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Learning, Tablet, Culture-Coherence?

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Abstract This paper presents understandings of learning in schools where Internet-enabled Information and Communication Technologies (ICTs) are taken for granted. The context is a full-scale 1:1 tablet project in Danish municipality schools where this study bring forward expressions of learning from one class (12-13 year old children) in order to offer interpretations of how the learning is possible to relate to the use of the tablet and the municipality intentions of changing the teaching and learning culture. The aim is a deeper understanding of learning and the learning-tablet relation. The qualitative research involves asking learners to describe learning with the help of their own pictures of learning situations. The learners' expressions of 'what learning is' are related to tablet use and municipality intentions of developing teaching and learning. Five themes show how the learners express learning, in coherence with the municipality's intentions. Key learning outcomes are related to this coherence and to the fact that learners use tablets in 55% of all expressed learning.

Keywords Tablets, Learning Culture, ICTs in Education, Digital Learning Environments

1. Introduction

When a municipality invests in a full-scale 1:1 tablet project and all teachers and learners in a municipality are given a tablet, challenges in teaching and learning will arise. Although school municipalities throughout Europe invest heavily in Internet-enabled technology, plans to support teaching and learning are reported to be lacking [1,2]. A kind of 'overbelief' in 'technology as solution' leaves teachers and learners to make their own coherent alignments of technology, teaching, and learning. This paper presents an advanced tablet project with a long-term strategy to change teaching and learning, including specific frameworks for developing digital learning environments. The 1:1 tablet project is one of the first and largest in Europe to use tablets on such a scale. Because of this, with no projects from which to learn, the municipality teachers and learners 'were developing new forms of practices and interactions *in situ* in the following phrase: "building the raft while swimming" [3].

Initially, technical viewpoints dominated the discussions of the uptake and use of the technology and obstacles to planned education were matters like synching devices and downloading apps to several children at a time. Other distractions could be social or gaming activities and other off-task behaviours as recognized in Willocks and Redmond [4].

However, when the municipality 'managed' initial distractions and began taking the technology for granted, it was time to balance the focus of the ICT acronym toward Information (I) and Communication (C) instead of just technology (T) as being about technical issues. This paper therefore aims for a deeper understanding of learning and the learning-tablet relation in a 1:1 tablet learning culture with the main research question: How is learning expressed in an advanced tablet project and how can learning itself be understood and related to the use of tablets? A Three step research approach is taken: The first step is to understand how children understand learning. Second, this understanding is related to the use of the tablets without asking explicitly about them. Third is to relate the learners' expressions of learning to the municipality's intentions to develop the teaching and learning culture. The paper uses 119 pictures of *learning situations,* taken by children, as the starting point in the exploration of learning in a 1:1 tablet project.

This paper presents learner perspectives and is part of a bigger research project that studied the implementation of tablets in all schools run by a rural municipality in Denmark. The data collection methodology of this paper puts learning in first place through the study object of *learning situations*.

1.1. Context

The studied 1:1 tablet project began on 6 January 2012. From that date, teachers and pedagogues (about 280) and all pupils from 6–16 years (about 2200) had one tablet each. The municipality choose to buy iPad 2, with 16 GB. The 1:1 tablet project, called Digital Learning Environments (DLE), is not just about internet-enabled ICTs for everyone in education; it intends to change teaching and learning culture.

The history of DLE goes back to 2008. In 2008, all the schools in the municipality started a three-year project regarding learning environments and pedagogical analysis, the LP model. This model is still one of their foundations. One of its aims is to establish learning environments with appropriate conditions for professional and social learning.

In 2011, the municipality was formulating a new strategy for its schools. A crucial issue was the decline motivation to learn with age. Experts on learning environments for youth found the environments 'too separated' from the students' everyday life. Even schools that had included students in the community no longer managed this because without the use of contemporary cultural tools (ICTs), the motivation to learn declined.

In 2012, a new educational strategy began. The introduction of the tablets was one part of it. The project regarding learning environments and pedagogical analysis was now 'boosted' with Internet-enabled ICTs. This was the start of the parallel, coherent DLE project intertwined with the other on-going initiatives to develop the teaching and learning culture. A fundamental principle for the strategy was that 'the school must get out in the world and the world must come in to the school.'

1.2. Digital Learning Environments

An explanatory model of the 1:1 initiative, called 'The Learning House' (Fig. 1) illustrates the building blocks of the DLE. It contains theory and methods that build on the foundation of the LP model, the view of the child as an actor, constructivism, and system theory. The project leaders in the municipality developed 'The Learning House'. In 2012, they introduced all of it to about half the local teachers. The rest got introduced to fragments of it such as students as producers ('learning by doing'), a community in change, and changed teacher roles. All school leaders learned about the model, which allows varying implementations 'on top' of the same fundamental foundation.

One key feature of the project is its organisation. It is centralised in the municipality as 'one unit' instead of having a project organisation at each school. Its model includes several levels, from the steering group with the project leader on top down to the lead users, students with certain IT knowledge and creative potentials. The municipality has around 60 lead users in the schools and they represent the students' perspective. This group of students helps the organisation in the communication and development of the project via a top-down and bottom-up approach (Fig. 2). The other levels contain lead teachers/IT coaches, which represent the teachers, and the task force, the school leaders and principals. On top of this is the level of the project leader and IT consultant for the schools that represents the steering group.

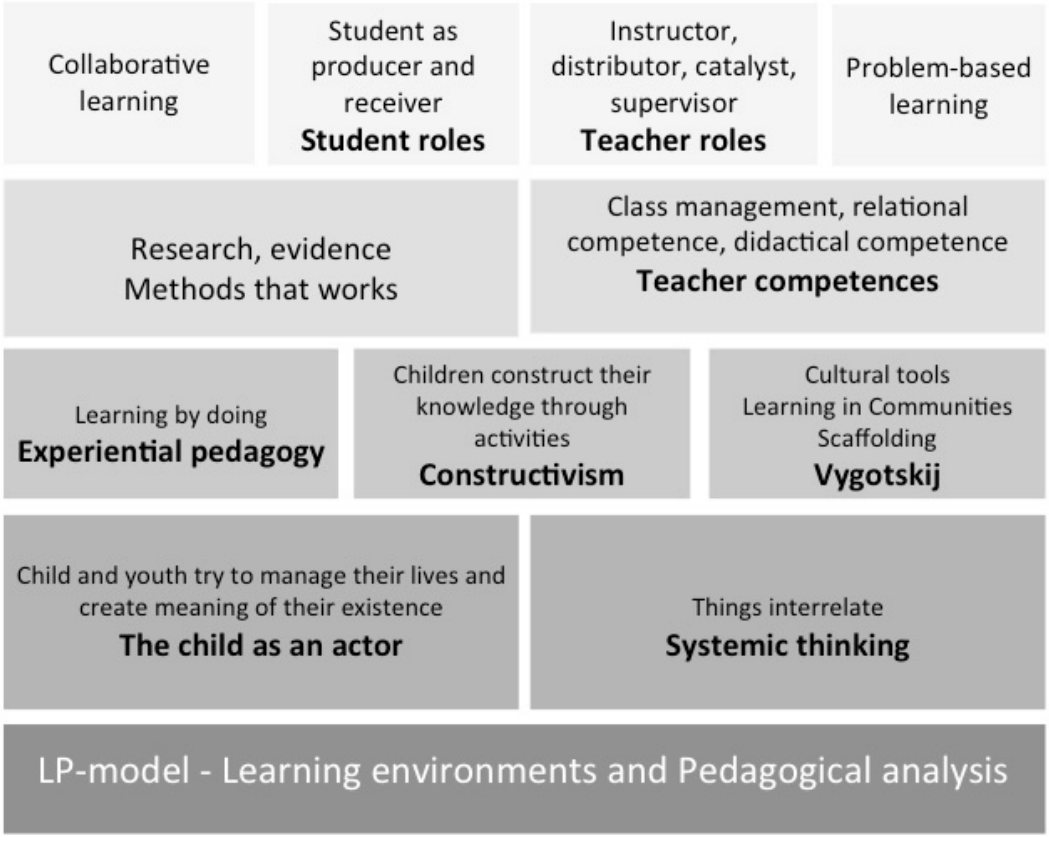

Figure 1. 'The Learning House' – explanatory model of the Digital Learning Environments project.

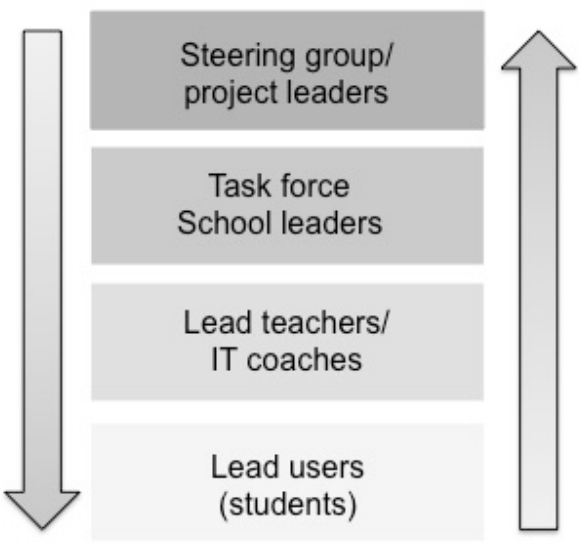

Figure 2. 'Top-Down and Bottom-up Approach'

2. Survey of the Field

In 2011, while the aforementioned Danish municipality decided to invest in tablets, Livingstone [5] found ICTs was not yet so embedded in social practices of everyday life that it could be taken for granted. School investments in technology happened more quickly than the process of adoption and changed lesson plans, despite the widespread view that ICTs was enhancing learning [5].

The issue of not taking the use of technology for granted is still a reality in many settings of education and social practices of everyday life. But many things have changed since 2011. The number of people connected to Internet at a worldwide scale has increased from 2,2 billion to 3,2 billion, and in the example of Denmark it reaches 96% of the population [6]. 2012 saw a 'boom' of large-scale projects with tablets. San Diego Unified School District in California invested in 25.700 iPads in fall 2012. That same year, Thailand announced a One Tablet PC per Child (1:1) campaign that included almost one million Android tablets [7]. See also [8,9].

ICTs implementation projects have been the interest of researchers with a variety of objectives, often discussed as 'improvement projects' of some kind. Four main interest points of the uptake and use of digital technologies are: policy, school organization and school leadership, teachers and teachers' professional development, and as related to students. With this in mind, future studies of ICTs in education "should have a more precise focus on the uptake and use of digital technologies, and/or adopt a holistic approach that encompasses structural as well as cultural aspects" [10]. A large evaluation project of 1:1 laptops in Swedish education called 'Unos Uno' concludes that 1:1 is not an IT project but rather a project of change where leadership is a success factor [11]. This is because vital decisions are made above the levels of the principals, by the municipality leadership that also has to be responsible for their outcomes [2]. A larger European project including 13 countries, MENTEP (MENtoring Technology Enhanced Pedagogy), asks, "How can policy-makers support teachers in developing their Technology-Enhanced Teaching competence" [12]?

Internet-enabled ICTs can connect to other spaces 'outside' of the traditional ones in education [13] and is also emphasized in national [14,15] as well as international policy [16]. However, research on tablet use in the learning process tends to focus on the devices first. Note survey questions like 'The iPad activity helped me learn the course content' or 'The iPad activity helped me connect ideas in new ways' [17]. This paper challenges this '*technology-centred'* research. Instead, to understand when tablets are useful and used in learning, this paper first studies the learners' view of what learning is and then relates the use to that, a *learning-centred* research methodology.

3. Theoretical Underpinnings

The theories that underpin this research present perspectives on learning, knowledge, and the theories behind the methodology. It positions the concept of ICTs in education from the perspectives of Information, Communication and Technology.

3.1. Learning and Knowledge

This research brings forward constructionist [18] and constructivist perspectives [19,20]. The social perspective is more emphasised, considering for example the social construction of the entity of learning, the zone of proximal development [20] or scaffolding [21].

The municipality framework, 'The Learning House,' consists of theories for knowledge and learning. Experiential learning is connected to the concept of 'learning by doing' [22] and experience as the source of learning and development and learning as a process of creating knowledge [23]. The municipality framework is based on a model for reflecting on learning environments and pedagogical analysis. This model as well as the first layer of the framework has connections to systemic thinking and social system theory [24,25].

3.2. Methodological Considerations

The theory of group cognition [26,27] inspired the design of this research and it has also guided the understanding of learning in the 1:1 tablet project from several aspects. The interview data are seen as collaborative knowledge of what learning is, preceded by a collaborative discourse on that subject. The process of group cognitions was present when the learners in the classroom solved the issue on how to present learning situations. The overall findings represent a learning culture with the tablet as its mediating artefact.

Group cognition theory argues for utterances as the unit of analysis in research. Utterances in this paper are the learners' statements about learning in the form of full sentences, short statements or sometimes just a summarising word. These utterances make group cognitions and collaborative knowledge visible [26-28]. In this research the focus group interviews is one example when the small group, formed by three individuals, present collaborative knowledge. The classroom, that collaboratively constructed the image of 'what learning is', is seen as a community where the teachers and the learners work together in learning processes. This means that the teachers and learners is not separated, cf. the Russian term of *Obuchenie* [29], they are seen as part of the same Learning expedition of exploring learning situations [30,31]. The classroom, together with the municipality leadership, forms a culture [27] and since the research focus is on learning in a context where Internet-enabled technology can be taken for granted via tablets; it is named a *tablet learning culture.*

Situated learning [32] and communities of practice and social learning systems has guided the analysis in the research via *engagement as a mode of belonging to a social learning system* [33].

In relation to this, the view of researching learning in this paper has significant similarities to Glăveanu's conclusions when researching creativity [34]. He brings forward the understanding of 'what is creative' as a result of subjective reception and social agreements. One can say the same thing about learning.

3.3. Positioning of ICTs in Education

There are a variety of perspectives or attitudes toward how we understand learning, education and the concept of ICTs in education [35]. Some focus on the 'I' as in information, some on the 'C' as in communication and some on the 'T' as in technology. Different research communities like computer science, informatics and educational sciences all research ICTs in education, but with different research questions revealing their focuses. Depending on one's perspective or attitude, discussions about the use and 'usefulness' of the technology can be 'mismatched'. To avoid this 'mismatch' of understandings, this section aims to position the view of ICTs in education.

In the studied context, learners use Internet-enabled ICTs regularly; they are dependent on it and can even take it for granted. However, this paper will not be about detailed knowledge of the workings of the technology. Those issues are treated with respect but not central.

3.3.1 Information

In 2007, Luciano Floridi's look at the future developments of information and communication technologies concluded that "we are probably the last generation to experience a clear difference between *onlife* and online" [36]. This view, along with concepts like *hyperhistory* and the *infosphere,* provides this paper with informational aspects on the concept of ICTs.

Hyperhistory is in many ways related to the 'historical state' of the researched municipality. The learning situations has moved in to a time where the schoolwork is not just ICTs-related, it has become ICTs-dependent; the teachers and learners depend on the tablets as a necessary condition for the learning in school [3].

Infosphere is equivalent with biosphere but with regard to information. The information all around us is presented like one 'information sphere'. It brings online and offline together into onlife. Minimally, an infosphere includes all digital online and analogue offline spaces of information. Maximally, the infosphere is "synonymous with reality" if we interpret reality from an informational perspective [37]. Infosphere have guided this research with the understanding that learners are influenced by, and dependent on the infosphere. The infosphere surround the learners, the information access and the activities to access information are increasing because of the tablets. The philosophy of infospheres is useful in the definition of ICTs from an information perspective.

3.3.2. Communication

CrossActionSpaces stresses the role of communication and those stakeholders who use the term IT lack this perspective. CrossActionSpaces can be understood as "spaces and 'rooms' that are made of human communication, linking both physical and online places" [13]. CrossActionSpaces are based on communication. When learners use Internet-connected tablets, social practice takes place in and across those spaces and 'rooms'.

The spaces of communication expand because communication develops and connects to more and other spaces of communication. A classroom situation can be when the learners 'google' for information. In Google (a communication space), they find a link (expanding towards another communication space) where someone communicates the 'answer' via a film on YouTube (another communication space). The learners will also discuss the new knowledge they got from the video in the classroom (yet another communication space).

Co-located settings [38] and theories of socio-technical systems [cf. 13] are cornerstones to the philosophy of CrossActionSpaces, which guides the understanding of how learners learn. The 'CrossActionSpace learner' can only exist in learning situations where Internet-enabled ICTs can be taken for granted.

3.3.3. Technology

Technology has always had impact on the development of social structures and thinking. Technological tools "give rise to new social structures; new tools of thinking give rise to new mental structures" [20]. The use of the tool helps humans "to relate more effectively to their external environment" [20]. In ICTs, the 'tools' can also be the psychological or mental tools we use to communicate and analyse reality where language via thought and speech is a

cornerstone [39].

Among such 'tools' that give rise to new structures and practices are the tablets and their features relevant to mobile learning: mobility, multimodality and Internet connection [40,41]. The tablet has multiple uses: it is just not a static tool, but "interactive and transformative" [13] and it affects daily work in the classroom, like "environmental forces" [3] in social practice.

This paper is not about tools, things or technical issues. It is about the processing of information and communication, with the interest in learning, and related to technology that gives access to information and communication—tablets. And, consider that there are also critiques against the role of technology in society that one should be aware of. Technologies can be seen as a mean to dominate people and enhance social reproduction through i.e. information processing, communication and the knowledge industry; technologies have become an organising form of society [42].

4. Research Design

The design of this paper builds on data from one classroom moving upwards in the school system via municipality frameworks for education. The design can be summarised through the following procedures:

1. Data collection through learning situations to collect the learners' view of learning.
2. Interviews about the learning situations.
3. Analysing the data through open coding of utterances in interviews.
4. Relating the utterances to the tablet use, theories, and frameworks to triangulate a complex and rich picture of the 1:1 tablet project.

These procedures are guided by the research questions:

1. How is learning expressed in an advanced tablet project and how can the learning itself be related to the use of tablets?
2. How do the learners' expressions of 'what learning is' and municipality intentions of changing teaching and learning interrelate when understanding learning in a 1:1 tablet project?
3. What are possible key learning outcomes, from a pedagogical and organisational perspective, of a three-year 1:1 tablet project, to inform stakeholders of a variety of levels in the educational system?

4.1. Data Collection Methodology

The study of learning situations was initiated to make the learners' voices heard. It was presented in meetings with teachers and school leaders, which led to voluntary sampling: 24 teachers got interested and signed up [43]. Finally, 11 teachers and 11 classes participated in the full study. This paper focuses on one class; the '*Poster Classroom'*. The choice of presenting one classroom in the present paper is based on the considerations that the complete dataset has been analysed and presented earlier [44]. And, experiences from that paper showed that analysis of one classroom with regard to the tablet use and the municipality intentions of changing the teaching and learning could benefit discussions of what influences the learners expressions and understandings of learning. The 'Poster classroom' turned out to have a rich and extent amount of data and that's the reason to why it was chosen. However, one classroom does not speak for a municipality on its own, it is used as an example of how learners' expressions of learning can relate to municipality frameworks for learning.

To study the learner's perspective, a research team used a mix of methods inspired by stimulated recall [45] and photo eliciting [46]. Learners took their own photos of learning situations, marked them with a word or a short sentence, and made them starting points for interviews.

Figure 3. Poster - Learning Situations

The data collection had two phases, preparation and classroom visit. In the preparation phase, the children were instructed to take a photo of a learning situation that *could be situated in school or in any other context* and then label it with one word they found appropriate for the picture. One class, the 'Poster Classroom', made one poster per child. The 'Poster' children presented several pictures on each poster, each labelled with a specific word or sentence (Fig. 3). The poster production was preceded with a classroom discussion of what learning can be and how children could interpret a learning situation. The second phase started when two researchers visited the classroom and collected data through semi-structured focus group interviews [47] with the photos as starting points. These interviews are

called *photo-interviews*. The children formed groups of three and all participants had made a poster of their own with 4–8 pictures that showed different situations of learning from their point of view. Usually, two audio recording devices were used to record the conversations and interviews. The utterances in this paper are translations from Danish into English.

In the main section of the interview, researchers were cautious not to point out a specific direction of how the tablets relate to learning. The whole idea of looking into *learning situations* was that we did not want to focus on the tablet but on learning. The findings therefore should have a learning perspective, not one of technology. This approach should strengthen the validity of the data that describe the actual use of the tablets in relation to learning when we don't ask for it explicitly.

School leaders and teachers approved the study in the municipality. The parents to all participating children were informed via letter. The Regional Ethical Review Board of Umea University reviewed the research (dnr. 2013-393-31).

4.2. The Nature of the Data

In the Poster Classroom, children in a sixth-grade class (12–13 years) made one poster each. The number of children in the class was 23; 12 girls and 11 boys that presented 21 posters (two failed to participate). The total amount of pictures on the posters was 119: they were starting points in the seven photo interviews. In the interviews the children took turns talking about their choices of pictures. In total, 121 utterances were generated from those interviews. Some utterances could fit several themes because they had several meanings. As a result of this, $\Sigma = 156$ is the total amount of utterances in all themes.

4.3. Some Utterances Were Excluded

The analysis excluded 11 utterances. They expressed mainly artefacts or products but did not really say anything about the learning or learning situations connected to them: Books with facts - You learn a lot – you borrow it at learning centre – (Utterance-ID no. 121).

In education, some artefacts are accepted as technology from which we have learned. Quotes like this say nothing about the learning, only that the learner presumes he or she will learn just by possessing an artefact. This quote described a book, but this research would also exclude a quote like Tablet - You learn a lot. The learner may very well learn, but maybe he or she won't. A book or iPad does not guarantee learning if it is not purposefully used. Same exclusion goes with utterances like: Skoleschema (Schedule of the school activities) – Different subjects/hours – (Utterance-ID no. 15) and School (pic of schedule) – You are in school to learn, you learn the most in school – (Utterance-ID no. 50).

4.4. Data Analysis

The analysed data is from the photo-interviews with regard to the learners' descriptions of learning situations. The unit to analyse was the children's utterances [27] in the form of sentences or short expressions based on the learners' own pictures. Data analysis was qualitative. The utterances were coded, which generated themes. The generation of themes was an abductive process: iterative in interplay between data and theory to understand learning in 1:1 tablet learning culture [48,49]. The second step was to relate the utterances to the use of tablets using the definition of; *being related to the tablet and the features that mobile technology in general provides by being present in the learning setting* [40,41]. If the learners expressed, for instance, that learning was to search the Internet for something specific, it is assumed that it is done via the tablet. Therefore it is a connection to what the learners express as learning and the use of the tablet. The third step was about connecting the learners' expressions of what learning is to the municipality framework; 'The Learning House' via the coded themes.

5. Findings

The findings are organized according to the generated themes. A total of 145 utterances were coded, resulting in five themes (Fig. 4). The findings are presented with theoretical underpinnings connected to each generated theme. This makes the results of the abductive process visible. The themes show the learners' expressions of 'what learning is' in learning situations when they learn. A 'theme' is defined as a pattern found in the information that "at a minimum describes and organizes the possible observations and at maximum interprets aspects of the phenomenon" [50]. The phenomenon in this research is *the learning in a tablet learning culture.* In the process of generating the themes, a research team of four researchers made an inter-rater reliability check also called inter-rater coding reliability [47,50].

The themes consider learning to be:

- 'Explanations in applications'
- 'To read and to learn new words'
- 'To be guided by someone'
- 'Finding out something new and making mistakes'
- 'Engaged interactions'

Table 1 shows the distribution of all themes.

Table 1. Findings - distribution of overall themes.

	Explanations in applications	To read and to learn new words	To be guided by someone	Finding out something new and making mistakes	Engaged interactions
Utterances in themes N = 145	n = 41 (28%)	n = 36 (25%)	n = 28 (19,5%)	n = 25 (17%)	n = 15 (10,5%)
Tablet related n = 80	n = 38 (93% of the utterances in this theme)	n = 18 (50% of the utterances in this theme)	n = 5 (18% of the utterances in this theme)	n = 14 (56% of the utterances in this theme)	n = 4 (27% of the utterances in this theme)

Theme 1 is labelled *'Explanations in applications'*. It is generated from n = 41 utterances (28% of all utterances in the themes).

It occurs in learning situations that have the characteristics of communicating or searching for information across the traditional boundary of the classroom. *Applications work as 'door-openers' to spaces of communication and information in all utterances.* It can be seen as receiving help, information, or guidance from/through *something* that supports learning (but no direct/live interaction or conversation). Obviously, there is someone 'behind' these things, but the theme focuses on learning *using tablets or interactive media as mediating artefacts.*

The learner role is twofold: receiver when receiving information and active learner/producer when communicating, searching information, and using knowledge.

The theoretical underpinning of this theme is connected to the philosophy of CrossActionSpaces [13] and the concept of infospheres when considering the merging of online and offline infospheres to one onlife context [3,37].

The 'Explanations in applications' was expressed like:

- Google – To find out things. You use it a lot in school. – (Utterance-ID no. 48)
- Ordbogen – You can ask about words you don't know about. A bit like Google Translate but better. – (Utterance-ID no. 93)
- YouTube – When you hear an English song on YouTube you can find an English word you don't understand and then you can go to Ordbogen to understand it. – (Utterance-ID no. 88)

The use of tablets related to 93% of the utterances (n = 38 of n = 41). The remaining 7% (n = 3) related to other interactive applications.

Theme 2 is labelled *'To read and to learn new words'*. It is generated from n = 36 utterances (25% of all utterances in the themes)

It occurs in learning situations that have the characteristics of reading and practising language skills (mainly learning new words but also writing and spelling assignments). The theme is focused only on the development of Danish since this is the main language spoken in the learning culture. Other languages than Danish were mentioned during the interviews but are not included in this theme.

The learner role is also here twofold: receiver when reading and producer when writing and doing assignments.

The theoretical underpinning of this theme is mainly connected to Vygotsky's view on language as tool. To read, to learn new words and to develop your mother tongue is seen as an important cultural tool. Language development can play a central role in learning as the learners express it. "Thought and speech turn out to be the key to the nature of human consciousness" and "all consciousness is connected with the development of word" [39].

Expressions from the learners:

- Reading – You understand more when you read. If there is something you don't know you can ask teacher, friends or Ordbogen. First I try to understand the sentence to see if I understand the word. (Utterance-ID no. 101)
- Read a book – To develop words and stamina. To read is important for development. (Utterance-ID no. 120)
- Dictate – To practice writing in a book – To learn to write without spell-check. (Utterance-ID no.99)

In this theme, 50% of the utterances are related to the use of tablets (n = 18 of n = 36).

Theme 3 is labelled *'To be guided by someone'*. It is generated from n = 28 utterances (19,5% of all utterances in the themes).

It occurs in learning situations that involve learning from someone, getting help, information, or guidance that supports learning from a person, often in direct interaction or conversation. This 'someone' can be a teacher, a peer, or as one child put it:

- 'You ask someone and learn. Can be anyone, teachers and others – someone that you know knows' – (Utterance-ID no. 2).

Another characteristic in this theme is given assignments. The guiding process shows that there is an agent 'behind' your learning—someone else, not you, has 'decided' what you shall learn and even sometimes how. The learner role in this theme is only to be a receiver.

The theoretical reasoning of this theme is related to the guidance a learner gets when solving a task or a problem initially "beyond the learner's capacity thus permitting him to concentrate upon and complete only those elements that are within his range of competence" [21]. It also involves "problem solving under adult guidance or in collaboration with more capable peers" [20]. While this paper emphasises

the learner dependence on technology, in this theme they are dependent on other individuals, such as peers or adults. This theme underlines the social perspective of learning as a benefit for the individual learner:

- The teacher is important – to give assignments. Outside of school it can be people around you. – (Utterance-ID no. 9)
- To ask classmates – It is easy to ask the classmates, same as with teacher – (Utterance-ID no. 67)
- Grammar – Important that the teacher explains. First teacher explains then it is an assignment. – (Utterance-ID no.73)

When learning is to be guided by someone, 18% of the utterances are related to the use of tablets (n = 5 of n = 28).

Theme 4 is labelled *'Finding out something new and making mistakes'*. It is generated from n = 25 utterances (17% of all utterances in the themes).

It occurs in learning initiatives and challenges. It shows the exploratory side of learning where the children express their own agency and initiate a process of learning by doing and reflecting. Related to ICTs, it is foremost when students are active and creative in *searching* and *finding* their knowledge. The learner role here should be an active producer.

The theoretical underpinning of this theme is related to Dewey who is often connected to the expression 'learning by doing' [22] and Kolb's [23] work on experience as the source of learning and development and learning as a process of creating knowledge.

Expressions in this theme:

- Learn from being wrong – to make it better another time. It's ok to be wrong in school – (Utterance-ID no. 14)
- Google – To find information. You can find things on Google to use in schoolwork. Also used at home. – (Utterance-ID no. 68)
- Try on your own – (Utterance-ID no. 21)

In this theme, 56% of the utterances are related to the use of tablets (n = 14 of n = 25).

Theme 5 is labelled *'Engaged interactions'*. It is generated from n = 15 utterances (10,5% of all utterances in the themes).

It occurs in group-learning situations. It is learning through communication where the learners interacted, collaborated, shared, or presented something together with others. It is *not* about receiving help-you 'contribute with something' in the learning process.

When the learner is collaborating in the learning process the learner role is to be receiver and producer - "they are not only consumers of information but also active agents and producers in the co-construction of new knowledge: pro-sumers" [31].

The theoretical connection is here described via 'Engagement as a Mode of belonging to a social learning system'. Engagement is about "doing things together, talking, producing artefacts…The ways in which we engage with each other and with the world profoundly shape our experience of who we are. We learn what we can do and how the world responds to our actions" [33].

- In the class – To learn together. It is important to be together in the class because we all have different views – (Utterance-ID no. 60)
- To show something - to not be afraid, to break limits – (Utterance-ID no. 33)
- Group work – In math for example we may work in groups, reading the same book about an assignment to try to solve it together. That is important for learning – (Utterance-ID no. 55)

In *'Engaged interactions',* 27% of the utterances are related to the use of tablets (n = 4 of n = 15).

5.1. In Relation to the Tablets…

Overall, n = 80 of all utterances in the themes (N = 145) were related to the use of tablets. This means that of all utterances where the learners express 'what learning is' in learning situations when they learn, the use of tablets is related to 55% of those expressions.

5.2. …and 'The Learning House'

In the findings, the theoretical underpinnings are shown for each theme. The utterances from the learners are connected to 'The Learning House' via the themes that were generated (Fig. 4).

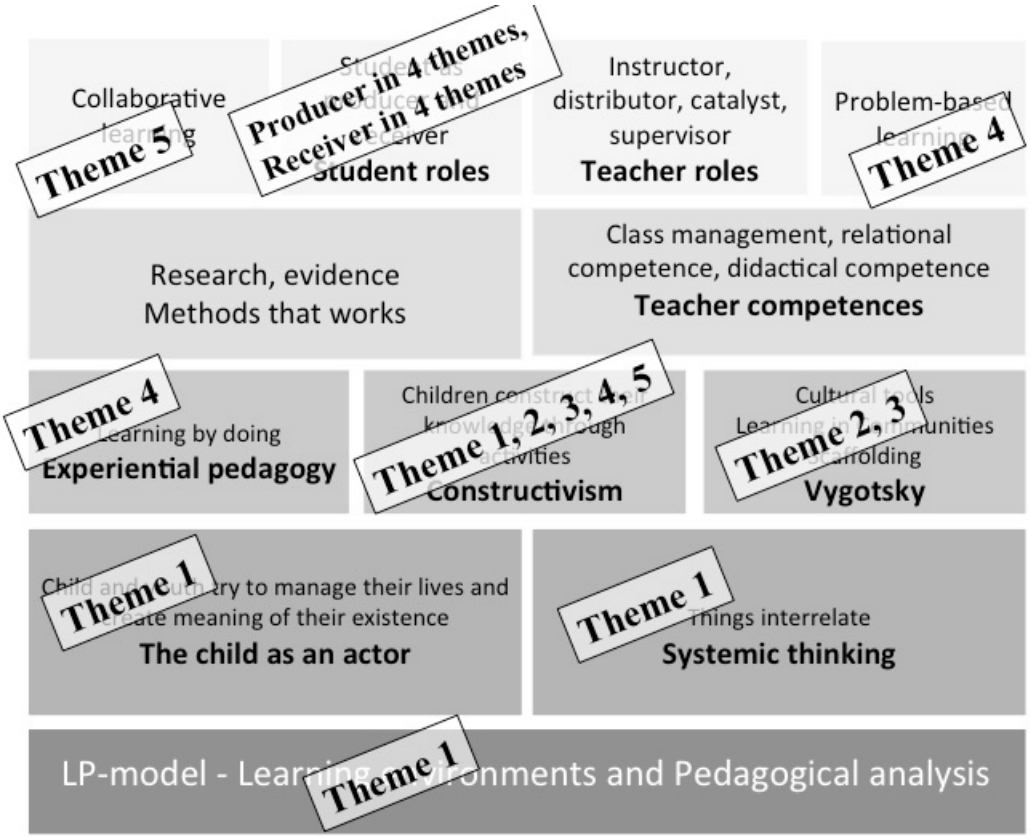

Figure 4. Findings – Five Themes – Related to 'The Learning House'

The building blocks called 'teacher roles' and 'teacher competences' are left out since the learners are the focus of this paper and the research methodology is not designed to gather conclusive data about teachers' competences and roles. 'Research, evidence, methods that works' is also left out since its formulations seem 'too vague' to relate to, at least with the research methodology and the theoretical background in this research.

Because of the characteristics of the themes and their theoretical underpinning; the building blocks in the framework and themes 1, 2, 3, 4, and 5 are presented as related to 'The Learning House'. The theoretical underpinnings of the themes have possible, interpreted connections to the building blocks in the framework since both the theme and the framework rely on the same theoretical approach. The themes describe characteristics of the 'student roles' and the findings connect the framework to the themes, in the two possible roles described in the framework: learners as producers and/or receivers. In the themes, both roles appeared four times each.

The relation between theme 1 and 'The Learning house' is more abstract. The blocks with 'systemic thinking' and 'the child as an actor' connect to theme 1 because of similarities with CrossActionSpaces. Just searching for 'explanations in applications' may seem simple but at the same time it holds some actions that supports the connections between the theme and the building blocks: *the child tries to manage the learning situation by connecting systems across traditional classroom boundaries*. Theme 1 has a connection to the LP model, because CrossActionSpaces and LP model share a systemic thinking approach with interest in social system structures [13, 51]. It also reveals infospheres included in learning environments of the 'hyperhistorical, onlife classroom' [cf. 37].

6. Discussion

The findings hold a variety of learning situations that were presented during a limited period during data collection. In another period and classroom, other learning situations and other themes may appear, due to factors like age, culture, gender, social and economic situations or, as highlighted in this research, whether Internet-enabled ICTs is present and taken for granted in the learning culture. With this in mind, this research continues the discussion in relation to the research questions.

6.1. Learning Expressions and the Learning-Tablet Relation (RQ1)

In the themes generated above, the distribution argues that the municipality has moved into a mindset that encourages the learner to connect to spaces and 'rooms' for information and communication outside of the traditional, physical classroom walls [13, 37]. Based on the first theme – *the 'CrossActionSpace-Learner' is personified in 28% of all expressions of learning.* In 100% of all utterances,

applications work as 'door-openers' to spaces of communication and information. The tablet hosted those applications 93% of the time.

When a municipality has invested in technology that enhances communication and information, it makes sense that the learning culture emphasises it, encouraging students to develop language skills to achieve new knowledge. In the second theme, a fourth (25%) of all utterances are expressing the connection to the language. The importance of communication and language as a 'tool for learning' is recognised. The language learning is supported by the tablets in 50% of the utterances in this theme.

The third and the fifth theme show the two perspectives of guidance by someone and collaboration via the roles of the learners. Both perspectives are brought forward in the theoretical perspectives of scaffolding [21]. and the zone of proximal development [20]. When being guided, the learners' role is to be receivers or consumers. When engaged, learners are active producers. In this research the guiding part is more mentioned when the learners express 'what learning is'. 19,5% of the utterances was about being guided by someone and 10,5% related to engagement in the learning, where you as a learner collaborate and contribute with something in the learning process. In learning situations, teachers and other guides are important; learners are not expecting to learn everything on their own. The tablet is used in 18% of the time when being guided by someone, 27% of the time in learning interactions.

In between guidance and engagement, we find learners that express learning as finding out new things and making mistakes. 17% of all utterances connect to theories that support 'learning by doing'. The learner is the agent behind his learning. This theme argues for a *creative learner* who finds new knowledge [22,23]. What is *new* depends on how the learner perceives and values the knowledge. In this theme the learners are using the tablets in 56% of all expressed learning.

6.1.2. The Learning-Tablet Relation

Learners perceive a value of learning in a situation. If there is no perceived value of learning in a situation, it cannot be called a *learning* situation. If the situation valued as learning implicitly or explicitly includes the use of a tablet, then there is a connection between the learning and the use of tablets. This research found the learning-tablet connection in 55% of all expressed learning.

Learning was related to the tablets in 55% of all utterances about learning situations. This is a strong argument for the view that the use of tablets in relation to learning can be taken for granted and even that the learners can choose to use the tablets when they want and in relation to the learning situations that they value as learning. This indicates; the tablets are integrated into learning just like books, pens, rulers or other artefacts. This integration is expressed when a learning culture is taking the Internet-enabled ICTs for granted. Such a learning culture needs not use tablets all the time, only when useful, just as no educational setting uses books all the time.

6.2. Interrelations and Learning Outcomes (RQ2, RQ3)

The DLE project developed an organisational scheme of levels of the educational system in the municipality. This revealed a top-down and bottom-up approach that connects the classroom to the municipality leadership. This research informs the leadership of education about a rich and complex picture of 'what learning is'. The learners' view of 'what learning is' relates to and in a way evaluates 'The Learning House'. The relation can also be seen as the interpreted coherence between the learning in the classroom and the intended learning from the municipality leadership (Fig. 4.) In addition the learners' uptake and use of the tablets is embedded in the understanding of the learning in the learning culture.

This paper informs national and international decision-makers about a municipality that has taken a step into hyperhistory [37], where learning is tablet-related and schools are ICTs-dependent. What they can learn from this is that themes and their theoretical underpinnings show a variety of forms of learning are valued and that the 'CrossActionSpace-learner' is real in a hyperhistorical environment. What arguments exist not to have such a learner in the classroom of today, especially when policy documents on international and national level aims to open up education? This paper also shows a learning cultures' systemic work of developing education, where the 1:1 ICTs project is one part in the ambition to change the teaching and learning culture. The context shows plans, frameworks, purposes, and activities for supporting the use of the tablets. One can ask if this is the reason why *learners use tablets when it is perceived to be useful for what they express as learning.* Whatever the case, for learning-centred research of learning culture the systematic work of the DLE project is vital. It enables understanding of education on a variety of levels in the municipality—from the classroom to school leaders to local decision-makers. In Sweden, it is reported that such systemic work in implementation of ICTs in 1:1 programmes is lacking, despite its importance [2]. The lack of systemic work and planning is found in other European countries as well [1].

6.3. Learning-Centred Research…

The research design of this paper starts with the data collection methodology of learning situations. It focuses first on learning and second on the use of the tablets in relation to the learning. This is, in some ways, a learner-centred paradigm [52,53]. That paradigm, however, is sometimes understood as presenting a more dualistic view of teachers and learners; the learning process is split into who is teaching and who is learning where the teachers' role is underlined as crucial [54,55]. This paper approaches their relationship as more intertwined. The 'borders' between teacher and learner are blurring. Indeed, *who is the learner in this learning*

culture? The learner can be anyone contributing to the outcome of the definitions of 'what learning is', as presented in the findings. This view can be explained by the Russian term of *Obuchenie* [29] and the concept of *learning expeditions* [30,31]. Yet the municipality leadership also can be seen as being included as a learner in the learning culture. This is supported by the 'top-down and bottom-up approach' (Fig. 2) and by the coherence of 'what learning is' with 'The Learning House' (Fig. 4).

The combination of these viewpoints makes this research *learning-centred*, which is connected to the use of tablets. Another research study may be connected to another artefact, method, or training in any form of education researched.

6.4. …Raising Questions About Education

The learning culture adheres to a constructivist learning approach (constructivist epistemology) and none of the findings contradicts this. Some worry that such an approach tends to enhance social reproduction [42], to reproduce localised knowledge and "fail[s] to provide the intellectual tools of conceptual thinking and its medium in advanced literacy that lead to an imagined, yet unknown, future" [56]. This paper cannot confirm whether the approach has done so here; however, the school is opening up to other spaces and spheres outside of itself, which seems to weigh against this interpretation.

Learning-centred research, in this paper, argues that the posters and the interview data are representations of collaborative knowledge rather than individual knowledge. Collaborative or individual doesn't matter to the individuals who participated in this research—no one gave them individual grades for the outcomes, no representations were more valued than others. But what if they were? What if the same classroom used the same ways to learn where the representations of the learning outcomes (knowledge) were actually measured and graded? How could someone tell whether the learners represent an individual knowledge or a collaborative knowledge based on subjective reception and social agreements? Why would such an educational system grade students as being individually responsible for collaborative knowledge or even the collaborative discourse of knowledge? Experiences from this research raise awareness that sorting individuals and making them responsible for social representations of knowledge is complicated. Maybe it is more complicated now than ever before. Is it even out of date? Or do we need new forms of measurements for it, using the group or culture as the unit to analyse and grade? Especially with onlife [3] and infosphere [36] perspectives, where the 'CrossActionSpace learner' can be taken for granted in the learning culture?

6.5. Implications for Future Research

Is the new challenge to *support the learners' perceived values of learning* and even put it in focus of the scaffolding process? Would this increase the learners' perceived value of education? Maybe this is the core of educational and learning sciences of today together with the question of who the learner is in a learning culture. This research can be seen as interpreting all individuals in the municipality as learners that co-construct the knowledge of how learning is expressed. And what about my role as researcher? Yes, I am also affected by the process of co-constructing the knowledge of 'what learning is' in a tablet learning culture. Because being in the role of learner is inevitable when practising research.

7. Learning, Tablet, Culture – Coherence!

This paper explores and discusses the learning in an advanced 1:1 tablet learning culture. The research process of following this 1:1 tablet project with the timespan of three years, has meant "developing new forms of practices and interactions *in situ* in the following phrase: 'building the raft while swimming'" [3]. Accordingly, the paper highlights and presents three conclusions as key learning outcomes to inform educational stakeholders on a variety of levels. All conclusions are all about the interpreted coherence of three elements: learning, use of ICTs in education, and intentions of developing teaching and learning.

The first conclusion is that when researching the use of ICTs in education, it makes a difference if it is understood from an Informational, a Communicational or a Technological (sometimes even technical) perspective. This paper argues for a research approach where all three perspectives of ICTs are theoretically problematized and intertwined, interdependent and mutually related to a research object of interest for education, such as learning.

The second conclusion is that the 'quality of learning' or 'what learning is' indicate what kind of learning and learning activities to which the learning culture subscribes. It sheds light on the culture's epistemology and maybe even its very ontology. In this paper, it is possible to relate the learning to the use of tablets and the municipality's intentions of developing the teaching and learning culture. What about those municipalities that cannot relate learning to the use of ICTs in education or intentions for developing teaching and learning cultures, because they have none of these? What does this indicate?

Technology-integrated learning designs should be aligned or coherent with the learners' perceived value of learning in a co-evolutionary process. I call this: learning-centred technology alignment. This alignment was present in 55% of all expressed learning and leads to the third conclusion. That conclusion is that to understand tablets as fully integrated and in coherence with the learning culture doesn't mean that they have to be used in 100% of all learning situations. What is important is that learners can choose to use them when they are useful and choose to put them away when they are not. A learning-centred technology alignment of 55% can be interpreted as that the learners in the 1:1 tablet learning culture makes balanced and reflected decisions about when

to use the tablets for learning and when not to.

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