Digital Didactical Designs of Learning Expeditions

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Abstract. Current studies on media tablets illustrated that mobile technology may improve learning when truly integrated into learning settings. The question remains what truly integrated means, how it might be operationalized. In a study of Scandinavian classrooms, the question was how teachers adopt and integrate media tablets in their teaching practices in order to provide learning opportunities for their students. Seven K-9 schools implemented media tablets for around 2,000 students aged 6-16 and ca. 170 teachers in a 1:1 programme launched in 2012 (one tablet per student). Mixed methods, interviews, classroom observations and online surveys have been applied. The findings illustrate new forms of teaching practices. Studying technology integration from the angle of a socio-technical-pedagogical practice, it reveals the interrelationship of teaching processes and quality of learning. This study shows five forms of Digital Didactical Design in practice, which affect tablet-mediated learning expeditions – most of the designs boost learning, others restrict learning.

Keywords: Media tablets, didactical design, empirical study, digital didactics.

1 Introduction

Over last years, the increase of mobile devies in classrooms exploded. Almost every student has a smartphone; the mobile devices do not stop at the door of the classroom [12]. It raises a pressure on how to handle these technologies in teaching [40].

In earlier times, Information and Communication Technology (ICT) was segregated from the normal teaching classroom, for instance, in computer labs. This has been changed with the invention of smaller flexible devices, like media tablets. There is a shift from separating ICT and education to *co-located settings* [10]; mobile technology becomes *part* of classrooms; both merged into new communication spaces. In addition, there is the change that teachers perceive the mobile device more positive than years ago [16]. For teachers, media tablets are not only a version of a lightweight laptop [23]. For them, it is a new kind of technology that combines several features of both laptops and handheld devices and became a rather new multimodal device in teaching practices [17] [18]. Research on mobile technologies in K-12 education reports opportunities for improving student engagement and achievement of learning aims [7]. It can be assumed that the new situations affect teaching in different aspects.

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However, "technology will probably not change what it takes to learn (…) but it may change how the process of learning is facilitated" [28] – the adoption matters. Kaganer et al. [24] showed that media tablets improve learning when "truly integrated" into learning settings. The question remains what truly integrated means regarding the teaching practice.

In this study, we look on how teachers meet the new challenges, how they integrate the media tablets. More specifically, from a European Digital Didactics approach, the study asks how the new situation affects *digital didactical designs* in co-located settings where physical teaching spaces and web-enabled tablets *merge into multi-overlaid co-located communication spaces*. In Scandinavian schools, which launched a one-to-one program, one media tablet per child, the study explores the richness and diverse pictures of teachers' didactical designs applied in a media tablet rich environment. Based on empirical data, our study reflects on designs-in-practice and helps educators to make informed choices and decisions about engaged classrooms.

2 Theoretical Framework

Studies on media tablets in education illustrate that mobile devices are useful for creating content in an interactive way [34] [15]. Such devices improve teaching practices [7] that shift towards learning-centred classrooms [31] [36]. International studies reveals that such devices create a new quality for open access to information [21], useful for user-generated contexts [37], and are able to change the ownership and power relations [40]. Studies also show that the use of mobile ICT can enable student creativity and student collaboration [8] [9]. However, highly relevant is whether the tablets are integrated into the pedagogical design or not. A pure focus on the media tablets cannot explain the emergence of new digital didactical designs "since tools are always specific to tasks" ([41], p. 155). Research on the integration of technology, pedagogical and content/subject knowledge by teachers, known as TPaCK models [27] [29] points toward a lack of those studies. They focus on micro levels of learning from a learner's perspective; they neglect that teaching is also a *design project* developed and carried by teachers. On the other hand, "the discourse surrounding TPCK is in our view largely blackboxing how teachers appropriate, coordinate and collaborate through educational technology at the level of *practice*" [17]. Still under-explored and under-researched is the teacher's practice, how s/he enables learner-centred classrooms in co-located communication spaces.

Innovations such as new technologies lead to a new situation in schools on different levels. The use of media tablets affects many layers of education, how humans act in the classroom to the content, and affects different layers of European *Didaktik*: 1) the relation between teacher, students and content – interaction model (inner layer), 2) the didactical design (teaching aims, learning activities, social relations and process-based assessment) (middle layer) and 3) the didactical conditions including curriculum development (including examination), strategic institutional management and academic staff development (outer layer), figure in [17]. We focus in this paper on the middle layer, the Digital Didactical Design.

Digital Didactical Design (DDD) – act of modeling and forming the teaching practice for learner-centred classrooms. We define teaching practices as sociotechnical-pedagogical processes where the enablement of learning is the central purpose. It is not possible to deliver learning like people deliver products. However, it is possible to create opportunities for enabling learning. Teachers can restrict or enable learning by applying different designs helping to increase the likelihood that learning takes place [42]. This understanding has its foundation in the learning-centered paradigm, where students construct meaning rather than teachers deliver knowledge [11].

When European Didaktik (definition in next paragraph) claims that a didactical design is the foundation for planning and doing the teaching practice towards a shift from teaching-centered to learning-centred approaches [32] [2] [42], then research should be able to study such learner-centered applied didactical designs in practice.

The term "Didactics" (didactical) comes from the Scandinavian and German concept of Didaktik [26] and focuses on the relation between content-student-teacher, and stress the differences of teaching activities and learning activities ([30], [14]). Didaktik does not only include methods, 'how' to teach, but also embraces the question of 'what' to learn (curriculum and content), 'why', and 'when/where', in what kinds of situations and locations, and how it can be reached, e.g., resources, institutional and academic staff development. One central component in Didaktik is the cultivation of social relationships. Without this, a didactical design would be mainly teacher-led instead of learner-centred.

We call it "digital" since in an Internet-driven world, teaching practices are always technology-based; but they do range from low to high extent of use supporting different forms of learning where the quantity and the quality of the technology-integration vary. We focus on media tablets, instead tabletPCs, since the latter also represents a laptop where the screen is used as tablet, whereas a media tablet is a rather a small flexible lightweight device with easy Internet access via WiFi and 3G/4G.

With the concept of "design", the focus lies on specific educational components. A design is the act of giving a *form*; it shapes a focus and key points for doing teaching; it is process and product at once. A design makes specific teacher's actions and activities visible. It put certain elements of a classroom in the center but does not take the whole reality into consideration. A design is the teacher's act of modeling the teaching practices with the purpose to enable engaged student learning.

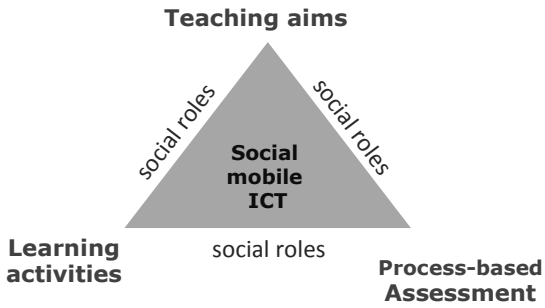

Fig. 1. Teacher's Design Elements and Relations – Framing Digital Didactical Design (DDD)

In *an ideal/dream world*, a teacher aligns following components to create a *form* for a learner-centred approach:

- teaching aims and intended learning outcomes are clear and visible
- learning activities are focused mainly on deeper learning (definition below)
- assessment is process-based (informed by guided reflections and "networked scaffolding" ([39], [4]), e.g., 3x milestones to adjust the DDD dynamically
- support of social relations and multiply social roles [19] [22]; teachers are process-mentor/learning-companion and students are pro-sumers/co-designers
- web-enabled mobile technology is multimodal integrated and gives access to overlaid, co-located communication spaces

How do the teachers do this in their practice; what *forms* do they give to their teaching practice; what designs do they apply in the classroom? The five elements together build the frame for modeling the Digital Didactical Design in practice (Figure 1); it links teaching processes to learning. The creation of such an environment affects whether learning can be achieved or not; when these five elements are constructively aligned, they build a purposeful *form*, then the likelihood is high that learning takes places and students are able to learn and meet the intended learning outcomes. A "constructive alignment" [5] is like a puzzle where the pieces complement each other to show a bigger picture.

This view on didactics, design and alignment put studies on technology-enhanced teaching and learning into a new light. Learning is not only a cognitive effort and teaching is not a delivery activity to reach the cognitive dimension. Instead, teaching is rather an activity-driven design, and learning is an on-going activity of knowledge production instead of consumption.

Quality of Learning – Continuum from Surface to Deeper Learning. Following the constructivism approach, learning is knowledge co-construction defined as co-creation of new knowledge that is "an active process of constructing rather than acquiring knowledge" ([11], p. 171). Active learning is related to the role of the learners, where they are not only consumers of information but also active agents and producers in the co-construction of new knowledge: pro-sumers.

Based on Kember's study [25], teaching has been seen for many years as delivery activity *as if* one could deliver learning where textbook readings are in the center of learning. Surface learning is described as remembering facts [1] and teaching contributes to surface learning in supporting the repetition of 'what is in the textbook' (teacher-centred classrooms). Deep learning approaches include activities such as evaluating, creating multi-perspectives [20], collaborative reflections [38]. Teaching that supports both surface and deeper learning helps the learners expand their thinking beyond consumptive behavior and beyond traditional reproduction of existing knowledge (intellectual, "conceptual change" [25]): the learner-centred classroom.

To contribute towards a matrix of quality of learning, a differentiation between individual and group learning is useful, too. The different *designs-in-practice* reach from surface, individual to deep, collaborative learning. Table 1 shows the continuum presented in table. Kember's study does not show how to support the move from surface learinng SI to DG deeper learning (illustrated by the arrow).

Table 1. Quality of Learning (Does the Teaching Practice mainly focus on SI, SG, DI or DG?)

	Individual learning (I)	**Learning in groups (G)**
Deeper complex learning (D)	*Examples (DI)* Multimodality, Critical thinking, Analyzing something	*Examples (DG)* Peer-reflective learning Evaluating and Creating in teams *(producer role)* *learner-centred classrooms*
Surface learning (S)	*Examples (SI)* Text-book readings Remembering, Understanding *(consumer role)* *teacher-centred approaches*	*Examples (SG)* Group learning: students split the tasks Applying

Our study explores the digital didactical designs applied by teachers in tablet-classrooms with regard to the quality of learning. The main research question is: What *forms* of digital didactical designs do teachers apply in their media tablet classrooms to support what kind of learning quality; to what extent and how? (RQ).

3 Methods

The community of Odder in Denmark with about 20,000 inhabitants and 7 schools implemented media tablets for all of their around 170 teachers and 2,000 students (K-9). The students got the media tablets in a 1:1 program (each child one media tablet) in January 2012. The municipality decided to buy media tablets because their laptops were out-dated. Instead of using new laptops, the community decided to use iPads. The school leaders and the local department of the teachers union were consulted and all parties agreed to the media tablets.

A qualitative approach with mixed methods [6] has been applied, particularly, classroom observations, teacher interviews, school visits (usually 1 school per day) and meetings with head teachers, as part of a larger study about media tablets and European didactics in schools and universities. In total, the research team was in the schools for 4 weeks (20 days) distributed over 2 years. Based on a voluntary sampling [6], 24 classroom observations (45-90 mins. each) plus interviews with the teachers (ca. 60 mins. each) were conducted in six schools in April 2012, August 2012 and August 2013; 7 male teachers and 17 female teachers. The teaching subjects ranged from Native Language, Math, English, Art, Music to Science such as Physics and Biology. The classes ranged from preschool class to 9th grade with different class sizes of 10 up to 27 students (a mix of male and female students). The *classroom observations* were usually conducted by two to three researchers with a training on how to do it and reflections after. They took notes, photos and video recordings with teacher permission. The classroom observations were theoretical guided and based on the digital didactical design elements, in particular, teaching aims, learning activities, forms of assessment, social relations, and degree of media tablet integration into the learning activities. Based on the experiences of a first round of observations, the observation sheet has been developed further. Through the data, it became clear that the concept of “constructive alignment” of the involved elements is a key issue and

the research team started to problematize the role of technology. The data illustrated that there is a differentiation between the extent of the tablet use – from low, medium to high extent. The observation sheet included (1) a description of the classroom from the Digital Didactical Design approach, to what extent the elements are in a constructive alignment, (2) how the media tablets are applied in the classroom, (3) communication patterns, social relations, roles (4) collaboration, forms of cooperative learning, (5) feedback and assessment, (e.g., process-based, when, how) (6) what is good/bad from the observer's point of view and why, (7) student learning, creative aspects, (8) special skills of the teacher, (9) anything else. The *interviews* were conducted by a total of three researchers and recorded. The interview guide was divided into five parts and contained 12 questions guided by the didactical design approach.

Data from the observations and interviews were first analyzed according to each classroom and then open coded [3]. For the data analysis, a scheme has been derived from the Digital Didactical Design model in order to make the different designs-in-practice for each classroom visible. The data were coming from the observations and the interviewed teachers. Each classroom was evaluated on this scheme (Table 2).

Table 2. Scheme for data analysis (per classroom)

Orientations towards Learner-centred classrooms	Description - data based	Component addressed? Y/N	**To what extent does the component support the learner-centred classroom?** 5=strong; 1= weak alignment
Teaching aims are visible/ clear? Are intended learning outcomes visible/clear? **Co-aims** by students included?			*Details of the design*
Learning activities are clear and appropriate, corresponding to teaching aims?			Surface to deep learning? Engaged classrooms?
Feedback: assessment is process-based? Guided reflections teacher/peers/self-assessm.?			Process-based?
Social relations/roles: teachers/students act in multiply roles? Which ones? Does the teacher explicitly support the cultivation of social relations; if yes, how?			Teacher=expert, process mentor, learning-companion, ...? Student=consumers, producers, collaborators, …?
Is the media tablet multimodal integrated? into the whole learning scenario			What is the purpose of using the media tablet; what activities are supported?
Overall analysis per classroom	Brief summary	How many addressed components in total?	-Summary (how many aligned components in total towards a learner-centred approach?) -Extent of tablet use as high (3) medium (2) low (1)

Low, Medium, High Extent of Tablet Use. The research team analyzed the teachers' applied designs based on what they did in the classroom including what they said in the interviews. In addition, the extent of the media tablet integration was analyzed: a low, a medium and a high extent. A low extent is defined as a non-value of using media tablets in the classroom situation or it was not evident; for example, the media tablet is a substitute for pen and paper or a textbook substitute. A medium extent is assigned when the media tablets are a substitute for other existing digital devices that also could have been used, for example, a computer, laptop or a digital camera. A high extent is defined when the use of the media tablet shows special characteristics

or features what no other device can make right now, for example, special apps, an one-in-all device, a multi-modal device.

The analyzed data were checked by content- and peer-review validation; at least 3 researchers checked the analysis of the data. Such a *communicative* validation was done by using inter-subjective methods that proves the quality of the findings [3].

4 Findings

The 24 observed classrooms have been analyzed to make differences and similarities visible. For every classroom, the data can be analyzed towards its applied Digital Didactical Design (Fig. 2); where the inner frame represents a rather teacher-centred (1) and the outer frame represents a learner-centered approach (5); on a 5-point scale from 1 to 5. Figure 2 gives an example of three analyzed classrooms (marked in different shades of grey). To each classroom, a summarized value has been derived, which is shown in Table 3 under "how many elements support the learner-centred classroom?". Table 3 illustrates the total amount in combination with a low, medium or high extent of the tablet use. The data indicates different *forms* of Digital Didactical Design; e.g., the classroom ID 6 has five aligned elements (=5) plus a high extent of the tablet use (=3) makes 8 in total. The research team defined that 1-2 is one *form*, 3-4 is another one, 5-6 is the third form and 7-8 is a fourth form. A special case is ID 3. Five *forms* have been explored named as MD, DD, BT, PD, RE.

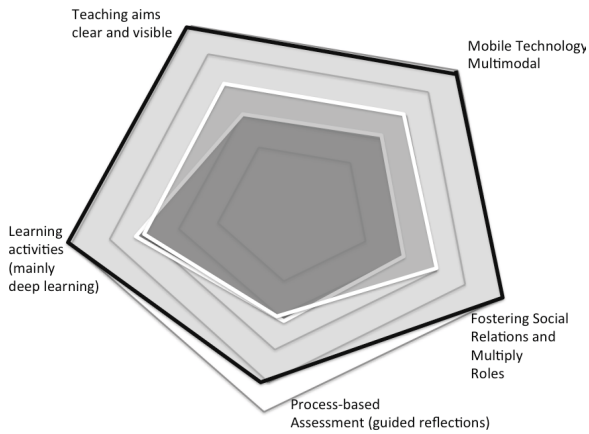

Fig. 2. Example of three analyses– one *form* per classroom (inner circle 1=teacher-centered; outer circle 5=learner-centred class)

Table 3. Classes representing different *forms* of Digital Didactical Design

ID	Subject (grade)	To what extent do the five elements support the learner-centred classroom and how many are aligned?)	Media tablet extent of use high=3; medium=2, low=1	Forms
5	Math (2nd)	5	+High (3)	=MD
6	Preschool class	5	+High	=MD
10	Arts (8th)	5	+High	=MD
11	Physics (9th grade)	5	+High	=MD

Table 3. (*continued*)

17	Language (7th)	5	+High	=MD
18	Chemistry (9th)	5	+High	=MD
20	History (5th)	5	+High	=MD
21	Language (4th)	5	+High	=MD
23	Language (5th)	5	+High	=MD
4	Math (1st)	4	+High	=MD
24	Language (9th)	4	+High	=MD
8	Writing skills (7th)	4	+Medium (2)	=DD
7	Music (6th)	3	+High	=DD
15	Geography (3rd)	3	+High	=DD
22	Geography (4th)	3	+Medium	=DD
16	Religion (3rd)	3	+High	=DD
3	*History (2nd)*	*1*	*+High (3)*	*=BT*
2	Language (2nd)	2	+Medium	=PD
12	Geography (5th)	2	+Medium	=PD
1	English (6th)	2	+Medium	=PD
13	Preschool class (0th=	3	+Low (1)	=PD
19	History (3rd)	0	+Medium	=RE
9	Science, Biology (1st)	0	+Low	=RE
14	Language (3rd)	1	+Low	=RE

MD = Media-tablet-Didactics (7-8)
DD = Digital Didactics (5-6)
BT = Benefit of Tablet integration (special case, 4)
PD = Potential for a digital didactical design (3-4)
RE = RE-alignment required (1-2)

The boxplot analysis in Figure 3 shows a correlation between aligned digital didactical designs and a high extent of the tablet use and vice versa.

It is important to stress that every classroom is rich of information itself and provides a *complexity* of information that cannot be mirrored in numbers such as in Table 3. Please read for further information our detailed qualitative study published in [18]. The purpose of Table 3 is to illustrate that there exist different designs-in-practices which can be clustered in different forms. We've chosen these clusters since it is useful to understand the different designs; the five *forms*

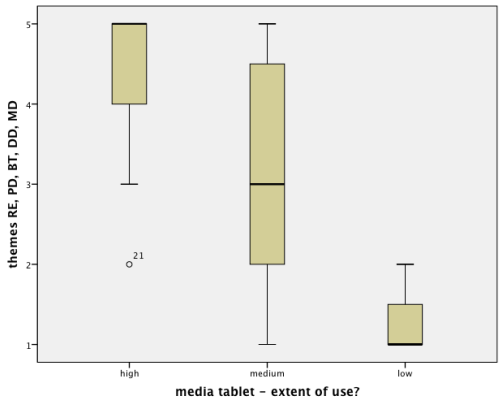

Fig. 3. Boxplot analysis - Correlation of digital didactical design forms and extent of tablet use; y-axis: 5=MD, 4=DD; 3=BT, 2=PD, 1=RE

do not go to much into detail (otherwise we would have 24 forms) but also they are not too general (e.g., only 2 clusters); this would be difficult to explore differences/similarities across the cases.

5 Discussions and Implications

One possible way of discussing the similarities and differences of classrooms is the exploration of their different applied designs.

Form of Media tablet Didactics (MD). 11 of 24 classrooms (ID=4, 5, 6, 10, 11, 17, 18, 20, 21, 23, 24) show the full potential of a digital didactical design in which the elements are constructively aligned to increase the possibilities for learning. The five elements of a DDD are aligned in such a combination that they foster the intended learning outcomes (defined by the teacher) and foster a learner-centred approach.

Form of Digital Didactics (DD). There are five classes (ID=7, 8, 15, 16, 22) that used the media tablets as a laptop substitute to reach the intended learning outcomes. The only difference to MD is that the teachers didn't use the unique potential of a media tablet as a multi-modal device. The cases of the DD show that the tablets are also useful when not using its full potential as a multimodal device but more as a laptop function. The teachers said in the interviews, however, when using the tablet like a laptop or for writing assignments, there are some obstacles, for example, there is no keyboard for writing and that makes a tablet slower than a laptop and then, an external keyboard for the tablet is required.

Form of weak alignment but Benefit of Tablet-integration (BT). The classroom ID 3 is an interesting case. The class was a traditional class, teacher-led, where process-based feedback and the design of social relations were not aligned at all. The rest of the digital didactical design elements were in a constructive alignment, however, with the goal to foster the traditional teaching such as "Instruction-Response-Feedback" [33] and less collaboration. The observers reported that the whole classroom was rather a weakness of not creating a supporting learning culture, which was obvious during the observation. But the media tablet integration made then the difference. The students got the task to create a movie or a book (students' choice) about the historical person called Kristian IV in order to show the teacher what they have learnt. The collaborative production of a movie by using the iMovie app was an added value to foster learning by producing. Through the phase of producing the students also reflected on what they created and discussed changes.

Form of Potential for Digital Didactics (PD). Four cases (ID=1, 2, 12, 13) have in common that the five components of the Digital Didactical Design are rather weak aligned; the added values of the media tablets and why to use them were not clear. The cases also show a weak alignment to reach the intended learning outcomes. The classes did not limit learning but rather did support a non-constructive alignment; a sign for teacher-centred classrooms. The classes integrated the media tablets in a medium to low extent. The potential for a stronger constructive alignment was obvious.

Form of RE-alignment of a digital didactical design; better without tablets? (RE). The data reveals three cases (ID=9, 14, 19) in which the integration of media tablets reduced the students learning experiences and restricted learning. The use of the media tablets and the didactical designs in those classes where not connected in such a way it would be beneficial for students learning. Instead it seems that the media tablet was applied in a way that limits the learning activities instead of supporting the intended learning outcomes.

Table 4 illustrates the digital didactical designs and its range from individual to group learning, 13 of 24 classes supported group assignments (9 collaborative deeper learning, 4 group assignments on the surface learning level); 11 classes focused on individual learning where 9 classes did support deeper learning and 2 surface levels. With regard to the MD+DD, 8 out of 16 classes might be labeled as "DG" (deep, group learning) and 0% are in the lower left (SI, surface, individual).

Table 4. From surface to deeper learning and from individual to group learning

	Individual Learning (I)	**Learning in Groups (G)**
Deeper complex learning (D)	• Transforming a math story (ID5) MD • Creating a multimodal book review (ID6) MD • Creating chronological order (ID21) MD • Creating a Multimodal Story (ID 16) DD • Finding animals across the globe (ID 22) DD • Individual produc. of audio product (ID 1) PD • Creating a digital story/proverbs (ID 2) PD • Writing a non-fiction story (ID14) RE • Individual timeline (ID 19) RE	• Collaborative writing (ID10) MD • Collaboratively designing of physical experiments (ID11) MD • Creating chemical experiments (ID18) MD • Collaborative creation of a multimodal product (ID20) MD • Collaborative production on "Explains everything" (ID23) MD • Creating a multimodal product from a graphical novel (ID24) MD • Collaboratively producing of music (ID 7) DD • Peer-reflective learning (ID 8) DD • Collaborative production of a video/movie (ID3) BT
Surface learning (S)	• Role-playing teacher-led (ID 13) PD • Mind mapping existing knowledge (ID9) RE	• Group discussions about math (ID4) MD • Group work outside of the classroom (ID17) MD • Finding/discussing distances, GoogleMaps (ID15) DD • Creating a digital presentation (ID12) PD

Since the selection of the classroom was based on a voluntary sampling, they are not representative all classrooms in Scandinavia. The data, however, reveals a richness of applied digital didactical designs in the teaching practice. From the perspective of innovative classrooms, the data is useful to analyze the potential of what is possible when using technology such as media tablets and what hinders learning.

Design Guidance – from Course-Based Learning* to *Learning Expeditions? The classrooms illustrate different forms of digital didactical designs (DDD) in practice clustered in five *forms*. It is not a surprise that the usage of media tablets in some of

the classrooms focused on enhancing deeper learning and others support surface learning. In some cases the applied design even limited the chance that learning takes place (*form* RE). The merging of all components such as new technology, aims and activities into a new digital didactical design lead to different *forms* – this is what our study illustrates.

When we have a detailed look into the classrooms, which foster group learning, then, one key principle could be explored which they have in common: They created learning opportunities which went from a course-based learning approach to student-centered learning expeditions. The characteristics of – and design guidance for – learning expeditions are:

- *New types of learning goals – more than one correct answer exists*. The teachers in Denmark created those digital didactical designs that enabled learning towards different possible solutions, where no correct answer exists, "learning when the answer is not known" [13].
- *Learning in classrooms moves into design projects*. Adopting the media tablet, the teachers in Odder created digital didactical designs that focus on learning as a *process*. The teachers activated the engagement of the students and their motivation by requesting them *producing* something; knowledge production over consumption. One teacher argued, "*I want to set the knowledge of my students free*" (ID11) that is why he created designs for learning focusing on knowledge production in groups. The media tablets helped to make the student's process visible.
- *From textbook reading to learning that turns into exploring sth*. The teachers combined traditional textbook readings with open-ended, unstructured spaces where students have been encouraged to experiment, play and explore topics.
- *Teachers foster students to make their learning visible in different products (and apps)*. While using different apps, the students shared their learning situations to learn from each other via co-located communication spaces. The assignments were created in a way that the students could choose how to make their learning visible; they did not only choose "to write". The teachers also supported students to create other products like digital paintings, digital stories, comics, movies and podcasts. The teachers used apps, which were originally not made for school purposes (e.g., Bookcreator, Puppetpals, Popplet, Stripdesign, Comicbook).

MD and DD clusters show that the classrooms moved from teacher-centred concepts to *Learning Walkthroughs* that presupposes a rather designed learning landscape more closely guided by teaching but with a greater variation and more student options to work and learn than the traditional course. The next step towards learning expeditions needs still to be done. Some classrooms (e.g., ID18, ID24) are on the way towards *Learning Expeditions* which are similar to learning walkthroughs; however, learning expeditions are more open-ended, problem-based learning paths, and contribute to goal/objective-oriented learning (e.g., to master X or to explore and understand the implications of Y) and the methods and instruments are very open. Learning does not take place in straight-ahead processes but in *loops* and detours, back & forth.

With this approach, we provide an alternative evaluation matrix for educational institutions for their teaching and learning practice; they don't need to rely on PISA only. This alternative option combines a two step approach: (a) studying Digital Didactical Designs in practice, including a qualitative in-depth description of the cases

(published in [18]) and (b) the perceived value of learning from the students' perspectives as published in [35] available in this volume of ECTEL2014 proceedings.

6 Conclusion

The aim was to explore teaching practices from the perspective of digital didactical designs and to make similarities and differences visible. The study explored five forms of digital didactical designs towards a engaged learner-centred classroom practice from bottom-up, a) specific media-tablet-Didactics, b) digital didactics, c) weak alignment but benefit of media tablet-integration, d) potential for digital didactics and e) re-alignment of designs for learner-centred classrooms. Some teachers created new digital didactical approaches they transformed their traditional classrooms into creative learning expeditions for their students. Other data showed potential for improvements, which the research team discussed with the teachers. Our main findings are:

- We developed a generic language for discussing, exploring and observing teaching and learning in technology rich environments where educational technology is used towards a shift from teacher-led to learner-centred classrooms; we call it Digital Didactical Design (DDD).
- This model was then used to analyze the data in schools in a Scandinavian country. Based on the data, we are also able to revise the DDD model.
- With the DDD model, we are now able to present the richness of different designs in the teaching practice in the context of 1:1 technology programs.
- The DDD model is especially suitable in contexts where new paradigms of teaching and learning in educational institutions such as Learning Expeditions are emerging where new technology is *one part* in this shift. The language of the model may be seen as primarily connected to the mesolevel (teacher's practice and student learning in classrooms); it does not focus on the micro-level in detail (human-content-interactions) or macro-level (institutional strategy viewpoint).
- With the reflection by the help of DDD in combination with the further development of the DDD, we now have an approach that focus on a) teachers' applied designs-in-practice b) technology in relation to the teacher's design, merging into new designs, and c) the extent of technology use. It means that we now have at least three ways to how we are able to present the results from a multimodal perspective and that is one benefit of the DDD model.

The teacher's role is one important engine for innovation; it makes the difference when the Digital Didactical Design (DDD) is aligned towards learner-centred classrooms. The innovative teachers in Odder (DK) applied new forms of DDD. Our study shows how such designs contribute to deeper learning to help the learners to reflect and deepen their skills on their way to become critical-constructive pro-sumers.

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