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USING DIGITAL TECHNOLOGIES FOR INCLUSION THROUGH STRENGTHENING PARTICIPATION AND CONTRIBUTION FOR LEARNERS WITH DEVELOPMENTAL AND ATTENTION DEFICITS

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Abstract

This paper investigates the potential of digital technologies for strengthening the participation and inclusion of learners with developmental and attention Deficits (focus learners) into the mainstream classroom. The paper describes the authors' approach to the challenge of researching the extent, to which digital technologies may support the learning process of focus learners – in particular in those aspects of the learning process that deal with the construction of learning products and the communication and dissemination of knowledge to peers. On the basis of the actual analysis and a succeeding discussion, the paper concludes with a description of the findings.

Introduction

It is beyond any doubt that the last decade of digital technologies and social networks has produced a changed educational environment (Conole, 2013). New possibilities for digital educational approaches, tasks and methods have come into focus. In general, this situation has offered new possibilities for inventing novel pedagogies resting on the affordances and utilization of digital technologies. It has enabled new educational designs, which – to a higher extent than earlier – rest on pedagogical bottom-up approaches (e.g. Sorensen, 2014), which offer learners an alternative way of becoming involved in the educational process as true agents. Simultaneously, the societal/governmental demand has increased dramatically in terms of schools to be able to include children with special educational needs (SEN) in the mainstream classroom.

The present paper uses the term *focus learners* to denote youngsters with developmental and attention deficits as e.g. Attention Deficit Hyperactivity Disorder (ADHD), Attention Deficit Disorder (ADD) or Autism Spectrum Disorder (ASD). It addresses the challenge of including *focus learners*, i.e. youngsters with developmental and attention deficits (see Andersen & Sorensen, 2015, for a more detailed description of the characteristics of the target group). The characteristics and symptoms of the group seem sensitive to the situated demands and the level of cognitive complexity of a task (Barkley, 2006). Their attention can rapidly fluctuate, and they are driven mainly by motivation arising from their hyperactivity and impulsivity. It is widely recognised, that children with developmental and attention deficits call for both

support, praise, acknowledgement and appreciation combined with clarity, aid and strategies to master complications in their tasks at school (ibid.). Poor school performance, social problems with peers and authorities (e.g. parents and teachers) combined with lacking self-confidence or self-esteem draw the picture of many youngsters with ADHD, where 65 % of them are still affected by their ADHD in the adulthood (Faraone et al., 2005). The number of learners in primary and secondary schools with challenges as described above has increased tremendously over the last decades (Due et al., 2014). Both teachers and schools are desperately looking for new methods and approaches to help the inclusion of focus learners in the mainstream school system (EVA, 2011). The contribution of this paper is to investigate whether the potential of digital technologies may contribute to support the challenge of inclusion in schools of youngsters with developmental and attention deficits.

Analytical optic

> *"Experience is, for me, the highest authority. The touchstone of validity is my own experience. No other person's ideas, and none of my own ideas, are as authoritative as my experience. It is to experience that I must return again and again, to discover a closer approximation to truth as it is in the process of becoming in me." Rogers (1961; pp.23-24).*

From this viewpoint it becomes quite clear that – as claimed by both Rogers (1961) and later confirmed by Wenger (1998) – it is not possible to teach another person "directly". Rather, it is possible only to humbly facilitate his learning (Smith, 2004). But how, then, more closely, may the affordances of digital tools that facilitate genuine inclusive learning be assessed and understood? Dalsgaard and Sorensen (2008; pp.272-279) offer a typology for digital tools that group these according to the indisputable affordances they offer in relation to two main types of functionality of learning: (a) *Participation in processes of communication* (dialoguing and stimulating the creation of communicative networks and awareness); (b) *Participation in processes of production* (using digital technologies to create and share digital products). Andersen & Sorensen (2015) sees a great potential in these types of technologies, also for focus learners. Being utilized in the hands of teachers as tools for helping the inclusion in mainstream classrooms of youngsters with developmental deficits and difficulties in focusing attention (ibid. Sorensen, Andersen & Grum, 2013; pp.389-397) creates great expectations with respect to *empowering* learners and helping the *process of inclusion*. Empowerment may be defined as the ability and power to control ones own life in a manner that makes space for understanding, influence, and meaningfulness in a way that promotes insight, transparency and ability to act as an active citizen. Empowerment is *both a process and a goal* in itself (Hoskins et al., 2006; Meyer et al., 2007; Sorensen, 2014). But which qualities of learning, does a process of *genuine inclusive learning* carry along? In Rogers' concept *experiential learning*, the main focus is on *personal change and growth* – and on the experience of the learner of being included. While generally acknowledging the significance of collaborative learning methods, Sorensen and Ò Murchú (2005) – inspired by Rogers (1969) and Colaizzi (1978) – presents an attractive existential understanding of the concept *genuine inclusive learning*. The

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following principles for *when* authentic inclusive learning can be said to take place, may be distilled: (a) When a learner participates and controls a significant, relevant process that is true to him/her; (b) when a learner participates and external threats are low; and (c) when reflection and meta learning (i.e. learning-to-learn) are the primary methods of assessing progress or success. Using the above generated optic, this paper wishes to explore the ways in which *digital modes of expression* and opportunities for *participation in processes of production of visible reifications* (i.e. structures for constructing, disseminating, reifying) may assist the inclusion of youngsters with developmental difficulties and difficulties in focusing attention: How may focus learners enhance their possibilities for developing a conscious and reflective understanding of their own capabilities and competencies?

Research design

This piece of research is one of the outcomes from a wider research design, ididakt by Andersen and Sorensen (2015), Andersen (2015) and Sorensen, Andersen & Grum (2013). Ididakt is an iterative and explorative qualitative research project, where data is collected in a real school context. It is a case study in the frame of EDR [Educational Design Research] using a hermeneutical, phenomenological interpretation of data. EDR is a "genre of research, in which the iterative development of solutions to practical and complex educational problems also provides the context for empirical investigations, which yields theoretical understanding that can inform the work of others" (McKenney & Reeves, 2012 p.7). A key element in the research design is that the research process integrate the teachers and goes hand in hand with their work and interventions into the field of study, and become a learning process for them in how to work with SEN learners and integrating ICT in the classroom and that the research process takes place in the real life context of the mainstream classroom (Andersen & Sorensen, 2015). An intervention model mirroring five types of ICT-based interventions was concluded (Andersen & Sorensen, 2015). While these five intervention types are presented and discussed in five separate research papers (e.g. Sorensen & Andersen, 2016a; Andersen & Sorensen, 2016b), this paper will be dealing with the extent to which participation and contribution of focus learners may be enhanced through the use of the ICT-based intervention, "Production & Dissemination" (Andersen & Sorensen, 2015, Figure 1).

Analysis and findings

Digital technologies have been used across 26 classes to facilitate and strengthen learners' participation in aspects of the learning process, such as the production of learning reifications and the distribution of learning activities. Table 1 mirrors the overall implementation of interventions in contexts of "Production & Dissemination" (Andersen & Sorensen, 2015, figure 1), as well as the specific impact from the analysis. Our analysis may be grouped in three overall types of interventions in the learning process, with regard to supporting learner participation: (a) Digital templates/structures scaffolding individual learning PROCESS; (b) Digital structures/templates scaffolding PRODUCT creation; (c) Digital structures/templates ASSISTING reading and writing (facilitating comprehension and communication).

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Table 1: Overall implementation in use context, and impact of intervention types on participation

Overall types of interventions in use context	Digital templates/structures *scaffolding learning PROCESS* for creation of text, image and video (e.g. writing templates, tools for sound/video production, PowerPoint, GoogleSlide and BookCreator, etc.)	Digital structures/templates *scaffolding reification of PRODUCT* (e.g. presentation tools, multi-modal production tools, Google Slides, Google Docs, etc.)	Digital structures/templates *ASSISTING reading and writing* (*comprehension and communication*) (e.g. Dictus, CDord, VoiceAssistant, AppWriter, etc.)
Impact on participation	- creating "safe ground" - supporting motivation - supporting multimodal expression and communication - helping contribution - helping collaboration - reducing risks - reducing anxiety	- appear open/inviting - provides structure and guidance - support multimodal expression and communication - reduces learner insecurity support sharing and disseminating	- teachers report unambigiously that these tools creates opportunity for participation

The more detailed analysis of each of the three groups of interventions is organized according to the parameters of learning quality they involve and support.

Digital templates/structures for individual learning PROCESS

In terms of digital tools and templates for structuring and managing PROCESS, teachers report that several learners experience structural support for the management of learners' processes. Interventions with structuring tools/interventions are likely to facilitate *enhanced participation* of learners. While providing structures/templates that give more overview and guidance of the task at hand, learners are more likely to feel inclined to *participate*, if their level of frustration is comfortable. Structures/templates scaffold enhanced understanding and stimulates a feeling of *safe ground* to act. The templates appear flexible in terms of learners themselves being able to adjust the level of support to their needs. The tools have also been said to possess the potential, easily and comprehensively, to bring and facilitate fun into the classroom – i.e. *supporting motivation*. Teachers have been using writing templates as well as sound and video supporting tools to create a feeling of safety in learners and for the purpose of enabling and framing learners' use of *multimodal expressions* in their learning products: "He [the focus learner] needs a frame to become motivated to solve a written assignment" (teacher statement, School F, 4th grade). Moreover, the teachers have also used tools (e.g. BookCreator) for supporting the coupling of various *modes of expression* into a whole *reification* (e.g. a book) that aims at reifying a whole product or outcome of a learner's learning process. The affordances of these tools seem to be concerned with their support of holistic multimodal types of expressions and representations of a longer process (e.g. a narrative). Helped by this type of technologies, teachers also, experienced *growth of focus learners* to become able to actively *participate* in the learning process "B has independently

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succeeded in solving the assignment within the lesson (…) systematically using the template. It is the first time in my experience that B has independently solved a written assignment during the school day" (teacher statement, School F, 4th grade). It provides the learner with self-esteem and most likely increases his feeling of being-able-to: "I have adapted templates … they fit to us and there is a correlation and familiarity with process and template" (teacher statement, 4th grade). Teachers see indications that learner motivation increases through the use of writing boxes, image boxes, etc. and through experiencing humour and enjoyment: "learners express enjoyment, and emphasize that it has been a fun experience – a success – to write and draw images of the main character. None of them wants to work without a template. "Our focus learners find it difficult to structure a text" (teacher statement, (School B, 7th grade). Focus learners "display *motivation*, assume *responsibility* and display ownership throughout the whole task" (teacher statement, School C, 4th grade). These tools enable learners themselves to adjust the level of scaffolding and, potentially, increase or decrease the level of scaffolding, and "instructions and explanations may be supplemented, multi-modally, with sound and images" (teacher statement, School A, 7th grade). Teachers stress that improvement is happening, when they utilize structuring tools for focus learners "success with the BookCreator template, containing writing boxes, image boxes, etc.; focus learner gets motivated, assumes responsibility, demonstrate ownership and remains participating during the whole assignment" (teacher statement, School J, 8th grade). This experience of increased empowerments is also gained in the lower level classes: "learner could independently and systematically carry out the task within the timespan of the lesson. It is the first time I have experienced that this learners has actually independently carried out and handed in a written assignment without an extension of time" (teacher statement, School F, 4th grade). Also in terms of motivation a positive experience is made: "the learner has succeeded in writing a story in the template. He states that he had a good process" (teacher statement, School F, 4th grade). But we also meet with disillusioned statements from the teachers concerning their use (or non-use) of digital tools: "I have downloaded the software, but it does not work, neither on my own iPad, nor the iPad of the school" and "I cannot come back again after an attempt to mail my text out of iVoice, and I cannot find an overview of the texts that I have recorded" (teacher statement, School C, 6th grade). The digital tools and templates seem in some cases to actually spawn teacher experiences of focus learners gaining a *feeling of being included*. Collegially, the teachers also communicate amongst them. We tried to convince teachers to start using Dictus for learners and, before the learners go to independent boarding school in the 9th grade. But teachers comment that "there is not enough time to teach them use Dictus" or "could you not arrange a free test period? But who would be helping them with access, installation etc., so we did not offer that". This feeling of powerlessness among teachers seems a very frequent and general problem (Andersen & Sorensen, 2016b). Teachers assert that learners seem to lack qualifications about "contributing" in a digital world, and that using structures/templates more easily stimulates and maintains not only learner participation, but also learners contributing and learners collaborating: "B and his peer seek on the internet an answer to their assignment. When they return, their text is gone. They have to start all over again. Learners are not used to inserting images from the internet – they don't know the

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method" (teacher F, 4th grade). *Reducing risks* and empowering learners that do not have faith in themselves and their own abilities is not a simple pedagogic task. Often the teachers detect a level of insecurity, which causes focus learners to stay "under the radar", i.e. causes them to want to "hide" instead of taking communicative, collaborative or other social initiatives. Too many defeats and experiences with the systems are likely to cause them – like burned children – to withdraw from taking initiatives, or to experience anxiety: "For M it is about structure in relation to content, for B it is about fear related to the white paper. He needs a frame in order to feel motivated and to dare solving a written assignment" (teacher statement, School F, 4th grade).

Digital structures/templates for PRODUCT creation

It is important for learners to be able to *reify learning items* (e.g. create and disseminate) and mirror learning processes. In terms of digital tools for reifying and for facilitating PRODUCT creation, teachers report that several learners find structural support as well as support for more "rich" expression through multimodal expression and visual communication. Templates seem to provide *general support for various tasks*. Teachers report that they help learners in general, as well as focus learners: "The templates provides support for everyone, and learners with surplus are able to break the frames. The structure of templates do not constrain anyone, it is open and inviting – not close and inhibiting. It benefits all learners" (teacher statement, School B, 7th grade). It helps them to structure their task. "Perhaps it can be a good idea in certain situations to have a common sound file, which he may use as brainstorm for the succeeding writing work in Dictus" (teacher statement, School B, 6th grade). "It gives them stabile frames facing an otherwise open and wide task" (teacher statement, School I, 2nd grade). "An example of good use of a *structuring intervention*" (teacher statement, School A, 7th grade): "We use a BookCreator book with a literary assignment to work with a youth novel. We start with a description of the goal and pieces of the task, so the learners themselves can turn up and down for the level of scaffolding. The written presentations are in several places accompanied by digital sound and image recordings, with instructions and explanations. Perhaps it is a good idea using a common sound file, which he may use as brainstorm for the succeeding work in Dictus" (teacher statement, School A, 7th grade). Several teachers look upon structuring tools (e.g. BookCreator) as user friendly tools that are able to scaffold the creation of a product in a fast and easy manner: "User-friendly tool, with a book as a quick result. The learner may easily navigate and orient himself via recognizable icons, headings and text boxes" (teacher statement, School d, 4th grade). Digital technologies offer possibilities for *multimodal expressions/communication* amongst learners. "The tasks the learners are supposed to carry out vary between written, sound or image production. The learners can continuously choose which task they engage with/in and which form of expression they want to use" (teacher statement, School A, 7th grade). Technologies (open educational resources), however, are not always perceived by teachers as simple pedagogical tools: "A student by accident erases everything. It is difficult on iPads, on which there is no undo-bottom in apps" (teacher statement, School I, 2nd grade). But there is also the opposite experience: "R is doing well, when he is allowed to work multi-modally. He has done well with a home assignment on

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family heritage" (teacher statement, School B, 6th grade). Teachers may help learners *to produce reifications* of their learning processes and their work. This may be done in a variety of ways. "The teacher may put in relevant concepts and ask the class to reflect and reify" (teacher statement, School F, 4th grade). "Learners work in PowerPoint or Prezi. They are to make an assignment about Punk. They are working independently, or in pairs" (Observations, 10th grade). A focus learner use a tablet and a speech-to-text software. "It is because it helps a lot" (teacher statement, School B, 6th grade). It enables learners to produce written texts verbally. An example of a way of working multi-modally: "Learners make re-tellings of Soria Moria castle in iMovie and upload to Skoletube. They produce together in groups part of the story, and they produce the illustrations. In this way they learn – zooming in and out – how they may use several illustrations in the same drawing. Learners produce keywords for their stories. They are not reading, when they produce speak-over. They must repeat in their own words. They produce keywords – and practice" (Observations, 4th grade). In general, it seems that the book template spawns motivation, ownership, and learner responsibility. In sum, digital structures appear to be fruitful tools supporting participation and inclusion, as they structure the learning process and, thus, invite, enable and empower the learner to participate.

Digital structures/templates ASSISTING reading and writing (facilitating comprehension and communication)

Teachers observe that a large proportion of focus learners seem inhibited by difficulties in reading and writing (facilitating comprehension and communication). This affects their processes of acquisition and dissemination of knowledge. In terms of digital templates/tools and digital interventions for ASSISTING focus learners' comprehension and communication, teachers report of a high level of unambiguous success. Also focus learners themselves seem to feel that these technologies widen and extend their visibility and abilities. They course them to more easily communicate, write and share with each other. Now, which types of assistive technologies are better to work with? Learners mention Dictus, as Dictus is able to write what is said via a Nexus tablet. It is popular in all subjects. A teacher recommends the Nexus tablet to learners from the point of view that it fits with Dictus: "It is because Dictus helps a lot" (teacher statement, School B, 6th grade). Another teacher F mentions writing software (Word) as the best type of software for her on the computer, because CDord functions with that. This is not the case with SmartNotebook, which she otherwise normally likes to use, because "it allows me to write many strange letters and invites me to make a beautiful layout" (learner, 4th grade).

Discussion

Our investigation has employed digital tools and interventions in learning situations with the aims of supporting, in particular (a) the facilitation of PROCESS, (b) the creation of PRODUCTS and, finally, (c) the ASSISTANCE with aspects of comprehension and communication. This analysis has demonstrated how various types of digital tools may be considered tools for inclusion as well. It becomes clear that good quality interventions with digital technology *invite and support participation and dialogue* – also in the *planning of the*

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learning process of the individual focus learner. Good quality interventions incorporate *opportunities for reflection*, tools and *structures for construction* and *dissemination* of their knowledge (to demonstrate "I am able to"), diverse, multimodal and assistive digital modes for communicating, collaborating and contributing. This promotes basic democratic and empowering skills, such as e.g. learning how to listen to other voices (Wegerif, 2016). Thus, to interact and dialogue with the focus learner and then decide about relevant questions to be investigated, enhances both *ownership* and *awareness* in the focus learner about his/her own process. The analysis above, organized in different categories, shows that digital technologies and interventions to a certain extent seem to provide focus learners with "handy" methods and tools for managing and participating in learning processes. It is vital in the process of *becoming aware* to employ the digital tools to *facilitate reifications* (visualization, organisations, etc.) so that focus learners get to see/realize what they themselves KNOW. Our analysis is organized in categories showing that focus learners gain a lot of help, support and opportunity from teachers' interventions with digital tools. This is likely to promote their feeling of being included. Alenkærs's definition of inclusion (Alenkær, 2013) views inclusion as a dynamic and continuous process, which seeks to develop the opportunities of any learner for participating and gaining in all parts of society. Dressed in the words of the Danish philosopher, Soren Kierkegaard, who used the concept "Hin Enkelte" to denote an including attitude and stress that every individual – irrespectively of prerequisites – is unique and valuable in life (Kierkegaard, 1843). To be included is in itself a life value for the unique individual/learner. To feel included, a learner must feel safe and secure in the learning endeavour. The reversibility of learning actions in a digital learning environment makes it much safer for focus learners to navigate in a "safe" environment. Reducing risks in the processes of creating learning products and reifying processes of learning is important to ensure that focus learners will have a voice in the choir of change and the democratic advancement of society.

Conclusion

The digital technologies and interventions seem to act as a vehicle for enabling inclusion of focus learners through transparent what focus learners are actually able to do. Using technologies enables them to observe, inspect and reflect upon their own learning (their level of knowledge and process of learning), and to disseminate, demonstrate and make visible – through reifications – their own learning. In order to create ownership, pedagogic strategies and interventions with digital technologies (whether viewed from the perspective of teaching or the perspective of learning) should incorporate opportunities for developing digital reifications. These, in turn, then stimulate learner reflection and awareness. The authors of this paper emphasize importance of *opportunities for reflection*, *tools and structures for construction and dissemination* of learners' knowledge (to demonstrate "I am able to"). In addition, multimodal and diverse digital modes for communicating, collaborating and contributing to promoting basic democratic and empowering skills, such as e.g. learning how to listen to other voices (Wegerif, 2016). To reduce risks, any fruitful pedagogical approach should employ digital technologies and interventions in ways that *empower learners* and

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promote a learner *experience of inclusion*, and a feeling of being recognized as a valuable participating and *contributing* member of a group of peers sharing an inescapable context of *mutual collaboration*, dialogue and collaborative knowledge building (CKB) (Sorensen & Andersen, 2016a; 2016b). The analysis has shown that learning interventions with digital technologies make focus learners thrive with a more full-registered – digital and multimodal – way of expressing themselves. While it invites and enables them to act in a new way, it also empowers them to take collaborative and multimodal communicative initiatives and, thus, express themselves more and better. The interventions and smoothness and reversibility of digital actions cause them to feel safe and secure, and stimulates their inclination and courage to participate and interact, to become interested and authentically involved with tasks, assignments, other students. It simply causes them to feel inclined to share, communicate and interact around learning endeavours, to feel ownership to their own learning processes.

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