpts from the three teachers will be presented.

Birger, age 47 years, 13 years as a teacher

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<td>… fordi det er det jeg savner nogle gange ved efteruddannelse, det er at dem der står og snakker og underviser, de ved hvad de har med at gøre. Det er ikke altid man oplever det ved vores efteruddannelse. Jeg har været til et hav af sådan nogle efteruddannelser, hvor jeg har hørt meget om hvad andre synes man skulle gøre, men der har aldrig rigtig været nogen der har snakket om hvad man ved man bør gøre. Det er sådan noget som den aktuelle</td>
<td>… because that is what I miss sometimes at in-service training, that those who talk and teach, they know what they are dealing with. This is not always what you experience at our in-service training. I have been at many such in-service training, where I have heard what others think you should do, but it has never really been someone who knows what you should do. It is this that the present in-service training reflects, that here you</td>
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Birger has changed to the teaching profession after 13 years as a hardware dealer. He has had his interest for nature from very early childhood; he has been studying nature and science literature all his life. He has ever since he left lower secondary school known that someday he wanted to become a teacher. During the interviews he repeatedly talks about becoming a teacher educator. In the above excerpt he puts emphasis on his devotion to evidence and an explicit knowledge base for educative activities. He sense that this approach to education better can be fulfilled as a teacher educator.

Poul, age 30 years, 4 years as a teacher

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<td>Jamen det man måske kunne se i det lange løb, det er måske, at der kunne komme lidt mere samarbejde på tværs af skolerne her i kommunen. I 8. klasse der får vi elever fra naboskolen, hvor vi så snakker sammen om vores 7. classes-planlægning, så det de lærer i 7. i fysik, det skulle også gerne være det de lærer de andre steder i fysik. Så det har vi sådan lidt på tværs, det kunne vi måske få lidt mere af, det der med at man kan vidensdele på den måde, det tænker jeg er en del af den aktuelle efteruddannelse … Det er det vi skal bruge det til.</td>
<td>Well, what you might see in after a while, that is perhaps, that there could be a bit more cooperation between schools in the municipality. In year 8 we get pupils from the neighbour school, then we discuss our year 7 planning, so what they learn in year 7 physics, should be the same they learn the other places in physics. So that we have a little in common, that we might do some more, sharing knowledge like that, that I think is part of the present in-service training … that is what we shall use it for.</td>
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Poul has been very focused on becoming a science teacher and he is dedicated to keep on teaching science. In the above excerpt he is developing his own local rationale for the in-service program he is participating in. He sees it as an opportunity to strengthen the curricular collaboration with the neighbouring 7 year school in order to improve the coordination and joint planning. The pupils from this school enter Poul’s physics class in year 8 along with pupils he himself has had in year 7 at his own school. He wants to make sure that all the pupils are well prepared for his 8 year physics teaching. This shows how focused he is on his present classroom teaching and on improving his teaching.
Karl has been engaged in a Danish Boy and Girl Scout movement [FDF] for more than 20 years, here he have been working with developing children and youngsters personal character and practical skills. Karl has been very focused on becoming a science teacher and has taking a - for Denmark - special 3-year teacher bachelor training program focusing exclusively on Physics, Chemistry and Mathematics. In the interviews he repeatedly talks about wanting to be a science teaching guide for his colleagues. In the excerpt above he also focuses on how his colleagues express their insecurity and how he can help them. Karl emphasizes how collaboration on the school can support other colleagues to improve their science teaching. This emphasis relates back to his scout engagement on personal development and coincides with his aspired foreground as a science teacher guide.

**Discussion**

The three presented teachers show different foregrounds for their participations in the same inservice program focused on collaborative development of science education. The expressed foregrounds reflect their career aspirations and relate to dimensions of their lived experience.

**Relations**

All three teachers relate to their own experience-based intentions with participation in the ongoing inservice program. Birger has experienced that evidence improves his teaching practice, Poul has experienced problems with the transition of the pupils coming to his school and Karl has experienced a shared interest to boost science teaching. The three teachers put these personal experiences in the foreground of their participation of the ongoing inservice program. This gives them *a set of cognitions and representations that operates as a lens through which they perceive their practice, make sense of it and act on it* (Kelchtermans, 2009, p. 38). This personal interpretative

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<td>Jamen jeg forventer jo i det, at, og det er vi også enige om tror jeg nok, en generel styrkelse af naturfagene og tænke det mere sammen. Vi har et par geografilærere med, som jo, det kan jeg godt tillade mig at sige uden at fornærme dem, er blevet sat til kort med nogle ting, når vi har snakket arbejdsmetode fx. Og har diskuteret det og ikke… Og lige “hov hov hov, det er jeg ikke med på. Hvad er det lige der menes her? Og hvad er det for nogle modeller i andre snakker om her?”. Og det er jo dejligt også at få snakket om det og få dem med også jo.</td>
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<td>Well I expect, that, and I think we agree on that, a general boosting of science and thinking it more integrated. We have a couple geography teachers, they, I can say this without insulting any, had to give up when we were talking about ways of working in science. We discussed it and they “hey, hey, hey I’m not following you. What do mean by this? What kind of models are you talking about?” It is nice to be able to talk about it and help them along also.</td>
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framework guides their interpretations of their daily teaching context, but is also modified by changes in and interactions with this context.

Besides these personal experiences Poul and Karl also refer to social experiences that have significance. They refer to former and present collaboration with colleagues in order to establish their foreground for the expected outcome of the ongoing in-service program. Through collaboration with colleagues on curriculum development, testing of new materials or methods teachers can achieve professional development alongside social recognition (Kelchtermans, 2009). Teacher collaboration in developmental processes helps to develop and sustain a local teacher community (Sillasen, 2010). This collaboration is especially supported when each member of a local teacher community finds the activities meaningful in his (or her) own teaching context. In such cases the members might feel a strong connectedness to the culture in the community (Sillasen, 2010, p. 1035). The local teacher community is thus an important setting where the teachers experience personal as well as social relations in their professional development.

Settings
School-based in-service training is imbedded in a setting of local school culture and local teacher community. This local perspective is in the above excerpts most significant in Poul’s narrative on the pupils being transferred to his school in year 8. This narrative reflects how the pupils’ different school cultures have to be merged into a joint school culture, where a certain progression of science subjects is prevailing. Poul expects the in-service program to provide tools for easing this merge.

Other of the seven participating teacher has narratives on how on-going school restructuring affect their own and colleagues engagement and commitment to in-service science education programs.

... well for the time being we try to arrange all these meetings, but as we also are being merged with the neighbour school, then there is very, very, very many meetings at the moment. This we have to take into account, that we don’t drown people in something, so we try to make it as free takeaway science teaching, because what you get for free you usually accept. (Laila, age 51 years, 21 as a teacher)

Laila tells here how she tries to implement the intentions of the in-service program, but being opposed by an ongoing school restructuring and merge. Research on school restructuring finds that teachers in different countries mostly have little influence on policy decisions affecting their work-life (Sohlberg, Czaplicka, & Lindblad, 2011). Teacher experience control of everyday work conditions but have little influence the framework of their work in, an in-service program can then be the way to solve the structural challenges given them, like in the narratives from Laila and Poul.

Any in-service program should be sensitive to this fact that teachers foreground for participation is strongly influenced by their own practice and context (Wallace & Loughran, 2012). The teachers’ interpretation of the significance of the setting is strongly influenced by individual and collective developmental continuity that has shaped the personal practice and social context.


**Continuity**

The continuity between on the one hand former school development and on the other hand present in-service training shape whether the teacher expects former positive experience to be met or whether it will support scepticism towards in-service training. This becomes clear when the teachers talk about their expected outcome of the in-service program and their career aspirations are combined. Birger wants academic evidence and he aspires to become a teacher educator, which is an academic profession in Denmark. Poul wants to improve the teaching by coordinating it across several schools; his aspiration is to teach science. Karl wants to help his colleagues to improve their science teaching and he aspires to become science education guide.

The teachers have followed and expect to follow different personal career trajectories. All three of them have entered the profession successfully and is beyond the induction phase at their present schools. They are well established in the profession and especially Poul and Karl are exhibiting strong signs of local commitment in their efforts to change practice inside and outside the classroom in order to improve science teaching locally (Rolls & Plauborg, 2009). Birger is older and more experienced and he is wondering whether he should stay on teaching lower secondary science or whether he should change profession to becoming a science teacher educator.

The teachers’ career trajectories exhibit different personal past and present experiences and their aspirations for participating in the ongoing in-service program reflects these experiences.

**The significance of addressing the personal foreground**

Teacher narratives open for an understanding of the relations between teachers practice and their lived experience inside and outside school (Daugbjerg, 2014). The teachers’ aspired foregrounds for participating in the present in-service program does affect the teachers’ narratives on engagement in the present in-service program. The amalgam of personal experiences and foreground shape the personal interpretative framework that each teacher uses to understand his or her actual challenges and problems as well as to engage in development initiatives. Insight into the teachers’ personal understanding of challenges and problems in the classroom at various points in their career can inform professional development initiatives of how to succeed with the intentions of a development program (Rolls & Plauborg, 2009).

**Conclusion**

Addressing the teachers lived experiences and foregrounds bring forward different and personal intentions of the participating teachers. Some teachers wants to improve own teaching others wants to help colleagues improving their teaching. Awareness of such differences can help in understanding why teachers do not respond or act as expected in continued professional development. Some even have foregrounds that differ from the agenda of the in-service training program, as they might see an in-service training as a career change opportunity. The differences should be dealt with pedagogically – or rather andragogically – so that in-service program planners and educators acknowledge these differences and address them directly. This indicates that the purpose of a given in-service program should be clearly stated and communicated, so that teachers with intentions deviating from the stated purpose can be met with understanding and guidance in order to stay in or leave the program.
References


