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Open and Interdisciplinary
Journal of Technology,
Culture and Education

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Registrazione del Tribunale di Bari

n. 29 del 18/7/2005

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ISSN 2240-2950

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Trajectories of knowledge builders: A learning lives approach

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DOI: 10.30557/QW000002

Abstract

This article takes the position that studying learners in different contexts and considering how resources from different contexts interconnect can support a broader understanding of students' 'learning lives'. This stance conceives learning in two ways. First, as ways of following young people at and beyond school as they use digital media for different practices. Second, as ways of studying the interconnected aspects of learning in situated contexts; for example, knowledge work at school that draws on students' experiences and practices from beyond the classroom. This article explores how studying trajectories of learning at- and beyond-school can provide insight into the process of knowledge building among students.

Keywords: Learning Lives; Knowledge Building; Trajectories; Formal/Informal Learning

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1. Introduction

Contemporary educational policy, research, and practice seem to be preoccupied with standardization, testing, and the deficiency models of education, schools, and learners. My point of departure is towards the learners themselves, and how we best can engage students in learning that have implications for their lives and trajectories as learners. One of the main challenges of 21st century education systems is to trigger engagement for knowledge building among students both for epistemological and ontological developments (Scardamalia & Bereiter, 2006). As such we need to contest taken for granted conceptions of formal and informal ways of learning, and rather explore the interconnections and networking between different contexts and life-worlds as experienced by young people themselves. It is through studying learners in different contexts and how resources from different contexts interconnect that we can better understand their ‘learning lives’ (Erstad & Sefton-Green, 2013) and educational provision in the 21st century.

Research on formal and informal ways of learning, and the connection between different learning contexts, is of course not new. This can be exemplified in areas such as research on transfer (Beach, 1999), within youth studies (Coleman, 1992), or socio-cultural perspectives on literacy (Scribner & Cole, 1999) and development (Forman, Minick, & Stone, 1993). However, technological developments during the last two decades have created new conditions for what has been termed ‘connected learning’ (Ito et al., 2013) or ‘new mobilities’ (Leander, Phillips, & Taylor, 2010). In contemporary societies with increased testing of students and performance criteria for schools and students there is also a need for redefining the importance of formal and informal ways of learning in order to understand the richness of young peoples’ learning.

This broad conception of learning can be conceptualized as ways of following young people in and out of school as part of different practices they are involved in throughout their everyday lives using digital media as an embedded part (Erstad, Gilje, & Arnseth, 2013). Further, such a conception of learning also opens up for studying the

more specific intercontextual aspects of learning in specific situated contexts, such as knowledge work at school drawing on students' experiences and practices from outside of the classroom. In this article, I will present data that address both these perspectives on connecting learning inside and outside of school. The research question that will be explored in this article is about how studies of trajectories of learning in- and out-of-school can inform us about the process of knowledge building among students.

2. The learning lives of knowledge builders

'Learning lives' (Edwards, Biesta, & Thorpe, 2009) refers to the coherence between learning, identity and agency, framed by studying peoples' learning trajectories over diverse 'timescales' (Lemke, 2000). Further, practices are not bounded by context, but emerge relationally and are poly-contextual, i.e. having the potential to be realized in a range of strata and situations based on participation in multiple settings. Learning is defined as (Banks et al., 2007):

- 'Life-wide', meaning not narrowed down to specific contexts, but moving schools, home and community;
- 'Life-deep', meaning not only epistemological, but deeply personal and ontological; and
- 'Life-long', referring not to specific age groups but as continually evolving.

Related to these terms the notion of 'trajectory' provides an analytical means for understanding learning activities across time and space. Participation trajectories are closely linked to identity as a "capacity for particular forms of action and hence a capacity to interpret and use environmental affordances to support action" (Edwards & Mackenzie, 2008, p. 165). I use the notion of trajectory as a way of identifying the pathways that a person, or an object, goes through within and across situations over time. We ought, then, to explore how participants are not merely situated in time and space, but also how they are actively networking learning resources across space-time (Leander et al., 2010). To analyse how people do this is particularly

important in knowledge economies in which people are regularly faced with new challenges that require the innovative use of knowledge and expertise.

The concept of ‘epistemic agency’ has been used in relation to the implementation of information and communication technologies in schools and has been linked to an increased focus on more active student roles. This is described as a transition from teacher dominated classroom activities towards the students taking more responsibility for their own learning, where participation in progressive inquiry require epistemic agency. Marlene Scardamalia (2002) points out that epistemic agency might be related to a learning situation where the participants “[...] set forth their ideas and negotiate a fit between personal ideas and ideas of others, using contrasts to spark and sustain knowledge advancement rather than depending on others to chart that course for them. They deal with problems of goals, motivation, evaluation, and long-range planning that are normally left to teachers” (p. 10). Rather than subsuming their thinking under the teachers’ cognitive authority, students engage in dialogical activity and take more responsibility for their own knowledge building and problem solving.

In specifying what this means for ways of learning we can turn to the knowledge building approach by Scardamalia and Bereiter (2006) and what they describe as ‘belief mode’ and ‘design mode’ (Bereiter & Scardamalia, 2003). The term ‘belief mode’ is derived from the traditional definition of knowledge as ‘true and justified belief’. ‘Design mode’, by contrast, is the mode of invention, theory building, solving real complex problems with no ready-made solutions, identifying and exploiting promising ideas. Instead of reproducing knowledge this opens up for ways of engaging learners on issues and ideas that matter for themselves and have some sort of connection to their own lives, not whether it is just ‘true and justified’ in its present form. Working with knowledge involves transformational changes not only in knowledge but also in problem definition. (Scardamalia & Bereiter, 2014)

As such, we should develop more expanded notions of learning sites, conceiving classrooms as “intersections” (Leander et al., 2010) where different experiences and interests are interwoven through knowledge creation, what I have termed ‘the expanded classroom’

(Erstad, 2014). School-based learning has obvious challenges with relation to increased complexities in the classroom and the use of new digital technologies. For research in this area, these developments raise methodological challenges concerning ways of studying “learners in motion” (Erstad, 2013), and conceptually, in ways of developing analytical categories and perspectives that grasp the dynamic interrelationships between learners, cultural resources that are used across different learning contexts and situations.

Schools are important institutions in our societies, but it must become more apparent how schools relate to the overall “learning lives” (Erstad, 2013) of students, with their learning identities and trajectories of participation across different contexts of learning (Leander & McKim, 2003). Change is created by supporting students in their learning lives more than through the alteration of physical boundaries and conceptions of the school of the future (Walden, 2009).

The aim of a ‘learning lives’ approach is to make explicit the mobilization of resources or affordances within specific contexts (Wertsch, 1998), while at the same time focusing on an approach that sees learning, and the capacity to adapt to changing roles, within different contexts (Holland, Lachicotte, Skinner & Cain, 1998; Hull & Schultz, 2001). It would be naive and misplaced to claim that this holistic and pluralist approach is new, in and of itself, but I would contend that this approach is all the more necessary in educational discourses today, as it offers a way of bridging the binary opposition between formal-informal learning, which is underpinning much debate about how communities, homes and schools may be re-inscribed as changed and changing sites of learning (Sefton-Green, 2008).

3. Methodological approaches and empirical data

Leander and colleagues (2010) point out that ‘following’ learners across and between sites is complex. Within ‘multisite ethnography’ researchers like Marcus (1995) and Falzon (2012) argue that the study of social phenomena cannot be accounted for by focusing on one particular site. However, the ways that different settings and contexts are

interrelated as experienced by young people themselves, as the unit of analysis, have not been present in many educational studies (Erstad, 2015; Leander et al., 2010).

In this section, I will present data from two different projects as examples of studying knowledge builders within and across contexts. The first example is part of a large-scale ethnographic study (2009-2013) conducted in a multiethnic community, the Grorud Valley in Oslo, Norway. This example is about one boy (15 years old) in 10th grade in one neighborhood within this community. The research design for the main study started in the classroom, where we spent about eight months conducting observations and interviews following whole classes in different subject domains and study programs. The students, with 60 students in different age groups, were sampled after spending several months in their class, choosing academically strong and weak students according to their teachers and grades, and an equal number of boys and girls. All students were then followed in their transition into the next level of schooling for another eight to ten months.

The second example is taken from a project (2009-2010) where we worked with two upper secondary schools for one year using the knowledge building principles developed by Marlene Scardamalia and Carl Bereiter and using the Knowledge Forum platform. This example is focusing on one group of students in one class during a project in science education.

Methods used in both these projects were such as survey on background data; semi-structured interviews; participant observations and field notes; audio and video recordings of interactions among students and artefact collection. In the second project, we also collected postings in Knowledge Forum as well as logs written by the students.

Example 1: A telling case

In the first study mentioned, we decided to create narratives of the learning lives of the individuals in order to develop a coherent presentation of data on a personal level (Goodson, Biesta, Tedder, & Adair, 2010; Thomson, 2009). These are structured as stories about

people's lives as told by themselves (Goodson & Gill, 2011). As Polkinghorne (1995) explains: "Narrative descriptions exhibit human activity as purposeful engagement in the world. Narrative is the type of discourse composition that draws together diverse events, happenings, and actions of human lives into thematically unified goal-directed purposes" (p. 5).

The following is an extract from a larger narrative about one boy called Ugur (15 years old). We met him during his last semester of lower secondary school (10th grade). One surprising finding in our data from this project concerning learning trajectories within this multicultural community was the role of ethnic community centers. These centers were set up in different neighbourhoodsneighborhoods of the community for cultural purposes of shared language and cultural activities. However, many of these ethnic community centers also provided school related activities. In the interviews, many of our informants explained that they had been active at these centers, almost every weekend, from the time they were pre-schoolerspreschoolers until they entered upper secondary school. Most often, these centers were situated in warehouse storage buildings in the community and had been rebuilt with regular classrooms with a teacher's desk and rows for students. The teachers were former students who now studied at the university in high-status fields, such as engineering, medicine, biology. They did this on a voluntary basis during weekends due to social consciousness of giving something back, as they expressed it, to their own community. For several of the students in the study, these community centers functioned to encourage students to better perform within the formal education system, in the core subjects of math, physics and science.

One of the students attending such a cultural center was Ugur. He was born in Norway with parents from Turkey. Ugur explained that he regularly went to the out-of-school Turkish center to work with mathematics and Lego robotics. During participant observation when we first entered his class at school he seemed very disengaged, especially during Math classes. He was sitting in the back of the classroom, sometimes resting his head on his desk or playing games on his iPhone during class activities. In conversations with his

teacher at school we asked about this and she answered that she knew about this but was not very concerned since he did fine on the Math tests and got an ok grade. However, she stated that Math was not his subject and she did not want to create problems with him so she did not comment on his behaviour as long as he did not create disturbance in the class. What caught our interest about him was some comments he made to us while we were sitting in the class, often at the back row. One example is:

The math level here is basic. Really basic! I cannot be bothered working with math in school any more. That's why I play computer games, you know? [whispers while looking at the teacher]. I practice at the center. (Field note, 2011)

This made us interested in exploring this center and we asked if we could join him one weekend while he was there. Ugur explained that he joined the technology courses at the Turkish center because he remembered having fun building a steam engine with Lego Technics, a present from his mother during his childhood. Simultaneously, he developed a competence in using computers, both software and hardware. In primary school, friends and teachers started to ask him for help, since he developed a role as a computer 'wiz' in his social network. This was not followed up in secondary school. What we discovered related to the comment above was that his passion was Math, and that he for some time was pursuing a trajectory of becoming good in Math, also in relation to his older brother that had a similar interest. As he explained in one interview:

You have clever people, engineering students, technology students. You are one of two or three young people getting help from one student in a very small classroom. Very good! Very good! I joined the math class to become as good as my older brother in math. (Interview, 2011)

He ranked the 'teachers' at this center as very good. So the reason why he seemed so disengaged at school was because he was bored and that the level of Math was basic for him and that he was working on more advanced levels with his 'teachers' at the center. This was not something the teacher was aware of and, therefore, did not take ad-

vantage of in ways of helping Ugur advance or using his Math competence in relation to the other students in the class. This shows how a broader understanding of learning trajectories and ways of bridging formal and semi-formal ways of learning could help both students and teachers.

Example 2: A project in motion

This study was part of a larger research project studying inquiry-based learning approaches among students in Norway. This example is from one class over a period of two weeks, which was the duration of a specific project on the theme of “Global warming” In the project, the students used Knowledge Forum as a collaborative platform. An important part of the project was a collaboration between the Norwegian students and students in Barcelona working on the same topic during the same period initiated by the teachers at the two schools.

The phases of the project are divided into:

- *Phase 1:* A trigger film, *An Inconvenient Truth*. The students and teacher discuss the film and decide on certain research themes and questions that different groups of students want to work on during the project period.
- *Phase 2:* Students discuss the research question and seek information, especially using the Internet.
- *Phase 3:* Students post notes on Knowledge Forum and comment on the notes of the other groups, creating a collective understanding of the theme “Global warming”.
- *Phase 4:* Students connect with students at a school in Barcelona, Spain, working on the same theme. They ask questions and comment on the postings from the groups working on similar issues, all in English.
- *Phase 5:* A video conference between the students in Norway and Spain.

An interesting entry point among the Norwegian students was a reservation among a few students about participating in this project. The reason they gave was a concern that they would loose valuable

time in following the curriculum. They thought that the project would take too much time and not be able to cover the rest of the curriculum in science education at this grade level before the exams. Some students also complained to their parents, who contacted the principal at the school, with the consequence that the teacher was called for a meeting to explain. The teacher defended her position and the reasons for doing the project, arguing that creating links between everyday and academic references would increase the engagement among the students. She managed to convince the principal and the parents to continue. A couple of months later, when the project had finished, the same students asked to have more projects of the same kind, because they believed that they learned more and better this way.

One interest in the project among the students was obviously the chance to collaborate with students in Barcelona. One boy (17 years old) wrote that:

I expect it will be fun to work with the Spanish students. I look forward to read the views they have about the climate problems, compared to what we have heard. I expect to get a lot of information by listening to the Spanish students. Media in their country have probably approached the climate issue in a different way, and it will be educational to be able to listen to different views.

His main expectation was towards exchange of information and views about the project theme of global warming and climate change. What he emphasized was how the views of the Spanish students connected with their own as an orientation towards an understanding of difference. It is interesting to see that many of the students are interested in the more general issue of climate change and how opinions are formed by media and public discourses, and how they might improve their own knowledge. In this sense, they also have a collective understanding of how they might learn from students from another country and culture. Also, the students position themselves as learners through their everyday knowledge, and this knowledge also guides their learning trajectories further on; how new information relates to their existing insight in specific areas. The issue of climate change and

global warming is especially interesting in this sense, since it is covered by a lot of debate in public media and among the population, since it has an impact on peoples' lives in a direct way.

Seeing Al Gore's film, *An Inconvenient Truth*, was an important trigger for formulating research questions among the students. Each group chose one specific issue to concentrate on, and then contributed to the overall discussion on Knowledge Forum. After seeing the film, each group of four students was asked to formulate one theory and research question they wanted to explore further and to put this on Knowledge Forum. One group chose to focus on the implications of climate change on the Gulf Stream. The intention of the teacher was to narrow down a collaborative "object" by writing "My theory", based on their previous knowledge about the issue, and then specify and elaborate on this further. As one student wrote in his log after the project had started:

In our group we started by writing a theory about the Gulf Stream based on the knowledge we had from before. To a large extent this was based on the film we had seen, *An Inconvenient Truth*, by Al Gore, that proposed that a cool down of the ice in Greenland might result in a new ice age in the North because the Gulf Stream will end. When we wrote the theory, we soon found out our knowledge was limited, and we needed to get answers on many small questions through this project to get insight in the theme.

They liked the initial discussion in the group and easily decided on an issue they all found interesting. The process of writing up their preconceptions about the issue also led them to an understanding of their own lack of knowledge about the issue. After deciding on the issue of "Global warming and the Gulf Stream" the four students in this group started to formulate research questions.

They then moved into a phase of gathering information, primarily from the Internet. Most of the time they worked individually, even though they sat next to each other. Now and then, they informed the others in the group about what they found, without really initiating dialogue. One of the boys (boy 1) in the group took charge of the process at one point, starting to guide the others and give them instructions about what to look for. He also defined what is relevant and

interesting in the information the others found. They also explored the substance of their research question and creating knowledge, even though this was still an initial phase. As an output from these discussions, they started to write notes on Knowledge Forum.

Theme: The Gulf Stream By Girl 1 Last changes: 2009, Jan 23 (13:17:12)
(My theory) Our theory is that global warming will cause a meltdown of the ice on Greenland. Melting water will lead to a cool down of the Atlantic Ocean. The Gulf Stream will change, because the difference between hot and cold water will no longer be as big as before. The Gulf Stream, which provides Western Europe with heat, will stop. In the worst case scenario, this may lead to a new ice age in Western Europe.
Theme: Ocean currents By Boy 2 Last changes: 2009, Jan 23 (15:07:00)
Ocean currents are caused by the wind. The wind makes the water move in the wind direction, and in this case, the current is caused by the westerly winds in the northern part of this basin. As the current flows northward from the low-latitude areas of the basin, the water cools, and increases in density. When the water increases its density, it sinks to the bottom of the ocean. The cold water flows slowly down along the coast of western Europe and Africa to complete the loop.

Figure 1. Norwegian students' notes on Knowledge Forum

The teacher moved around the groups and engaged in discussions with the students and made suggestions, for example that they could log into a site with updated research results (www.forskning.no/).

When entering phase three of the project they started to write their findings into Knowledge Forum at the same time as they read aloud to each other from the sites they searched on the Internet. They reached a level where they no longer brought in new information, but rather tried to make sense of different interpretations and decide on a statement to be put on Knowledge Forum. They then moved into a new phase dominated by communications and sharing of information with the students in Barcelona, which initiated interactions between the two student groups.

Theme: Question By Spanish girl Last changes: 2009, Feb 05 (16:39:21)
(Need to know) Hey!, we are X, Y and Z but we don't understand very well your arguments. We tried to look at your sources, but they are in Norwegian, so we can't read them. It would be a great detail of you if you could put some similar sources in English. Thanks!

Figure 2. Spanish student note on Knowledge Forum

This question triggered a long note written by one boy in the Norwegian group, explaining the consequences of the melting of the ice on the Gulf Stream. He used several sources, especially one by a Norwegian professor who had written an article on a national research site in English. These connections between the Norwegian and Spanish students were more about sharing information and making their positions than in-depth discussions and common explorations. The last part of the project was a real time video conference where the students presented their results from the group work and the collaboration between the two classes. Due to technical problems and the formal framing of this sequence it did not work as intended by the teachers, and the students were a bit shy in presenting for each other and expressed that they would have preferred to use social media to discuss the results with the Spanish students.

In their reflection logs, after the project had ended, the students wrote about their experiences.

When we worked on finding “new information”, I found a lot I did not know from before and adjusted some things I was uncertain about. (Boy)

The research question was one of the main reasons that I learned so much. Because we had a question that consisted of so much information, we also got a lot of information we could discuss and learn from. (Girl)

In “my theory”, we mainly took Al Gore’s film as a starting point, and what it presented concerning the Gulf current. (Boy)

As the boy mentioned, the students adjusted their former knowledge from what they had picked up from media and other sources outside of school after searching relevant research within this field. The trigger film was important as a starting point in formulating their theory and their critical stance to the findings presented. As the girl also mention, working on the research question was an important part of their work.

They were positive about knowledge building as a method in the way they commented on other postings and the questions and comments they received themselves. They seemed to learn from this in the sense that discussing in this way made them understand the issues the other groups were working on and also how they themselves expressed their knowledge for the others to read and understand, as illustrated by the following comment:

My group received a number of good questions about our theme, and about what we had written. I got a number of comments on the note about what sea currents are and how they move, because I think the note could have been difficult to understand, because this is a difficult theme, and because there were some difficult words. (Boy)

In their evaluation of their own learning process, expressed in these reflection logs after the project had ended, they were quite explicit in what they have gained from this project.

I have changed views about the Gulf current and Greenland. I have not made a specific opinion about what is right or wrong. I believe the CO₂ level has increased, but I am still a bit uncertain about how much that is manmade, and if the consequences are as large as many seems to think. Today, I, for example, found “proof” that some of the things Gore said were wrong. Researchers disagree (even though Gore says they do not). I can therefore not say that I have changed my opinion. (Boy)

The conclusion has to be that I have learned a great deal, not only about the theme, but also to be critical. Al Gore has a theory, the theory that we built our theory on. Our theory we cannot be sure is right. Since there has been a lot for and against on this issue we agreed that there should not be a set answer on what will happen. Personally, I believe that the Gulf current will stop immedi-

ately. I have changed my opinion a bit, but I am still very doubtful. Because there is so much disagreement, there is quite a lot that became even more unclear than it was. This is because I really did not know so much about it before. Before the project started, I did not really have any opinion about global warming. I guess I had come to the conclusion that, yes, it is there but what can I do about that issue? (Girl)

As the girl mentioned, they not only learned a great deal about the issue they were working on, they also learned “to be critical”, and what that means in a process of argumentation and knowledge building. From the analysis, it is clear that this is something that developed over time as part of the group’s collective reasoning and collaborative efforts. Similar processes are working when they mention that they have changed opinions concerning their preconceptions on the issue.

This is an example of how an ‘expanded classroom’ can open up possibilities for students in different ways. Partly, in the way the teacher uses the trigger film to generate ideas and ways of engaging students in their preconceptions about this topic. Partly, also in the way the technology gives possibilities for collaboration and challenging each other opinions and information they find, and a new dimension created through the collaboration with the Spanish students. This example is, also, about how epistemological issues are handled in such school projects. Among students and in public discourse, research and knowledge is often contested and portrayed as constantly negotiable and challenged, which leaves the students with unclear learning output. The students are engaged in the process and involve themselves on a personal level, but not finding ways to consolidate their knowledge building and learning identities.

4. Implications

Two main issues have been explored above. One is about in- and out-of-school activities and how knowledge is connected, the other is about trajectories of knowledge building over time. The students in both examples make connections between their activities and practic-

es out of school with knowledge creation in schools. In the first example there is a disconnection between the two in the sense that the teacher and classroom learning is not connected to what Ugur experiences as enhancement of knowledge, but rather as disengagement. In the second example this is used more strategically by the teacher as a way of engaging the students building on their prior knowledge and opinions as well as experiences from media coverage and technology use they engage in outside of school. In this way, the teacher supports the students' epistemic agency both related to the task they are working on and the interactions within the group and the students in Barcelona. Ugur develop also a sense of epistemic agency in the way he relates two different learning contexts and his own learning identity and positioning within both. The implication is that the teacher is unknown about an important aspect of his knowledge building, the fact that his favourite subject is Math.

In studying the trajectories and flow of knowledge building among the students in the second case, it is clear that they were very engaged in the issue they were working on. In the class, as a whole, it was also interesting to notice that their initial very critical remarks and attitudes towards the project and Knowledge Forum changed a lot, based on their experiences and an understanding of what they gained in knowledge and insight on the issue, as seen in their logs and comments after the project had ended. An implication from this case is the broader aspects of learning that their process exemplifies. They draw on personal experiences and insight from outside of school and throughout the project connect to resources online and in ways of communicating with students in Barcelona, as an 'extended classroom'.

From kindergarten to primary school, children learn schooling. They learn to engage with objects in certain ways, to behave as students, and to negotiate their identities in regard to subjects and peers. In school, they learn discipline and focused attention, and that it takes work to succeed. Sometimes, they find that the skills and identities developed or the resources available in the community are useful and can be re-contextualised and mobilised in school to manage the tasks and problems they encounter.

In several of the research projects I have been leading we find that teachers struggle with creating learning environments that truly draw on informal learning experiences of students (Silseth & Erstad, 2018; Wiig, Silseth & Erstad, 2017). Teachers are generally positive to the importance of involving students' experiences and practices from other contexts as part of classroom activities but have problems to implement this in practice. The example of Ugur is positive in the sense that he himself manages to develop his interest in Math both at home and at the ethnic cultural center. However, it is a negative case concerning his experiences with school. The teacher does not discover his engagement about Math and the fact that he is really bored at school. This raises some fundamental critical questions about school as sealed off from other aspects of the lives of these young people, concentrating on content and curriculum standards. The second example shows a learning environment that opens up for more inquiry-based learning where students can draw on different resources and create their own agency based on their experiences and opinions. The teacher in this class was very experienced and was exploring other ways to engage the students. Still the students struggled to develop learning trajectories that strengthen their knowledge building, and much of their discussion is obviously unscientific. Instead, they negotiate about information they find and opinions about key issues without gaining new knowledge. As such, these two examples are not success stories of connecting learning inside and outside of school. They are rather critical comments on the challenges of making such connections among students as knowledge builders. Boundaries are important in an educational sense because they influence the way young people engage themselves in learning and succeed in the school system or build their own learning trajectories as alternatives to succeeding in schools. What is important as ways of (re)establishing continuity is the important role played by boundary interactions or activities and the value of supporting these in some way for sustainability (Bronkhorst & Akkerman, 2016). Continuities and discontinuities of learning trajectories are blurred as defined from the position of the learner, and there is a diversity in the ways such boundary crossings and learning trajectories are developed.

In this article the concept of learning lives has been used to draw attention to the coherence between learning, identity and agency, framed by studying peoples' learning trajectories over time and space (Lemke, 2000). Further, practices are not bounded by context, but emerge relationally and are poly-contextual, i.e. having the potential to be realized in a range of strata and situations based on participation in multiple settings. As such, the term 'learning lives' can open up for new understandings of the richness of young people's learning experiences in contemporary cultures. The research presented in this article has larger implication for how we study knowledge building and learning over longer periods of time and across different contexts, studying what Jan Nesper (1994) termed "knowledge in motion". Related to 21st-century competencies, this raises important considerations about the process of knowledge building and creation among students, over time and also across contexts. As such, it challenges traditional conceptions of formal versus informal ways of learning, also implying different approaches towards conceiving assessment that will support knowledge building as life-wide and life-long.

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