



## ARTICLE

### Digital Tools for Structure in a Mainstream Class

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## Digital Tools for Structure in a Mainstream Class

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### Abstract

The subject of the article is how digital structure and predictability affects the learning environment. This is key knowledge as regards both class management and learning. An intervention research design was employed. The intervention aimed to test digital aids in a mainstream class: a digital day planner board and a Time timer wristwatch with a countdown function. These aids are usually allocated to individual pupils. Two classes, with 16 and 17 students respectively, were included in the study. Three of them had neurobiological disorders such as ADHD, Tourette's syndrome and ODD. Before the project period, there was considerable unrest in the classes. The data set is based on focus group interviews, observations and conversations with pupils. We also gathered the teachers' change narratives. The material will be analysed and assessed in relation to other studies on the impact of digital aids for this group of pupils. Teachers' feedback shows that the digital timetable board helps them to visualise the day's structure, and they note that pupils with special needs use the board to orientate themselves during the day. The countdown function has created greater calm during activities. Pupils report that they like knowing how long the activity will last – this provides a sense of calm.

**Keywords:** Mainstream class; Neurobiological disorders; Time structure; Intervention; Digital aids

## **Introduction**

In this paper I will discuss how the use of digital timing and scheduling aids improve student focus and classroom management. The article will thus focus on a very specific technology, quite different from technological learning aides typically looked at.

Technology is assuming ever-greater importance in society, and is increasingly being adopted in schools. Rogne (2013) writes, for example, about how both children and adults write much more than before because of the internet and social media. Several projects have examined the use of digital technology tools in school (see, for example Murati and Ceka, 2017; Pandya and Ávila, 2017). A comprehensive Norwegian study has examined Norwegian teachers' choice of teaching aids, and established that primary and lower secondary teachers mainly choose paper-based teaching aids, and supplement these with digital teaching aids and learning resources (Gilje et al. 2016). They also found that the school owner (the municipality) mainly initiated the introduction of digital teaching aids rather than the school or the teachers themselves.

A study that evaluated student teachers' use of digital tools (Polly and Rock, 2016) found that the students primarily made use of technology on a lower level, and focused only on basic skills. Meanwhile the study reveals that if the student teachers' used technology in ways that addressed higher-order thinking skills, it had significance for how they structured the session. This paper is based on a project conducted in a mainstream class comprising pupils with various neurobiological disorders such as Attention Deficit Hyperactivity Disorder (ADHD). The main aim of the project was to test aids usually allocated to individual pupils with difficulties, in a mainstream class. The impact of different classroom innovations on the pupils' psychosocial environment is examined in different ways by a team of three researchers. The article's focus is a subproject led by the author. The subproject examined the research question: 'How does a digital structure affect the provision of a calm learning environment for pupils in a mainstream class?'

Digital structure in this context means digital tools that help to structure the school day and the pupils' work tasks. These aids are usually allocated to individual pupils, but we wished to use them for all pupils in the class. A calm learning environment entails a learning environment in which pupils are focused and there is an atmosphere of quiet and calm enabling them to work on their assignments.

## **Structured teaching and calm learning environment**

The impact of structured teaching has been specifically examined in relation to children with disabilities. Structured teaching is described as teaching where the adult 'determined what material the child would use, how long the child would work, and how the child would work.' (Mesibov, 1997:26). In other words, the pupil is offered a system that shows what, when and

how long. Schopler (1966) found that autistic children comprehended visual information more readily than auditory information. Visualised structured teaching proved to have good effect for autistic children (Schopler et al. 1971). The structure positively affected the pupils' participation and relations as well as having a good impact on pupils' general behaviour. TEACCH methodology (Mesibov 1997) has been developed partly as a result of such knowledge. TEACCH stands for the Treatment and Education of Autistic and related Communication Handicapped Children, which is a methodology developed by Mesibov (1997). The TEACCH approach emphasises working within predictable parameters where time, amount and number of activities are carefully structured. The methodology was originally developed for children with diagnoses within the autism spectrum, but has also had positive impacts on children with other learning disorders (Nordgate, 1998). TEACCH has received criticism (Smith, 1996), but this has not been linked to the time structure.

Principles linked to time structure still apply in the field of special education. Individual pupils have day planner boards that show what they are going to do, when and for how long. Digital solutions have gradually replaced earlier paper-based solutions. A user-centred innovation project targeting children with ADHD and autism has been carried out in Norway (Gjære, 2017). Welfare technology has been tested to improve pupils' everyday lives. One of the conclusions of the project is that children benefit from aids that structure their time and their activities. At the same time, technology must target the children's needs as opposed to adapting the child to the technology. Integrating digital solutions into everyday technology such as telephones and tablet computers gave the best effect. Awareness of a need for structure has also been fostered in ordinary pedagogy. For example, theories of classroom management stress the importance of routines (Lester, Allanson and Notar, 2017). The authors also state that structuring time will result in pupils settling down more quickly and focusing on the learning tasks. Strom, Strom and Sindel-Arrington (2016) conducted a study of 240 pupils at junior high school in relation to time management. One of the conclusions was that pupils need help to structure their time. According to Postholm (2013), responsibility for this rests primarily with the class leader.

The reason that solutions integrated into everyday technology function best for pupils who need cognitive support may be linked to the problem of stigmatisation (Goffman, 2000). Everything that distinguishes a child from the group he/she wants to identify with can contribute to a stigma, and in this case, teaching aids can stigmatise them and define them as out of the ordinary.

Assistive technology is described as technological modifications used to surmount barriers that people may face in acting independently, participating in society and carrying out activities in a safer or simpler manner (Hersh, 2017). Hersh (2017) has adopted a systematic approach in order to classify communication and ICT-based learning technologies for people

with disabilities. The study focuses on the need to identify enablers and barriers, support pupils and teachers in their choice of appropriate technology and make provision for flexibility with a view to the future development of learning technology.

Van Hoye and Lootens (2013) have examined five different dimensions of time structure in relation to unemployed people. The five dimensions were sense of purpose, structured routine, present orientation, effective organisation, and persistence. One of the findings in the study was that two of the dimensions – sense of purpose and present orientation – gave the greatest psychological well-being. This shows that time orientation plays an important role in people's perception of well-being. The study also found that those who appeared to be open to new experiences, conscientious and proactive maintained a time structure independently to a greater degree.

## **Methods**

This study is part of an innovative project. Innovation is understood in this context as the introduction of a change with the intention of changing practice (Skogen, 2004). The first year of the project comprised a mapping phase, where focus group interviews were used (Krueger and Casey, 2015) as well as observation in the classroom (Thagaard, 2012). Malterud (1996) describes the focus group interview as particularly well suited when the researcher is seeking to identify perceptions in collaborating professional communities, in this case the perceptions of the teachers working in the classes in question. The teachers reflected on what they understood by the concepts of 'psychosocial environment' and 'neurobiological disorder', and how they assessed the psychosocial environment in their own class. They discussed their own role as a teacher and class leader. During the mapping stage, observations centred on acquiring a picture of how the class functioned both academically and relationally. An observation form was used to investigate the contact between the pupils, and between the teacher and the pupils (sociometry) as well as a form to monitor the implementation of the teaching session. An intervention was introduced on this basis and this is now being evaluated. The intervention aimed to test digital aids in a mainstream class: a digital day planner board and a Time timer wristwatch with a countdown function. The innovation phase lasted from August 2016 until May 2017.

We conducted a strategic selection of participants for the study. Schools in Finnmark, Norway's northernmost county, were invited to take part in an innovation project linked to the topic of psychosocial environment. The inclusion criterion was a mainstream class where one or more pupils had neurobiological disorders. A diagnosis in the neurobiological spectrum was not a requirement in itself, but was chosen because from experience pupils with neurobiological disorders both affect and are affected by the psychosocial environment in the class. The Norwegian Centre for Research Data has been notified of the study, and all the

teachers involved and the parents of pupils with neurobiological disorders have given their informed consent. The names in this paper are pseudonyms.

A primary school in a small urban municipality enrolled its two Year 4 classes (age 8-9). Class A consisted of 16 pupils, three with neurobiological disorders such as ADHD (Attention Deficit Hyperactivity Disorder), Tourette's syndrome and ODD (Oppositional Defiant Disorder). Class B had altogether 17 pupils, one of whom had considerable problems of concentration and was under assessment for suspected ADHD. Class A had had the same contact teacher since Year 1: Anne, a teacher with a lot of experience who had worked at the school for many years. She resigned in January of the project year, and the class got a new teacher, Are, who had worked as an on-call substitute teacher throughout the autumn. Class B had had four different teachers during the first three years of school. In August of the project year, Ben started as the main class teacher. He had just completed teacher education, and this was his first teaching job.

The mapping phases showed two classes with a lot of unrest among the pupils. Several of them wandered around, talking to fellow pupils. There were frequent questions about how much time there was left, either as regards the time set for an activity or the time remaining before the break. As a result, the teachers decided to introduce an innovation that would give the pupils predictability in terms of time.

Data were collected in different ways throughout the year of the intervention. We observed the use of tools during school visits in September, November, January and May. Following the observations, we conducted dialogue meetings with the teachers at which we discussed the observations and reflected on them, and the teachers decided how to adjust the use of the tools. In November, the teachers had conversations with groups of pupils to elicit the pupils' experiences with the digital aids. We recorded and transcribed these conversations. A focus group interview (Krueger & Casey, 2015) was carried out with the teachers in question in January and this was recorded and transcribed. In May, the teachers presented their observations to their colleagues. The presentation, which was filmed, also forms a basis for the data material.

In an innovative project, the researcher collaborates closely with the actors in the field of practice, and this may lead to a lack of distance to the results. Efforts to solve this problem have been made by differentiating between dialogue meetings intended to adjust the innovation and interviews where the focus was on the teachers' narratives related to a potential change. During observations in the classroom the pupils were told that the researchers were present to observe how the teachers and pupils worked. The pupils appeared to accept this.

The results presented here are based on one project year only. Therefore, we cannot comment on whether the change will be permanent.

### Tools chosen for the intervention

Digital day planner boards were chosen to orientate the pupils about time and tasks. Class A received the Cognita day planner (figures 1 and 2). Class B received the Memoplanner (Figures 3 and 4). In order to provide a time structure for individual tasks, both classes received Time timer wristwatches (Figures 5–7). These are wristwatches that function as an ordinary watch but with a visual countdown function.

The Cognita day planner is a digital clock that is horizontally aligned (Figure 1). Figure 2 shows a segment of the day planner, with a light diode marking the progress of the day. Class teaching begins at 0815 with assembly and dialogue. At 0830, the class will prepare for a reading session lasting 15 minutes. This is followed by work on Norwegian assignments before attending a performance at 0900. The orange fields indicate the pupils' breaks outside while the green show when the pupils are to work with different subjects inside the classroom.

Figure 1 Cognita day planner



Figure 2 Segment of the Cognita day planner



Figure 3 shows a typical day display for the class using Memoplanner. On Thursday 10 November, the class had the following subjects: Norwegian, English and Science. Between each subject, they had breaks outside, and a lunch break in the middle of the day. The photo is taken at 11:17, which is made clear by both the digital and analogue display and the countdown function of the vertical light dots in the middle of the board. The teacher can click on the various subject symbols and thus show a detailed plan for the relevant session. Figure 4 shows an example of the order of activities in the day's science period.

Figure 3 Memoplanner day display

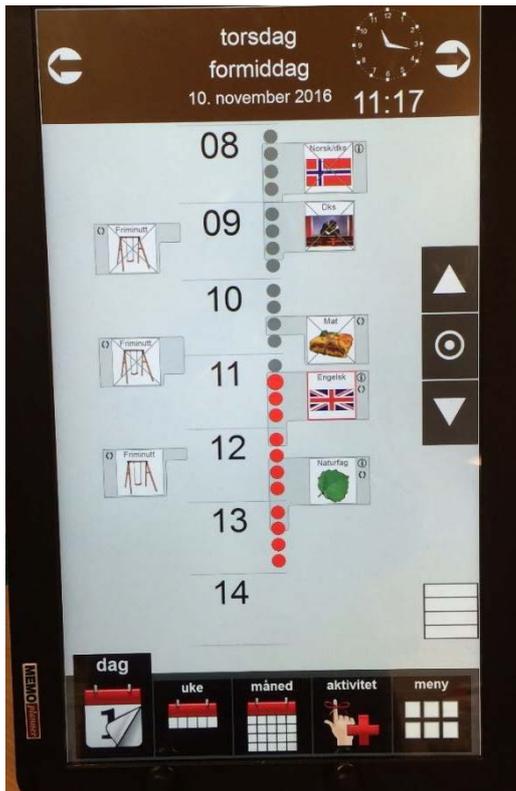


Figure 4 Memoplanner subject display



The Time timer wristwatch has two functions that were used during the intervention: 1) Time shown in analogue and digital modes (Figure 5) and 2) Countdown function (Figures 6 and 7). The teachers chose to set the countdown at 15 minutes, and organised activities on this basis. The pupils could start the countdown with one click. At the start, there was a full red circle (Figure 6), but as the countdown proceeded, the red lines gradually decreased (Figure 7). This function was used when the pupils were to read, work at their stations, or work with assignments individually or in groups.

Figure 5 Time timer wristwatch with analogue and digital modes



Figure 6 Time timer wristwatch with 15-minute countdown



Figure 7 Time timer wristwatch, countdown almost completed



## Results

The data have been analysed in order to answer the question of how a digital structure affects the provision of a calm learning environment for the pupils. This issue has been normative for the extracts selected from the conversations. In this connection, the data material is organised under different sub-topics.

### Perceived usefulness

The pupils primarily used the Time timer wristwatches when the teacher initiated this. The teachers said that they used a fixed mantra or instruction when the watches were to be used: 'Ready to start the wristwatch – 5, 4, 3, 2, 1.' When the teacher reached 1, the pupils clicked to start the countdown. Some of the pupils said they also used the wristwatches of their own initiative. They had found other functions as well, such as the night setting, the stopwatch and so on.

During the observation in November, only one of the teachers used a fixed instruction. Ben used the same instruction every time and the pupils were ready to click at the same time. He described the value of this:

'They have complete control of the 15 minutes. And I follow the same procedure every time I start it. I start in the same way every time to have a fixed pattern. So when they hear the number 5, they know that we will start in 4 seconds, quite automatically.'

In Anne's case, it was more random how she got the pupils to start the wristwatches. We observed more unrest in her class. The pupils who did not manage to start at the same time as the others appeared to be frustrated, and wanted everyone to start again. After discussion of this, Anne chose to use the same instruction as Ben. At the next school visit, the instruction was well established and there were no signs of frustration or unrest when the pupils were told to start their wristwatches.

The teachers said that the wristwatches had helped the pupils to learn the time, and they mentioned individual pupils who had particularly benefitted from the countdown function. They also believed that it resulted in a calmness in the activity that they had not observed earlier.

When discussing the day planner boards, the teachers stressed their belief that these gave the pupils a predictability and feeling of security throughout the day. Are took over the class in January. He expressed great enthusiasm for the day planner board:

'I quickly familiarised myself with the day planner board, and I've used it from Day 1. It's always been up and running when the pupils come in and I review the schedule every day. I see that many pupils are dependent on it and then it functions very well.'

Ben, who used Memoplanner, could achieve a greater level of detail than was possible with the Cognita day planner.

'What's good about it is that I see that the kids get a very detailed overview of each period, we can enter details of what we're going to do. It's been excellent for the pupils; they know the whole time what they're going to do. If we have a period where we're going to have a lot of different activities, everything is indicated there so they're prepared for what comes next.'

Anne, who used the Cognita day planner, recognised its value for both the class as a whole and for individual pupils:

'The majority are able to relate to the day, but he (name of pupil with ADHD) benefitted enormously for the little moving dot. It was like night and day for him. He probably benefitted most from it, even though everyone else did too.'

During the conversation with the pupils, Anne asked whether they felt they needed the day planner. Several showed their agreement by nodding and answering 'Yes', while one of the pupils said: 'Without it we don't know what we're going to do.'

The teachers gave some input about the general usefulness of these learning aids. Are pointed out how structure was positive for the pupils:

'Maybe the reason why displaying the time all day works well is related to structure. We have a number of pupils who need more of a rigid approach, meaning that everything should be clear and understandable the whole time. I see that there are an awful lot of pupils who need the day planner and, in that respect, it's really given quite good results, maybe especially that it provides motivation.'

### **Analogue vs digital**

Before the digital day planner was introduced, the teachers wrote the time and name of the subject on the blackboard. When a new period began, the last period was erased. The digital version showed time and subject, as well as activities within each subject. The pupils were preoccupied by the difference between the two:

- Pupil 1: I think it's better than the old daily timetable we had on the blackboard, but there's one thing I think is a real downer; we could draw on the blackboard, but we can't do that on the digital daily planner.
- Pupil 2: I think it's better than when we wrote on the board.

When talking to pupils, Anne asked which timetable they thought worked best: the present one or the one they had before. One of the pupils answered immediately 'This one here', and several of the pupils agreed. One of the pupils added:

'It's also better for you because now you don't need to write every day almost the same as you write every week. Now it's much simpler – for instance, you don't need to remove the lunch break or...'

The pupils also had ideas about how to improve the structure even further. One of them suggested that each individual should have a mini-version on their desk:

'It would be quite cool if we had a tiny little daily planner on our desks, because then we would have it in front of us. Then we could look at the date and flick through. We can't press anything, because it's locked. We could just flick through and look at it.'

### **Supplementary use**

The teachers said that they used the Time timer wristwatches in the reading session; the pupils had a 15-minute reading session every day. The watches were also activated when pupils were working at their stations, and sometimes in the case of individual work when the teacher estimated that it would take 15 minutes.

The teachers asked the pupils about the situations in which they used the Time timer wristwatches. The pupils rattled off the same areas as the teachers had mentioned, but it turned out that some of them used them without being instructed by teachers:

- Pupil 3: We don't just start the countdown function to read and work at our stations. We also do it when we're outside and doing outside activities, and then we... Sometimes we use them in the breaks. Not so often, but it happens.
- Pupil 4: Sometimes we have maths, but sometimes it's only for 15 minutes, and then I use it.

- Pupil 5: I use it when I'm reading and at the Norwegian and maths stations, and if we have 15 minutes to do something.

Pupil 5 also gave an example of how he himself used the wristwatch to structure his time:

- Pupil 5: What we did yesterday when we made the planets – then I timed that.
- Anne: And you used the wristwatch?
- Pupil 5: Then I used 15 minutes.

The supplementary use noted by the teachers was primarily linked to learning the time and concepts linked to time. Ben commented on this by saying:

'What's good about using Time timer wristwatches in Year 4 is that many pupils can't tell the time. Now they each have a wristwatch. I've seen very clearly that when they have a watch, they can learn the time themselves. They grasp the concepts without thinking.'

### **User-friendliness**

The pupils received the Time timer wristwatches in September, when the weather was still mild. In November, the season for mittens and gloves arrived. This affected the use of the watches. Several pupils reported that wearing the watches was uncomfortable. Several said that it hurt, and some specified the problem:

- Pupil 6: We got it at the start of the summer. Then I used the watch because then I wasn't using gloves, so I used to set it in the lunch break that lasted 15 minutes. Now I'm wearing gloves, and it gets a bit tight.
- Pupil 1: Sometimes it hurts to wear it. Because it's tight and it bites into my wrist so then I have to take it off to get some air.
- Pupil 7: It gets very cold, and it hurts.
- Pupil 6: You get snow in between here (indicates between the strap and wrist)
- Pupil 9: It's sweaty wearing it.
- Pupil 7: Sometimes when I wear it, it itches. Because it's too tight.

The Time timer wristwatch has a plastic strap and this seems to be why it is sweaty and clammy between the watch and the wrist. The display is large and it is difficult to make room for it inside mittens or gloves. The pupils' solution was to avoid using the watches outside. Pupil 1's remark exemplifies this: 'What I do now, since it's winter, is to take it off before the break.'

User-friendliness regarding the day planner board was more related to accessibility than to comfort. Those sitting far back found the symbols too small:

- Ben: You see what's there? Is it clear?
- Pupil 4: It's a bit difficult when you're too far away. But it's possible.
- Ben: Could it be a bit bigger, maybe?
- Pupil 4: No, it couldn't be bigger, but it could maybe be... a bit closer.

Apart from this, neither the pupils nor the teachers had any remarks in connection with the user-friendliness of the day planner board.

### **Calm learning environment**

The pupils had few remarks specifically related to a calm learning environment in the classroom. Teacher Anne tried to elicit different nuances:

- Anne: Maybe there's not so much unrest?
- Pupil 3: It hasn't become very much calmer.
- Anne: So you don't think it's become very much calmer, no.
- Pupil 8: I do.
- Pupil 6: Me too.

In other words, the pupils disagree to some extent about whether they experience more calm or not. As well as asking them directly about this, Anne also tried to ask them indirectly:

- Anne: Do you think having the day planner means anything – was it better before or when you had to pay more attention yourselves?
- Pupil 1: It's better now.
- Anne: Do you get more done or work better when you know the day planner is keeping tabs on how long ...
- Pupil 2: Yes, much better. (Several agree).
- Anne: Do you think it's a bit calmer in the classroom when you all know how much time there is? (Several agree).
- Pupil 4: Before people used to shout out: 'When do we finish?' 'When do we finish?' and now we have wristwatches and know ourselves when we are finished.

The teachers said that they perceived a calmer environment in the class. Ben in particular put forward this view, but Ann and Are confirmed his remarks:

- Ben: In my classroom, the wristwatches functioned very well at the start. As soon as we started, there was peace and quiet. The pupils showed a lot of concentration. (...)

It's been great to have peace and quiet, especially when it comes to reading and group/station work.

- Ben: I'm satisfied with the development we've had in the project, and you can see from the kids that they've actually been happy with the structure they've had now. They know what we expect of them, and they have expectations to the wristwatch and themselves as well. When they have started the countdown, they expect that I will keep quiet for 15 minutes. And they expect that the pupil beside them will also keep quiet. It's such a good structure and a good experience for us, but especially for the pupils.
- Ben: What's good about my day planner board is that you see it as soon as you come into the classroom. (...) After every break the pupils stop and look at it. Maybe without thinking about it, but they do it. So that's a sign that they want to know, so they're prepared and that's good to see. Now I don't get questions like 'How much time is left?' and 'What should we do now?' It's all on the board, so they know.
- Are: Some pupils need a light at the end of the tunnel, to know that OK, I'll work up to that point. In a way it's been very good for a lot of them, to have the security of knowing that you can look at the light dot that shows the countdown, that you kind of know that "OK, then I'll get a break" or "I only need to work till then".

## **Discussion**

The teachers and pupils had a number of inputs that we can relate to how a digital structure affects the provision of a calm learning environment for pupils in a mainstream class. In the following section, I wish to discuss the results across the topics analysed.

### **What time structure gives the pupils**

The teachers primarily provided input about what effect the digital time structure seemed to have on the provision of a calm learning environment for the pupils. The day planner boards, both the Cognita day planner and the Memoplanner, gave the pupils predictability as regards what was going to happen, when and how long it would take. The teachers were of the opinion that this gave the pupils a feeling of security and inner calm.

In their study of adults, Van Hoyer and Lootens (2013) pointed out that time orientation and perception of meaning gave unemployed people higher psychological well-being. In all likelihood, this dimension is also important for school pupils. In our dialogue meetings with the teachers, we found that they had to be made aware of the routines they themselves used to impose a time structure on their day. This might include an almanac, a timetable or a clock, for example. Teachers who became aware of their own practice appeared to find it easier to understand the needs of their pupils. The teachers had some degree of structure before the intervention. However, the intervention provided a more detailed structure, giving the pupils a clearer time orientation. The opportunities given by the day planner boards of specifying

activities during the period probably gave the pupils an understanding of the connections. It is possible that being prepared for ensuing activities helped to create a perception of the meaning or purpose of attending school.

The teachers brought up the usefulness of the day planner board for individual pupils in the class in particular. Pupils who earlier had not settled down to the activities consulted the day planner to see what they were supposed to be doing. For one of the pupils the Cognita day planner was a success because he could then continually check where he was in the day by looking at the light diode on the day planner. The teacher believed he needed to have an overview of the time, which the day planner board with light diodes and the Time timer wristwatch helped to provide.

### **Analogue vs digital structure**

Before the intervention, the teachers wrote a kind of daily timetable on the blackboard. This presented what subjects the pupils were going to have and when. The time of the lunch break was also written on the board. This analogue timetable took up about a quarter of the board. The teachers erased the periods as they were completed. Observations in the classroom showed that this was frequently forgotten.

The pupils were preoccupied by the fact that the new day planner boards freed up space on the board. The analogue board system made it possible for the pupils to manipulate the timetable by erasing and writing different times or different subjects. Only the teacher can alter the Memoplanner since this is done via the PC. The Cognita day planner is a semi-analogue tool where the time and the light diode are shown digitally but the remaining information is based on paper or cardboard symbols. The pupils could theoretically change the layout, but did not do so.

Polly and Rock's study (2016) shows that student teachers often chose low-technology solutions. These can function equally as well as digital but they depend largely on people making the necessary changes, for example erasing what has been carried out. When a light diode changes electronically, the pupils know that what is to the left of or above the diode has been completed.

The wristwatches could show both analogue time in the form of decreasing lines on a circle and digital time in the form of figures. The teachers had the view that the use of the wristwatch helped pupils to learn the time. As one of the teachers said, pupils mastered the mathematical concepts without thinking about them. The choice of a countdown of 15 minutes promoted greater understanding of quarter of an hour, half an hour, and an hour.

### **Finding calm**

This study shows impacts on two kinds of calm: the pupils' inner calm, and general calm in the classroom.

The teachers described individual pupils who started the period in front of the day planner board and who were continually checking how far they had come in the day. Anna said that it was like 'night and day' for one of the pupils, an expression that denotes a big change. In this case, it was a highly positive change where the day planner board apparently functioned as a tool that gave him control and consequently a feeling of calm. To prevent him having to come forward to see the planner, she decided to move him so he sat immediately in front of the day planner board and thus had a full overview.

There was a change of teacher in one of the classes in January and the new teacher, Are, was not familiar with the tools. His feedback was that he found the day planner board very useful from the very first day, and said that it had given many pupils in the class a feeling of security.

All three teachers stated that there was greater calm in the classroom after the introduction of the tools. They also pointed out that questions such as 'How much time is left?' and 'What should we do now?' were no longer heard. As Ben said: 'It's there on the board, so they know.'

There is much to indicate that time orientation has a positive effect on the pupils' well-being. A predictable framework gives pupils the opportunity to use their mental energy on areas other than the decoding of the structure. It seems as if simple measures such as providing a visual overview of time and activities create a feeling of security in the pupils. This is clearest for pupils who at the outset have concentration and attention difficulties or have other neurobiological problems. Teachers found that such pupils were those most strongly impacted by the technological tools.

### **User-friendliness**

The day planner boards were the largest we could find on the market. Nevertheless, the pupils at the back of the classroom had difficulty seeing the symbols and the times. The teachers solved this problem by moving the pupils who most needed the day planner boards to the front of the classroom. However, classroom versions of such day planner boards would be preferable.

As regards the Time timer wristwatches, both pupils and teachers were very satisfied with the watch's functions and the user options they had for the countdown, for example. However, it is unfortunate that the pupils experienced discomfort when wearing the wristwatch. This can

easily result in the wristwatches being put aside even though their usefulness is regarded as high.

## **Conclusion**

In this study, aids that were developed to address individual needs were tested in a mainstream class. We wanted to build a structure for the whole class, a structure that would normally be adapted to individuals, and to examine whether this affects the provision of a calm learning environment for pupils in a mainstream class.

The time structure can be described as necessary for some but useful for many. The teachers had identified some pupils who had a particular need for time and activities to be structured. The pupils are young and there may be issues that have not yet been identified. A common structural solution can therefore be valuable in order to prevent difficulties. For those who have a particular need of structure, it may be beneficial that structure is a natural element of the school day. The group will probably regard a day planner board that is placed at the front of the classroom and regularly reviewed as of joint interest and not something unique that stigmatises individuals. Stigmatisation can thus be reduced. In addition, such digital aids can be easily adapted to the needs of individual pupils without this being obvious to other pupils in the class.

The study has shown that the digital structure has had a positive effect on achieving a calm learning environment in the class. A question this raises at the same time is whether digital means are essential to achieve this. The teachers would probably have achieved much of the same effect with an analogue system, but this would be more vulnerable in respect of teacher follow-up throughout the day. What appeared to have special significance for some pupils was the opportunity to follow the light diode and thereby note where they were in the school day. It is unlikely that teachers are able to remember to move a sign manually from activity to activity. In that respect, a digital system provides a self-regulation that we cannot achieve via analogue systems. However, it would be interesting to carry out a comparative study of a digital and analogue structure. Our focus in this study was on the effect the intervention had on the class as a whole. In a later study, it would be interesting to elaborate on the perspectives of the pupils with neurobiological disorders, for example in the form of individual interviews in respect of a similar innovation.

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