

Lesson study as a way of improving school-day navigation for pupils with severe intellectual disability and autism

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Abstract

Purpose – This research explores lesson study as a way to enhance the quality of teaching for pupils with learning disabilities and autism spectrum disorder by observing changes to one pupil's (Wilma) active educational participation. The study also investigates if and in what ways the professional development impacted teaching practices.

Design/methodology/approach – Five teachers met with the author on four occasions. Between these meetings, the teachers delivered the lessons they had planned together. The author video recorded the meetings to discern how the teachers' expressions developed. The author shared their thoughts with another researcher to enable an interrater validity examination.

Findings – The implementation of the lesson study vehicle enabled the teachers to transform their thinking from mainly focusing on pupils' deficiencies to instead focusing on their strengths. A relationship was found between teachers' understanding of central coherence, their skills in adapting received instructions and pupils' abilities to process and contextualize information or discern the whole picture.

Research limitations/implications – Research that involves teachers in the learning process emphasizes the relation between teachers' thinking and their potential to enable the contextualized inclusion of pupils with learning disabilities.

Originality/value – This research offers important insights into how school-day navigation for pupils with severe intellectual disability and autism can be understood through the lens of variation theory; the teachers' repeated and adjusted use of the frame on the schedule strip enabled Wilma to discern what would happen next during the school day.

Keywords Autism, Central coherence, Inclusive education, Learning disabilities, Lesson study, Professional development

Paper type Research paper

Introduction

This study is framed by the [UN Committee on the Rights of the Child's \(2006\)](#) core principles of inclusive education, which is a set of values that seeks quality, meaningful and effective

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education for all pupils. To achieve this goal, the UN proposes close cooperation and training programs for teachers and other personnel. This study targets professional development within special education, focusing on accessibility for pupils with a combination of intellectual disability (ID) and autism spectrum disorder (ASD). In the present study, ID and learning disabilities are used interchangeably. [Holmqvist and Lelinge's \(2020\)](#) systematic literature review revealed a research gap regarding how the collaborative professional development implemented in inclusive settings relates to pupils' outcomes. Therefore, this study considers teachers' professional development using the Lesson Study (LS) model by using the changes in one pupil's educational situation as an example of how teacher professional development can impact practice. As the presence of ID and comorbid ASD leads to weaker central coherence (CC) than in age- and IQ-matched control groups ([Aljunied and Frederickson, 2011](#)), these CC limitations should be considered in special educational needs and disabilities (SEND) teaching. This study contributes to the literature by examining how a collaborative professional development program can improve teachers' abilities to enable the active participation in the specific educational environment of a single female pupil with limited CC due to ASD and comorbid ID.

[Foreman *et al.*'s \(2014\)](#) collaborative professional development program, which aimed to enhance communicative exchanges between professionals and individuals with severe ID, revealed that implementing professional development in SEND teaching is challenging and time-consuming. However, the authors also found a correlation between the professionals' responsiveness and improved pupil involvement and alertness ([Foreman *et al.*, 2014](#)). By offering professional development for teachers, the present study builds on [Foreman *et al.*'s](#) findings, predicting that the quality of the participating pupil's education would be improved as a result of careful professional development for these participating teachers.

Prior research

Lesson study research into the diverse needs of all learners. [Goei *et al.* \(2021\)](#) highlighted the benefits of using LS to improve practice and encourage learning among all students, including those in SEND education. These results are promising, as limited research on LS has been conducted in inclusive settings. This may be because teachers and researchers outside of Japan have difficulty understanding the Japanese perspective of lifelong learning goals, where it can take six months to formulate an LS lesson, even when the teachers involved work on it daily ([Fujii, 2014](#)). Accordingly, [Seleznyov \(2018\)](#) emphasized that although LS has been frequently used in Western countries, there are remaining challenges in finding a transnational shared understanding of its original core components and in particular how to apply research in practice. In this context, [Norwich *et al.* \(2020\)](#) suggested the need for research measuring the changes and limitations in LS to increase participation, belonging and achievement at the highest possible level in SEND teaching. The application of LS in different settings and countries varies; however, to be considered as an LS approach, it must include three core elements:

- (1) Collaborative design of lessons or units of study
- (2) Execution of the design with observation
- (3) Reflection on the product with a view to improving it ([Ono *et al.*, 2013](#), p. 2)

Swedish compulsory school for pupils with learning disabilities. In Sweden, the dynamic flexibility needed in SEND teaching is accommodated through the requirement for both general and specialized teacher qualifications to teach in Compulsory School for Pupils with Learning Disabilities (CSLD). However, this can lead to problems as it may be difficult for teachers to satisfy both the general and specialized requirements. The proportion of properly certified teachers in CSLD for pupils with severe learning disabilities is under 30% ([SNAE, 2020](#)); therefore, collaborative professional development is an urgent and highly important

task to guarantee the quality of education for students with ID. Klefbeck (2020) found that in the CSLD context, LS has the potential to enhance pupils' learning and teachers' professional development. Given that learners with learning disabilities are highly diverse, Klefbeck proposed individual case studies rather than student group examinations. In the present study, LS was used to enhance the quality of teaching for pupils with ID and ASD.

Theoretical framework

This study used *variation theory* (Marton and Booth, 1997; Pang, 2003) to interpret the transcripts of the intervention and capture which aspects teachers focused on when planning, implementing, and assessing their teaching. The concepts of variation theory posit that distinguishing something requires experience of its variations. This means that to be able to identify pupils' abilities, teachers must be aware of what aspects the pupils focus on and how they relate these to other aspects; teachers must identify specific learning objects through their awareness of pupils' behavior related to those objects. In the present study, Zhang *et al.*'s (2021) *situation awareness* (SA) was also employed to enable an unprejudiced analysis of the *critical features* (Marton, 2015; Pang, 2003) of teachers' thinking. SA is an empirical model used to grasp a psychological understanding of the characteristics of participants' reasoning tasks, analyzed in three stages of information processing. In the first step, elements relevant to the task are identified; in the second, these identified elements are assessed, graded and connected to certain items; and in the third, critical aspects of the discerned items are further analyzed (Zhang *et al.*, 2021).

Aim and research questions

This study applied LS to enhance the quality of teaching for pupils with ID and ASD by exploring changes to one pupil's (Wilma) active educational participation. It aimed to determine if and in what ways this professional development impacted practice. The following questions guided the research:

- RQ1. What aspects of how to design instruction for Wilma in her school context were teachers initially aware of?
- RQ2. Which changes, if any, were found in the teachers' focus when planning and carrying out instruction in Wilma's school context?
- RQ3. In what ways did Wilma's knowledge develop or change during the intervention?

Materials and methods

Study context

In Sweden, CSLD is guided by two curricula: (1) the "general" curriculum, which is comparable to the general compulsory curriculum and covers basic reading, writing and arithmetic; and (2) the "alternative" curriculum, which focuses on physical coordination, communication, aesthetics, everyday activities and basic science. The alternative curriculum is most commonly applied to pupils with moderate to severe ID and comorbid ASD.

Teacher participants were strategically selected as part of an intact sample. The inclusion criteria were teachers who undertake SEND teaching in an educational context that targets the needs of pupils with ID and comorbid ASD. The intervention took place during autumn 2019 in a self-contained classroom (i.e. a classroom where one or several SEND teachers are responsible for the instruction; here, the pupils often require comprehensive and highly structured educational support (Spencer, 2013)) in a public school for 400 pupils with and without ID in a small municipality in southern Sweden.

The teachers adopted the visual activity schedules (VAS) approach, using visual clues, such as images or photographs, to visualize and prepare for the next step or activity during the school day. Knight *et al.* (2015) summarized VAS as an evidence-based practice, also highlighting that the schedules should be introduced systematically and adopted at the individual level to be efficient. This had already been undertaken by the teachers at the school; however, guiding the pupils' interest in the schedule and understanding how to follow the structure of the school day required further development.

Data were collected at the group level for all pupils ($n = 10$); the analysis used data from the teachers' collaborative work, as well as classroom data at the group level, before data from the case pupil were analyzed.

Participants

The teacher group comprised five female special education teachers with varying experience levels in SEND teaching (see Appendix 1; <https://www.webshare.hkr.se/klekam/appendix1.pdf>). To examine the teachers' development and changes in instruction, data on one 12-year-old female pupil with limited verbal communication skills, ID and comorbid ASD were analyzed. The teachers selected this pupil for their professional development because they found her the most challenging to teach; this choice was appropriate since research involving girls in this context is limited (Happé and Frith, 2020). All participants gave their informed consent.

Ethical considerations

All the pupils had been diagnosed with ID; therefore, appropriate ethical considerations were adhered to (The Swedish Research Council, 2017). Of 12 pupils in the class, ten gave their informed consent to participate (nine male, one female; aged 6–15 years) in cooperation with their caregivers. The study's ethical procedures were approved by the Swedish Ethical Review Board (No. 2019–02767). To minimize the risk of disruption, the author did not participate in the lessons but followed the process through notes from the teachers' observation protocol and photos and video recordings of the lessons.

Procedure

The study followed Kuno and Ikura's (2014) case-study model. However, while Kuno and Ikura (2014) investigated students' development as active citizens in society, the present study's research lessons focused on school-day navigation for pupils with learning disabilities and, thereby, their active participation in education. As in Kuno and Ikura's study (2014), the learning process focused on the individual student, instead of the group. The case student was observed, and their learning process was described, followed by an analysis of changes in their perceptions. The intervention consisted of cyclic processes, starting with group discussions among the teachers that identified the knowledge gaps, which were then followed by the collaborative design of the intervention and the implementation of the lesson units. Thereafter, an assessment and revisions of the lesson units were conducted. The lesson content was based on the teachers' strategies to enhance pupils' presumptions about what would happen next during the school day, specifically targeting the case student's awareness.

The author guided the teachers through the LS vehicle in four collaborative planning meetings (9/18/19; 9/27/19; 11/13/19; and 12/18/19). It took the teachers six weeks to implement the lesson units. At every morning class and final lesson of the day, when the teacher used the VAS stripe to inform the pupils about that lesson's activities, a frame was implanted to guide the pupils' focus toward the VAS. The implementation of the frame onto the VAS stripe allowed pupils to discern how the activities during the school day (the parts)

would proceed (Monday–Friday, 9/27/19–12/18/19). The classroom had an open floor plan, allowing the teachers to be constantly aware of all lesson activities in the learning environment and observe and take notes of the proceedings. In the planning meetings, the author acted as a facilitator, guiding the teachers through the LS procedure and ensuring that all teachers could voice their thoughts. Details of the pre- and postintervention group discussions of the lesson units are included in Appendix 2 (<https://www.webshare.hkr.se/klekam/appendix2.pdf>).

Data collection

Transcripts. Four hours and 39 min of discussions were transcribed, amounting to 146 pages of text (double-spaced, 12-point Arial font). The verbatim transcripts included nonverbal expressions and conversational signs frequently used by the teachers.

Photos and video recording. The author asked the teachers for photos or video recordings from the lessons that could be discussed during the pre- and postlesson examinations; however, the teachers had very few opportunities to contribute this content. One photo (10/14/19) and a few video sequences (2:28, 2:59, 0:46 and 0:39 min; 12/4/19) were provided. The video sequences were discussed at the fourth collaborative meeting (12/18/19), and the photo was presented at a clarifying interview (11/23/20) with teacher Daisy.

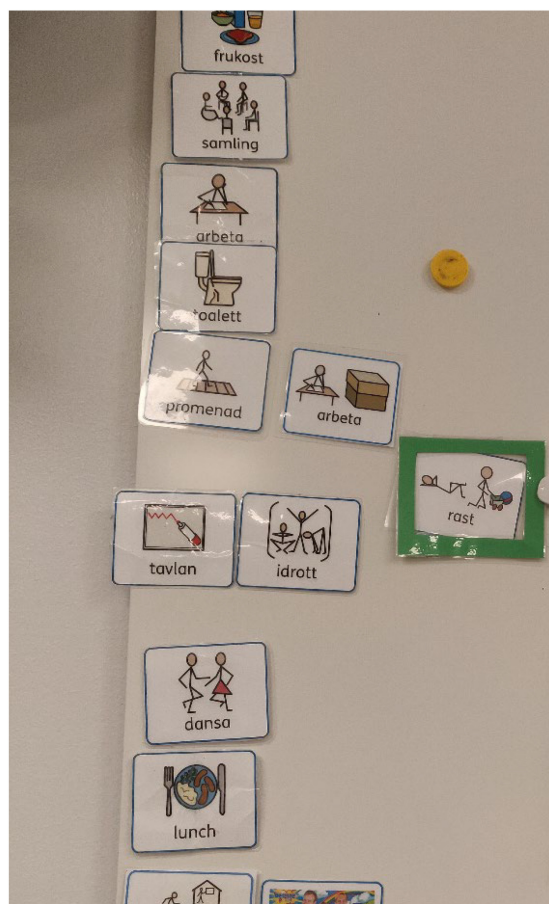
Teachers' observation protocol. The open classroom allowed the participants to take turns observing and actively teaching. The teachers used a digitally shared observation protocol to examine the pupils' responses to their actions when the *visual frame* (Plate 1) was applied on the VAS. The observation protocol covered pupils' reactions observed at both the group and individual levels when the teachers applied the visual frame and immediately afterward (a translated version is available at <https://www.webshare.hkr.se/klekam/appendix3.pdf>). This made it possible to determine if the pupils seemed interested in the teachers' action with the frame and if this action allowed the pupils to understand what would happen next. Each teacher supplied one to four descriptive notes, including assessments of the pupils' interest and understanding of the proceedings.

Analysis

The principles guiding the analysis were variation theory and assumptions about discernment of the parts of a whole, in this case seeing the parts and their order during the whole school day. The analysis was conducted at two levels: the teachers' discernment of the case student's understanding of the educational situation and the case pupil, Wilma's, expressed understanding of the parts and whole of the school day. The research aimed to characterize changes in the teachers' knowledge structures about the pupil's needs and to analyze the aspects they discerned. Following the iterative process of the LS, the lessons were designed, implemented, analyzed and revised based on the pupil's needs, which were discerned collaboratively by the teachers. Thus, the author could not predict or decide what professional development the teachers should develop; the teachers were required to identify this themselves. To enable an open-ended interpretation of the collaborative discussions, the analysis followed [Zhang et al.'s \(2021\)](#) inductive three-step analysis, identifying primary elements, validating and finally evaluating the items discerned to capture the participants' key focus and grasp the teachers' situated awareness.

Analysis phases and content. The study followed [Nowell et al.'s \(2017\)](#) systematic model to assess the accumulated data. The phases were as follows:

Phase 1. Familiarization with the data was achieved by processing the transcripts and reading them closely. This phase was conducted partly in collaboration with the teachers. Extracts, statements and gestures from the transcripts were used to exemplify the themes identified as critical features. The results of the preliminary analysis were presented to the



Note(s): The green frame on the visual activity schedule helps the pupils navigate through teaching activities and rest periods

Plate 1.
The green frame

teachers through feedback at each planning meeting, which helped encourage *stimulated recall* (Calderhead, 1981). The meetings were also video recorded.

Phase 2. NVivo 20 software was used to organize the analytical process. The preliminary findings of changes in the teachers' understanding of how to handle the teaching situation indicated that they became more confident after completing the lesson units. Peer debriefing was then conducted, during which transcripts of the second and third planning meetings and the results of the preliminary analysis were shared with a group of seven researchers. At the peer debriefing (9/16/20), the researchers checked the reliability of the changes in teacher confidence that the author had identified in the transcripts; however, they noted that the items used for assessment (on a scale from professional uncertainty to certainty) were unclear. Instead, critical features in the teachers' expressed professional development, which were identified as changes in their awareness of the pupils' CC by one of the participating researchers, became evident.

Phase 3. To identify changes in the teachers’ awareness of the pupils’ CC, [Happé’s \(2013\)](#) definition of the three aspects of CC related to ability was applied in the variation theory analysis. These include aspects showing that the student pulled information together, processed it in context and related this information to the big picture or extracted meaning. A fourth aspect was also added, that of overall weak CC, that is, the tendency to focus on and remember details rather than the overall structure or meaning ([Happé, 2013](#)).

Phase 4. A senior researcher undertook an interrater validity check ([Armstrong et al., 1997](#)) on the author’s analysis of the critical features of the teachers’ identification of pupils’ CC in the transcripts (10/14/2020). One page of the transcript was used in this check, which took place during a Zoom meeting. Nine researchers oversaw the process through shared screens. The researchers agreed that, with a few exceptions, the validator highlighted similar units in the transcripts to the author.

Phase 5. A researcher and the author conducted peer debriefing on 10% of the analysis. The interrater validity check was processed through pages 30–35 of the transcripts of the second and third meetings (see Appendix 4: <https://www.webshare.hkr.se/klekam/appendix4.pdf>). Each note in the transcript of either of the raters became an included item to either agree or disagree on. The level of agreement was calculated for each category of CC, and the calculation revealed ratings from 0.63 to 0.86 at different parts of the transcripts, which is considered acceptable ([Sun, 2011](#)).

Phase 6. In the final phase, [Nowell et al.’s \(2017\)](#) recommendation for trustworthiness was followed. Quotations from the transcripts were found to support the analysis and highlight changes in discernment among both the teachers and the case pupil.

Results

At the initial planning meeting, the author, who acted as researcher and facilitator during the intervention, introduced variation theory. Assumptions based on variation theory guided the lesson design and were used to analyze pupils’ discernment of how to relate activities during the whole school day. During the implementation of the LS cycle, the teachers collaboratively designed a clarification tool in the form of a frame to guide the pupils’ focus on the parts of the whole and their relations to each other, as well as the whole school-day schedule. The teachers attached pictures onto the VAS stripe in a varied order from one day to another; however, the intended use of the frame on the VAS stripe, from top to bottom, was constant. The results highlighted teachers’ discernment of the pupils’ CC, identified through a variation-theory-based analysis of the transcripts of the planning meetings.

Teachers’ understanding/discernment of CC

An analysis of the CC aspects the teachers were aware of before implementing the lesson units was undertaken. Statements about the pupils’ weak CC were most frequently made (58%) in the second collaborative meeting (see “pre-intervention” in [Table 1](#)).

Aspect of CC	Pre-intervention Frequency	Post-intervention Frequency (percent)
Merging information	7 (13%)	31 (31%)
Contextualizing information	13 (25%)	33 (33%)
Giving details a broader meaning	2 (4%)	22 (22%)
Weak CC	30 (58%)	14 (14%)
Total	52 (100%)	100 (100%)

Note(s): The percentage refers to the distribution of measured occurrence of discerned aspects of CC

Table 1.
Noted aspects of CC in teachers’ expressions

One example in which a teacher's statement was linked to their awareness of pupils' weak CC appeared in the second meeting. Here, Cara explained how some pupils did not appear to understand the VAS:

Excerpt 1: There was one pupil who had probably not attended school before. They [the family] moved from one school to another. The pupil had been in several educational settings but never perceived the structure. "So, what . . . [spoken in a brighter tone to reflect the pupil's own voice] . . . am I going to play now?" [The educational structure] was not clear. "Of course, I'm going to play [spoken in a brighter tone]." But the visual schedule indicated another activity. "What schedule?"

The second most frequently discerned aspect of teacher awareness before the intervention was linked to teachers' considerations about pupils' abilities to *contextualize information* (25%). This is exemplified in the following quotation, in which Cara explained how the visual timer was used to inform pupils how long was left before changing the teaching activity:

Excerpt 2: There are often many things going on in the class, but [the time-tracker tool] is a way to explain them. [For example], in five minutes, it will be . . . [The time-tracker] shows them.

The consequences of discerning pupils' weak CC were seen in an example of one of the first registrations in the teachers' observation protocol (10/9/19). In this excerpt, the teacher (Alice) noticed that the pupil was unable to follow the activities in the VAS but used the frame to mark the desired activity:

Excerpt 3: The pupil stated, "This frame really works," then tore the frame away from its position on the VAS stripe and instead put it on the computer picture. The teacher grasped the frame and moved it back to the position that indicated "work." This process was repeated. Finally, the pupil cut the frame into pieces.

Teachers' changed focus in planning and conducting instruction

In the third planning meeting, after implementing the frame onto the VAS stripe, statements related to the teachers' awareness of the pupils' abilities to contextualize information were most frequent (33%, "post-intervention" in [Table 1](#)). Statements about the ability to contextualize information were prominent when the teachers discussed the pupils' understanding of the order of the activities in the schedule when using the frame. This was evident in the following quotation, where Alice recounted how she explained what would happen after lunch:

Excerpt 4: I said, "It's time for a break. You should go and have a nap." First, he said yes. But after looking at his VAS, he jumped down from the chair and said something like, "Are you sure?" I replied, "Yes." But when I glanced at the VAS, I saw that immediately after lunch, there was a patch that stated "lawnmower." That pupil loves lawnmowers. . . He asked, "What does it say?" I replied, "It does not tell you to go and have a nap. It says that we should do something with a lawnmower." "Oh really?" he responded. [Alice nodded]. So, I had to move the frame [to the schedule position for lawnmowers]. But he understood.

In the third meeting, *merging information* was the second most frequently mentioned CC aspect (31%). These statements mainly appeared when the teachers discussed how to further develop the lesson units. For example, this was evident when they considered how they could best help the pupils understand being divided into different groups and activities:

Excerpt 5: What we could do is use two small green frames at the same time. Then we could explain, "Your next activity is positioned in that green frame, but yours is positioned in the other" [makes gestures with both of her hands as if forming frames in the air]. (Daisy)

Differences in teacher awareness

Regarding RQ2, which concerned the differences in the teachers' focus after implementing the lessons, changes in this focus were observed when they were planning and conducting the instruction. These changes related to the teachers' practice in terms of the impact of the research lessons on changes in Wilma's social behavior and information processing. The clearest identified difference was that the teachers progressed from mainly discerning aspects of the pupils' shortcomings (related to their weak CC) to strategies about how the pupils' CC abilities could be reflected in the lesson units' design. At the group level, the teachers moved from mainly discerning aspects of the pupils' weak CC to considering their general CC abilities. This encouraged the teachers to concentrate on didactic solutions to adapt the received instructions based on the requisite skills identified for each pupil.

An example of how the teachers changed their awareness from focusing on the pupils' shortcomings to considering their CC abilities emerged in the following passage from the third meeting. Here, the teachers analyzed how one pupil had discovered an additional communicative use of the frame:

Excerpt 6: It's the same pupil a little bit further down [referring to the shared observation protocol]. He picked up a larger green frame and used it to contain "computer" plus "handicraft." The green frame was taped [on the pictures in the VAS]. . . He wanted to show me that he was not interested in it [the frame] before. And then he wanted to show that this was what we should do: He used his own green frame. He went and picked it up in the box, where he knew that it was, and he showed it to me. "It's time for computer and a handicraft." "You do not have to try anything else." (Alice)

Wilma's development during the LS

Descriptions from the teachers' planning meetings, the teachers' observation protocol and the sequences of photos and videos were used to identify the changed discernment in the case pupil's development. In the second planning meeting (9/27/19), the limited possibilities for the case pupil to participate in education emerged. This was evident in Alice's statement describing Wilma's actual situation:

Excerpt 7: Wilma just walks around. She seems to be unaware of events around her. It's difficult to catch her attention. It's difficult to motivate her. The result is conflict – with other pupils and with us [the teachers].

Alice's description of Wilma's limited ability to participate in the lesson was captured in a photo (10/14/2019) that the teachers shared (Plate 2, left). At the clarifying interview, Daisy explained the context of the photo, which was taken when the class received a visit from a dental nurse:

Excerpt 8: The dental nurse went forward and basically pressed that thing [an electric toothbrush] into Wilma's hands. She then sat there and fiddled with it. It was no more exciting than that, even though we had thought it would be an exciting situation; it was a new person visiting us and so on. But she seemed just a little bit bored.

When asked if this passive response was representative, Daisy responded:

Excerpt 9: I would say that at the beginning of that semester, she [Wilma] just sat there at the back of the classroom and looked down. We could not reach her.

One critical feature became evident in the teachers' observation protocol (12/2/19), indicating a shift in the teachers' discernment of Wilma's passive to active participation in the classroom:



10/14/19



12/4/19

Note(s): The images (presented here with participants' permission) show critical features in Wilma's participation from passive to active receiver of the given instruction

Plate 2.
Changes in pupil-
participation

Excerpt 10: The pupil [Wilma] takes part in the teacher's activities in the final lesson of the day by grabbing the frame and using it to mark that this lesson is finished and that now playtime begins. The pupil is apparently satisfied. (Daisy)

The active participation discerned in the observation protocol corresponded with a shift from the fourth meeting (12/18/19) described by Alice and Cara, who shared their reflections about a sequence in a video observation (12/4/19). It also revealed the teachers' awareness of Wilma's discernment of the educational context:

Excerpt 11: Cara: If we do things in a slightly different way, she [Wilma] responds in a slightly different manner. That makes it a little easier for us to move on.

Alice: In that video sequence, [we were telling] the class it [was] going to be a sports lesson, which [was] easy to accept because we know she really likes sports lessons.

The "different manner" that Cara discerned in Wilma's transition from passive to active responses to learning is also visible in a snapshot from the video sequence mentioned shown in [Plate 2](#). A comparison between the left and right sides of the figure illustrates the differences in Wilma's glances and body tension corresponding with the discerned changes in the responses she gave.

Wilma's knowledge development

Wilma's increased participation in teaching indicated her improved discernment of space and time. However, the data were insufficient to fully determine to what degree Wilma's knowledge increased during the intervention since the teachers were sometimes unable to understand what she was saying and, thus, lacked the opportunity to let her respond to the given instructions. This situation was illustrated in the following passage from the fourth meeting:

Excerpt 12

Alice: She has very limited verbal language, and sometimes she scratches other people. [Alice makes a scratching gesture in the air.]

Researcher: So, she has hardly any verbal language?

Cara: No, she does not have much verbal language, so she uses some signs. But they are not very developed, so she cannot channel her feelings or express when she is angry or sad. Instead, she resorts to actions.

Teachers' changed instructions

At the individual case-pupil level, the instructions given were somewhat delayed. A critical moment occurred in the third meeting (11/13/19), when all the teachers had forgotten to take notes on Wilma's reactions to the lesson activities. Wilma had been selected as the case pupil because all the teachers had agreed that they had not paid sufficient attention to her constant needs. The absence of notes about Wilma allowed the teachers to realize a possible connection between their inattentive reactions and the emergence of educational difficulties or challenging behaviors.

Following this critical insight at the third planning meeting, a developmental process emerged that further influenced the enacting of instructions. At the fourth meeting (12/18/19), the teachers stated that since the last session, they had started to present more advanced learning content to Wilma and had begun interacting with her differently. This was apparent in the following statement from the fourth collaborative meeting:

Excerpt 13: [reasoning about a new teaching approach arising]. . . Pedagogical, dramaturgical, or whatever you want to call it. You get involved in a different way. Or you make things exciting. [Cara rubs her hands and blows lightly into them.] You explain things in a more attractive way. She [Wilma] fully agrees with that. (Cara)

This quotation indicates a relation between the teachers' enhanced discernment of Wilma's understanding of the activities in the VAS and their capability to design instruction that encouraged Wilma's active participation during the lesson.

Discussion

Situation awareness is an inductive process through which the research object's awareness is gradually constructed (Zhang *et al.*, 2021). In the present study, several research questions guided an investigation into the impact of LS on teacher instructional processes and student learning. Before the intervention, the teachers commented frequently about their pupils' disorientation in the educational environment. The teachers' statements corresponded with the core components in Happé's (2013) definition, identifying features that focused on pupils' weak CC. The teachers' awareness of Wilma's reactions when applying the visual frame to the VAS stripe during the lessons can be interpreted as follows: In applying the frame, the teachers did not solely consider aspects of the pupils' CC limitations but also paid attention to their pupil's comparatively high ability to discern concrete details, which is a capability that sometimes occurs in individuals with comorbid ID and ASD (Knight *et al.*, 2015). After the intervention, the teachers developed and could discern the critical features of their pupils' CC capabilities (Happé, 2013). This can be understood through the lens of variation theory (Marton and Booth, 1997; Pang, 2003) as the teachers' intentions in applying the frame on the VAS were constant, as well as the direction from the top to the bottom of the VAS stripe. At the same time, the items (i.e. the activity pictures) within the frame varied. The study's focus on the case student's awareness of the role of procedure in the school day allowed the teachers to distinguish how pupils' awareness of details could be strategically used to enable their discernment of the critical aspects of the learning content. Therefore, there appears to have been a connection between

applying variation theory (Marton and Booth, 1997) in LS (Ono *et al.*, 2013) and the teachers' collaborative understanding of the core aspects of CC.

The observed link between the teachers' understanding of CC, their prerequisite skills in adapting received instructions and the pupils' abilities to process and contextualize information or discern the whole picture (Happé, 2013; Knight *et al.*, 2015) was important for the teachers' abilities to recognize or assess the educational context. Wilma's ability to navigate the school context was not evident before the teachers had developed their own responses based on their understanding of her CC. These findings indicate that LS promoted Wilma's participation in learning but was insufficient to prompt her knowledge development. A critical feature (Marton, 2015; Pang, 2003) in teachers' thinking emerged, namely that Wilma's limited verbal ability prompted her to use challenging prelinguistic behavior. Thus, to enhance similar students' participation in education to a level of *active participation* (UN Committee on the Rights of the Child, 2006) during learning, it is also necessary to implement comprehensive language development.

Sustainable inclusion through communicative involvement

The observed changes in teachers' awareness of the pupils' CC indicated that the implementation of the frame permitted a crucial *communicative involvement* in the educational encounter (Foreman *et al.*, 2014). Marton and Booth's (1997) concept of awareness (i.e. teachers' attentive recognition of pupil behavior with the object of learning in focus) allowed the researcher to become aware of the teachers' ability to identify the pupils' own awareness of what would happen next, both at an individual and a group level.

Teacher–student communicative involvement was evident in one sequence where Alice observed one of the pupils making his own adaptations to the frame by taping it onto requested images. In this case, the frame became a communicative tool that informed the teacher and the pupil's classmates about additional suggestions for the proposed activity. This finding is in accordance with Knight *et al.* (2015), who highlighted the benefits of adapting VAS at the individual level to expand pupil interaction in the classroom. Due to its Japanese origins, adapting an LS for Western contexts can be challenging (Fujii, 2014); however, sustainable change in SEND teaching is demanding (Foreman *et al.*, 2014), and in the context of SEND teaching, collaboratively based challenges could be what is needed to improve pupils' capabilities to engage in learning.

In the present study, pupils' discernment during the teaching was understood through the lens of variation theory (Marton and Booth, 1997; Pang, 2003). Similarly, through a process of peer debriefing with other researchers, the author became aware of how aspects of the teacher discussions related to core components of CC. The findings revealed that the teachers' awareness of CC underwent a major and crucial shift from mainly focusing on issues linked to weak CC to predominantly emphasizing those associated with the pupil's abilities.

Validity

Norwich *et al.* (2020) emphasized the urgent need for robust methods to confirm the trustworthiness of the findings of LS research, which, in this study, was achieved by a step-by-step assessment (Nowell *et al.*, 2017). To confirm interrater validity (Armstrong *et al.*, 1997; Sun, 2011), the analysis was undertaken in collaboration with a senior researcher.

Limitations and considerations for further research

In an effort to contribute new findings on pupils' outcomes (Holmqvist and Lelinge, 2020) to the research on teachers' collaborative professional development, this study considered use of the LS model in terms of the observed changes in a case pupil's participation in education. To strengthen these findings, additional case pupils should be assessed using a comprehensive

framework in which the pupils' engagement in learning is measured. In addition, the observed variation (Pang, 2003) might have been even more comprehensive if more of the lesson units had been video recorded. Further studies along these lines will assist in better understanding the potential contribution of LS in supporting both students with a range of disabilities and their teachers.

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