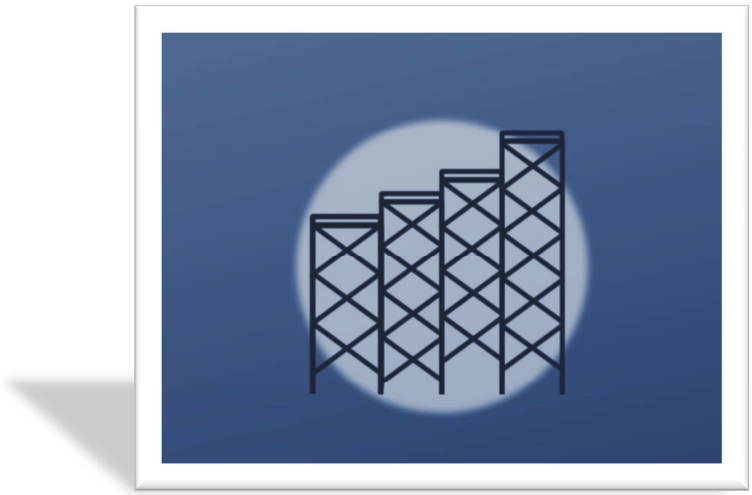
Exploring the steps and process of scaffolding during teacher- student interactions



V.C Robeer BSc
Langebrug 160, 2311 TB Leiden
06-26390933
valeriecrobeer@hotmail.com / v.c.robeer@umail.leidenuniv.nl
s1025759
Educational Studies, 2014-2015
20 ECTS.

First Supervisor: Dr. K.F.A Stroet
Second Supervisor: Dr. F.J. Glastra
Faculty of Social Sciences, Department of Education, Wassenaarseweg 52
Leiden
+31 (0)71 527 3955
k.f.a.stroet@fsw.leidenuniv.nl

Abstract

In view of the introduction of 'Passend Onderwijs', a greater emphasis will be on how teachers can give instruction to a large range of students with their own cognitive needs. To cater the needs of each individual student, teachers have to understand how to apply adapted support like the scaffolding technique. This technique is contingent on student's cognitive needs. Two steps of the model (checking the diagnosis and checking students' understanding) of contingent teaching and fading of support and transfer of responsibility were the point of focus in this study. For exploring the steps and the process of scaffolding during teacher-student interactions, one teacher and his first general secondary education-pre-university class were observed and interviewed to examine how scaffolding was applied in the classroom. Training and reflection sessions with the teacher were done to promote and reflect on the process. The observations were transliterated and divided in teacher-student(s) interactions. Teacher turns were coded by two researchers to measure the inter-coder reliability. The findings demonstrated that the teacher didn't apply the step checking the diagnosis that many times and used something that resembled this step. It was demanding to find out why checking the diagnosis might be so challenging. There were differences in how the teacher used step 4. Teacher-turns in which the teacher used something resembled students' learning were more about the teacher understanding of the student and not about the understanding of the student itself. Further, Interesting movements of fading and transfer of responsibility that the teacher mentioned in the interview were found in some interaction parts. Future research should focus on a sample with more teachers and more intensive training sessions and reflection sessions Above all, implications of this study are useful considering 'Passend Onderwijs'.

Keywords: Passend Onderwijs (Inclusive Education), Scaffolding, adapted support, model of contingent teaching, checking the diagnosis, checking students' learning, fading of support, transfer of responsibility.

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Introduction

A recent development in the Dutch education system is the introduction of 'Passend Onderwijs' or 'Inclusive Education'. The basic idea behind this change in educational policy is the integration of many students with special needs within primary and secondary education schools apart from the special education. Until recently the educational policy for the Dutch primary and secondary schools was less structured as a result that there was no coordination between special and regular education schools so that some students with special needs fell between those stools (Ferguson, 2008; Messing & Bouma, 2011).

In the current situation of 'Passend Onderwijs' primary and secondary schools have to accept all students without the exception of those with special educational needs. Special needs students embrace a large range of students for example, students with learning disabilities (e.g. dyslexia), students with a higher ability (gifted students), students with hearing, visual impairments and students emotional and behavioral problems (Frederick, 2005). For addressing the different needs of all these students, teachers must be aware of the individual need of their students. This entails that teachers have to take care of how they give instruction to improve their students' academic knowledge (Cambra & Silvestre, 2003).

As a result of this introduction of 'Passend Onderwijs', there will be a greater emphasis on how teachers can give instruction to a large range of students. The researchers Florian and Linklater (2010) found that teachers lack necessary knowledge and skills to find out how to fulfill these student's needs. Moreover, teachers have difficulties in adapting their instruction because they don't have enough time to offer that kind of instruction (Carolan & Guinn, 2007). Another study done by Reezigt (2012) on the recent situation of Dutch schools indicated that teachers have to learn how to cater those needs because there is a question of stagnation in the recent situation. This stagnation, that entails the schools struggles with accomplishing data-driven teaching, could be due to a deficiency in knowledge of teachers and schools to evaluate their way of teaching and their curriculum in order to improve students' performance.

A technique that teachers can use in order to achieve fulfillment of the needs of each student is the technique of scaffolding. Scaffolding can be described as a technique that teachers can use to help students with their cognitive task on temporary base by determining what a particular student needs. This way of giving scaffolding support is adapted to the specific understanding of the student. Applying adapted support is demanding because teachers first need to consider what's the prior knowledge of a student (Van de Pol & Elbers, 2013). In order to cope with these higher demands, a new teaching role is demanded. This

new role encompasses teaching in a more assisting way. Conform the theory of Vygotsky (1978) teaching in an assisting way means that a person with expertise (a teacher) has to develop students' current level of understanding. In such manner, scaffolding constructs new strategies for teachers for manage their positions within a teacher-student interaction (Lin, Hsu, Link, Changlai, Yang, & Lai, 2012).

This new teacher role of constructing adapted support might be difficult. The way of how the teacher gives support might be different for each interaction with a particular student (Seidel & Shavelson, 2007). If there is too much of 'control' by the teacher, a student will underestimate himself. This leads to little challenge for the student. On the other hand, support that overestimates a students' understanding will be too challenging. Adapted support is effective because it is fitting student needs assuming that scaffolding is a technique to give adapted support to students' understanding that will be taking away if it isn't needed anymore (Van de Pol, 2012; Van de Pol & Elbers, 2013; Bruner, 1978).

Scaffolding differs in a qualitative way from helping because these are two aspects that are different in a teacher-student interaction where scaffolding is used (Mercer, 1994). In case of helping, a teacher helps a student to provide the right answer or assists with performing a task. If the teacher uses scaffolding, he will assist a student to complete a task or let the student think how he or she can deal with the task. This will help the student to develop skills that could be helpful for tasks on different difficulty levels and all subjects (Hammond & Gibbons, 2005; Van de Pol, 2012).

Exploring the concept of scaffolding according to Van de Pol

The dissertation by Van de Pol (2012) about scaffolding in teacher-student interaction will be the foundation of this study. In her research, Van de Pol (2012) indicated that research on scaffolding in the context of the classroom is limited mainly because of the complexity to investigate the combination of the concept of scaffolding and how this established in the classroom. This complexity is a result of a dynamic process that scaffolding compassed. Dynamic means that during the scaffolding process the teacher is able to respond to the student based on his or her needs. For example like the type of questions the teacher is using during the interaction with a student. In that way, the concept of scaffolding does not entail the same in every interaction (Van de Pol, Volman, & Beishuizen, 2010).

The dynamics of scaffolding makes it complicated for teachers to implement scaffolding in the classroom as well. Therefore establishing a model for promoting scaffolding might be very practical for the reason that teachers don't have any or only a little

scaffolding skills. In the present study, a program for teachers was applied to improve their scaffolding skills because there were no programs available for training these skills and teachers have to be aware of using this technique because it could be beneficial for teachers. Prior research has already shown this program to be useful for promoting teachers' scaffolding skills because teachers were able to learn how to apply scaffolding (Van de Pol, 2012). If teachers can apply their scaffolding skills it will help to fulfill each student's needs because according to Hammond and Gibbons (2005) the scaffolding technique is efficient. They pointed out that scaffolding is efficient way to fulfill students' needs because it offers the right amount of instruction, in other words scaffolding could probably improve students' achievement (Van de Pol, 2012).

To resume, the introduction of 'Passend Onderwijs' that involves that more attention has to be paid to the way of how teachers can learn and apply adapted support to students. The scaffolding technique is efficient way giving temporarily adapted support to students to fulfill their cognitive needs. It is not that easy to apply the scaffolding technique because of the dynamic process of scaffolding during teacher-student interaction. Therefore, in order to discover how scaffolding can be applied and what's happening during interactions, this study attempts to define the particular steps and process of scaffolding during teacher-student interactions which will give valuable insight data in what way scaffolding occurs.

Theoretical framework

The researchers Wood, Bruner, and Ross (1976) were the first to recommend the concept of scaffolding as a metaphor. This metaphor can be described as set up a temporary stage which refers to the way of increasing instruction so long as necessary. When instruction of the teacher or the construction is no longer needed because the student is able to work on his own or the building is finished, the scaffold can be removed (Hammond & Gibbons, 2005). This description was first related to the interaction between a parent and a child. They used the term scaffolding as a metaphor for the support a parent is giving to a child in practical daily situations. Giving support helps the child to reach a goal or solve a problem. Besides this interpretation of the concept, scaffolding can also be connected to the educational practice. Stone (1998) tried to analyze and refine the metaphor on the level of teacher-student interactions. Scaffolding needs to be an interactive process in which the teacher gives support

and the student responds and learns from it. Teachers who are using the scaffolding technique develop themselves as a facilitator of knowledge or something like a coach to the student and creating context where student' get the possibilities to ask questions according to Tiantong and Teemuangsai (2013). If teachers don't use the scaffolding technique, they are acting more like a content expert during interactions with students.

The concept of the scaffolding is based on the theory of Vygotsky particularly to the Zone of Proximal Development (ZPD). The Zone of Proximal Development can be described as the difference between the actual performances of a student and what a student can do if support is available what is called the potential level of performance. The term proximal refers to proximate what can be described as an area in which a student almost succeed something on his or her own but needs support which is adapted to the students' actual development. Therefore, the zone of proximal development varies for each individual student (Vygotsky, 1978).

Through the given support, the student will be able to learn something new. This given support must be constructive for the student in order to increase his understanding (Vygotsky, 1978). The ZPD can be linked to scaffolding according to Cazden (1979). Chang, Sung and Chen (2002) found that scaffolding offers adapted support that is established to the student. If the student has reached his potential level of performance within the ZPD, the scaffold or the adapted support of the teacher can be removed. In addition, the extent of support that is given in the ZPD is not the same for every child. To clarify this point of view, the ZPD refers to the individual development of a student where the social, cultural and historical background and the age of the child affect the cognitive development of the student (Loughran, 2010).

In the theoretical framework of scaffolding there are three components that are characteristics of scaffolding namely contingency, fading and transfer of responsibility. Before Van de Pol, Volman and Beishuizen (2010; 2011) started their large literature study, there was no univocal definition of the concept of scaffolding. In such manner, these characteristics were specified as a result of a large literature study. The interpretations of the three constructs that are used in the study by Van de Pol (2012) to scaffolding in teacher-student interaction will also be used in this study.

These characteristics of scaffolding can be linked to the process of support that the teacher is giving to the student during a 'difficult' task. The first characteristic and key component during the process of scaffolding is ongoing diagnosis or contingency. Van de Pol (2012) outlined a few studies which defined the concept of contingency such as the study done by Nathan and Kim (2009). She used that information to operationalize the definition of

contingency for her own study. Contingency can be described as temporary, adapted support that the teacher will give, based on the response of the student. Further, contingency is a crucial aspect of scaffolding. The teacher uses diagnostic and scaffolding strategies to fulfill the needs of a student. These strategies have to be contingent for the student in order to contribute on students' responses. For contingency support, the teacher has to figure out what kind of knowledge the student has. After this step, the teacher can give adapted support to the student because of his knowledge of the student's level of learning (Van de Pol, 2012; Van de Pol, Volman & Beishuizen, 2009). Contingency can be linked to formative assessment according to Shepard (2005) because by collecting information of the student the teacher tries to adapt his support during particular interactions.

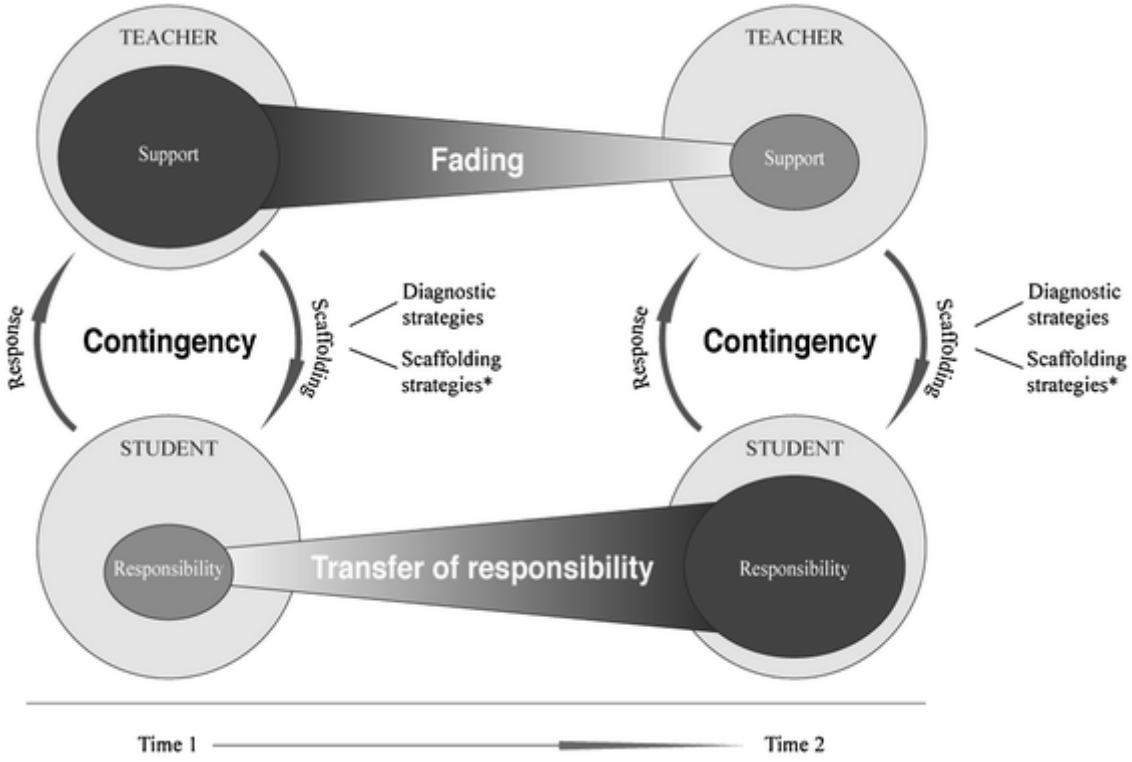

Figure 1: An outline of the conceptual model of scaffolding presented in the article by Van de Pol, Volman and Beishuizen (2010).

Fading is another component of the conceptual model of scaffolding. Fading refers to decreasing the extent of support from a teacher and depends on students' level of understanding. This component originates component from a study by Maloch (2002) about the teachers' role in scaffolding situations. She established that teachers behaved as a facilitator and that during discussions with students, teachers need to handover the responsibility to the student step-by-step. The student is able to complete a task on his own

and doesn't longer need support. This process takes place step-by-step (Van de Pol, Volman & Beishuizen, 2010; Dennen, 2004). The third characteristic of the model is transfer of responsibility. Transfer of responsibility is related to the situation of the student. The transfer takes place if a student can still successfully complete a task without the support of the teacher. The concept of responsibility can be linked to students' learning regulation on cognitive and meta-cognitive activities (Van de Pol et al., 2010). The definition of transfer of responsibility that Van de Pol (2012) used was based on the study by Reigosa and Jimenez-Aleixandre (2007). This study about performing problem-solving tasks concentrated on the process of transfer of responsibility to the students. The researchers found that students during problem solving consider that they have to take their responsibility for their own learning. If a teacher declines his support and transfers back the responsibility to the student, there will be a question of ascending control of the student and there will be no more or less teacher control. This means that the responsibility is transferred to the students. They have to accomplish their own learning activities (Verloop & Vermunt, 1999).

Fading and transfer of responsibility are two components of the model that can be integrated. These components refer to the change of the students' capability of solving the remaining part of the problem. Successful transfer takes place if there is a decline of support by the teacher. If fading or transfer or responsibility occurs in a non-contingent way there is no question of scaffolding. This implies that a teacher uses his previous information about students' knowledge in an incorrect way with the consequence that fading and transfer of responsibility cannot occur (Smit, Van Eerde, & Bakker, 2007; Wood, Bruner, & Ross 1976; Puntambekar & Hübscher, 2005; Van de Pol, Volman, & Beishuizen, 2009).

There is a difference between settings in which scaffolding can be applied. Scaffolding can be distinguished in two levels; micro level and macro level. On a micro level, the teacher can adapt his support or instruction within an interaction with a student who need some help. In other words, the learning of the student as a result of the giving support takes place on the micro level. The micro level is a component of the macro level. The school and classroom level are related to the macro level of scaffolding. For example, when a teacher stimulates students to work on a selection of particular tasks, he has to manage of how his classroom should be in order to support his students by connecting the tasks to the program and curriculum goals. In brief, the macro-level can be described the way of how groups of students are coordinated by the teacher (Wells, 1993; 1994; Hammond & Gibbons, 2005; Van de Pol, 2012).

The model of contingent teaching

One of the major focuses in this study will be on one of the characteristics of scaffolding namely: contingency which refers to adapted support. Contingency is a prerequisite for scaffolding because if a teacher uses the technique of scaffolding within an interaction with the student, he is teaching in a contingent way (Van de Pol, 2012). Next the model of contingent teaching was constructed to get more insight in the information the teacher uses during interaction with the student. With this intention, the model of contingent teaching emphasizes the use of information of the student learning level and to compile the steps of scaffolding. The adaptation of the teacher and the responses of the student are two important aspects in this model (Van de Pol, 2012). The origin of this model was partly based on research by Wood, Wood and Middleton (1978). In accordance with the results of the study by Wood et al. (1978) contingency was useful for the students because as a result, they were able to complete most of the tasks by themselves after instruction. A further elaboration of this model was made by Ruiz-Primo and Furtak (2006, 2007). They investigated the teachers' informal formative assessment practices in a classroom and tried to construct a model for analyzing these interactions. This model combines diagnostic and contingent approaches. Van de Pol (2012) adapted these previous studies to construct the model of contingent teaching. According to research (e.g. Van de Pol & Elbers, 2013), contingent teaching is an effective way of teaching because this way of teaching is coherent to students' understanding.

The model of contingent teaching consists of four steps and this model can be noticed as a cycle process (Van de Pol, Volman, & Beishuizen, 2011). The first step is applying diagnostic strategies. These diagnostic strategies can be distinguished in two sub-strategies: asking diagnostic questions and reading of student work. The goal of these diagnostic strategies is to figure out what a student already knows (cognitive) about a subject. This can take place direct or indirect. Direct diagnosing means that diagnosing takes place during interaction in the classroom situation. Indirect diagnosing is another way of diagnosing students' knowledge. Smit, Van Eerde, and Bakker (2013) stimulated teachers to get more insight in students' homework and making weekly notes about their progress. They found that teachers will not use this way of diagnosing all the time but would help them with constructing the diagnose. Direct and indirect diagnosing better fits this way of applying diagnostics strategies then Smit, Van Eerde, and Bakker (2013) first adopted in their study (online or offline of applying diagnostic strategies).

The next step is checking the diagnosis in the model of contingent teaching. In this stage, the teacher examines if he understands the student correctly. By asking questions, the teacher gets more information about the current understanding of the student. The aim of this step is to create a common understanding of what the student needs and the teacher has to do. A prerequisite of this step is that students get the possibility to respond to the question of the teacher (Van de Pol, 2012). Applying diagnostic strategies and checking the diagnosis are part of the diagnosis phase of contingent teaching (Van de Pol, 2012; Van de Pol, Volman, & Beishuizen, 2011).

The third step consists of intervention strategies. Intervention strategies refer to the actual differentiated support. The intervention strategies can be applied through questions, hints, explanations, providing information and instruction. Yantraprakorn, Darasawang and Wiriyakarun (2013) summarized a few intervention strategies with a short description. They distinguished three levels of strategies. On a low level, a teacher could give hints or steering questions. Hints are short ways of help to guide a student like keywords or pictures. Hints are comparable with prompts. Steering questions are more helpful if a student needs more guidance. On a medium level, open questions and feedback are represented. Open questions are useful to enhance students their knowledge. Feedback is a direct evaluation of the work of the student and it will help for deeper understanding. Providing information, explanations and instruction are defined on a higher level. These interventions are detailed forms of differentiated support and will help the student with difficult tasks. However, the appropriate level of support depends on obtained information of step one and two (Van de Pol, 2012).

The last step is checking students' learning. The goal of step 4 is to find out if the students' learning is extended. Checking students' knowledge is mainly done by asking questions like *'Can you explain it to me, in your own words?* Students will try to give a brief summary of the new things he or she has learned by given an explanation or an elaboration of what they learned. After the teacher concludes that the student made progress or if the student learned something new, the teacher will transfer the responsibility back to the student. A study that was done by Koole (2010), about students' reaction to given explanations on mathematics problems indicated that checking students' learning during teacher-student interaction is about the students' comprehension and not about the teachers' understanding of students' comprehension. In other words, it's concentrated on the students' learning. This step was added to the model to get more insight into the effectiveness of the scaffolding effort but need further research must be done to figure out the role of this step (checking students' learning) (Van de Pol, 2012).

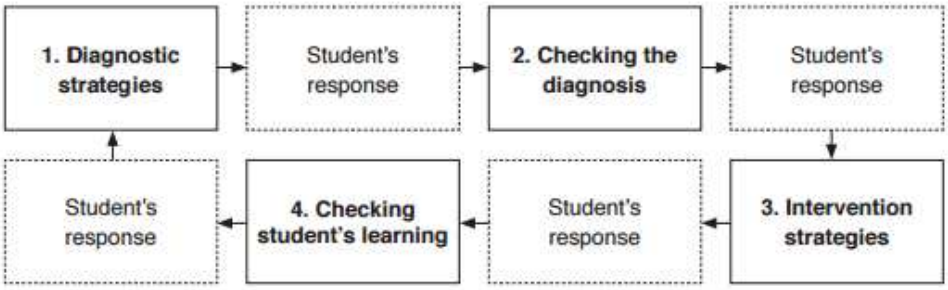

Figure 2: The model of contingent teaching including the four steps. Adapted by Ruiz-Primo and Furtak (2007).

A strong element of this model is that it was useful for teachers in learning how to implement the steps of contingent teaching in the classroom. Teachers, who participated in the experimental study of Van de Pol (2012) about scaffolding in small-group work, demonstrated a higher quality of steps during interactions. These teachers were able to give contingency support to their students. In such manner, it turned out a functional tool for promoting teachers' scaffolding behavior. For this reason, this model of contingent teaching by Van de Pol (2012) was used in the current study to investigate how the teacher handles and uses these steps during interactions with students. This will give valuable information of how these steps are constructed and how these steps are emerged in the teacher-student interactions.

Computer-based scaffolding

In recent years, there has been a growing interest in computer-based scaffolding. Owing to this interest in computer-based scaffolding a large part of research on scaffolding was done in computer-based environments. In view of this growing interest and the number of research that has been done computer based scaffolding will be discussed to show the amount of the essential aspects for dynamic face-to-face interactions like contingency of a human instructor and how fading and transfer of responsibility take place during these interactions.

Computers have provided the development of computer-based scaffolding, especially for online learning. According to the researchers Yelland and Masters (2007) this is a new type of scaffolding can be called technical scaffolding. Technical scaffolding means that the computer provides the instruction based on the scaffolding technique. In that way, it differs from face-to-face scaffolding because most of the time there is no instructor who is giving immediate support. Rather, computer-based scaffolding can be used to expose students to rich problem-solving contexts (Belland, Walker, Olsen, & Leary, 2015).

Several studies indicated that the scaffolding technique could be useful in computer-based environments. Wood (2003) was one of the first researchers that indicated the distinction between guidance face-to-face and computer-based guidance in his overview study. He found that computer-based environments in which tutoring take place cannot compete the way of tutoring by a teacher because of the individual variation of students when it comes to learning results. Another study by Belland (2011) examined computer-based scaffolding and the role of transfer of responsibility. Computer-based scaffolding gives support to improve students' abilities to solve complex problems. The results of this study indicated that scaffolding in combination with computer-based tools was useful but on the other hand computer based scaffolding can't always fulfill students' needs because it is based on pre-programmed computer settings especially in case of ill-structured problems.

These two studies outline that computer- based scaffolding may promote students' learning and performance. However, there are a number of concerns to notice. The first concern in computer-based scaffolding is to calibrate the support or in other words: contingency. It's difficult to apply contingency in computer based environments because most of the time static scaffolding is used. Static scaffolding in computer-based environments can be described as standard feedback over time during cognitive tasks. There is no consideration of the individual needs of each student because every student gets the same feedback. An exploration of studies about the effects of static scaffolding established that this type of scaffolding can be intensify the procedure of problem-solving resulting in difficulties with transferring knowledge (Molenaar, Roda, Van Boxtel, & Sleegers, 2012).

Another concern of computer-based scaffolding is the absence of a human instructor also called the social aspect of scaffolding. During interactions with the student, the teacher got some insights of the student as a result of previous observations, experiences and conversations with the student. This knowledge of the student can help the teacher during interactions with the student. An advantage of a human instructor is that he or she can give an instruction that is adjusted to the situation and the needs of the student at the moment. Dynamically adjusting the instruction will be challenging during computer-based scaffolding. This will be challenging for computer-based scaffolding because it depends on students input from sensors and other ways to get more information about the status of the student. Therefore, the settings of the computer-based scaffolding system have to be installed in some way that there are possibilities to evaluate and establish students' needs (Holden & Sinatra, 2014).

Besides the absence of a human instructor, students have to take responsibility to regulate their own learning. While the human instructor (teacher) has the ability to recognize when to fade the instruction and transferring the responsibility to the student, these actions are more challenging in computer-based environments. This has to do with the level of scaffolding and instruction. The level of scaffolding and instruction, which is given in the computer-based situation, can be inappropriate for an individual student. This may result in students becoming demotivated to continue their tasks (Holden & Sinatra, 2014).

Accordingly, research about computer-based scaffolding showed that scaffolding can be used in a computer-based environment. This means that students are learning based on programmed computers that are giving standard feedback. It differs from the way of giving support by the teacher because computer-based programs lacking elements that are important in the teacher-student interaction like giving differentiated, adapted support. As already noticed, the focus in this study will be on the process of scaffolding especially during dynamic face-to-face interactions with the teacher and student mainly on the steps of the model of contingent teaching. Computer-based scaffolding is discussed to show the amount of the essential aspects for dynamic face-to-face interactions like contingency of a human instructor and how fading and transfer of responsibility take place during these interactions.

As previously stated, this study aims to contribute the concept of face-to-face scaffolding with the emphasis on the steps of the model of contingent teaching and the process of fading of support and transfer of responsibility. The purpose of this study was to access information of how a teacher would implement the steps of the model of contingent teaching and how fading of support and transfer of responsibility will take place during teacher-student interactions. Because very little is known about the practice of scaffolding in the educational context, this study attempts to give insight knowledge of how scaffolding in teacher-student interaction looks like. One of the greatest challenges will be to describe the teacher-student interactions and to explain how the teacher manages the interactions.

Present study

This present study about the implementation of scaffolding in the classroom is a continuation of previous research on scaffolding by Van de Pol (2012) and Van de Pol, Volman and Beishuizen (2010). The focus in this study will be on two steps of the model of contingent teaching and fading and responsibility (two main characteristics of scaffolding). The following main questions will be the focus of this study.

1. *What distinguishes interactions that entail the application of step 2 (checking the diagnosis) from other interactions?*

2. *What distinguishes interactions that entail the application of step 4 (checking students' learning) from other interactions?*

3. *How do fading and transfer of responsibility take place during interactions with students and how does the teacher experience these processes?*

The first two research questions will be examined during specific interactions between a student and a teacher. The focus will be on the application of the steps and if the teacher uses the step in an accurate way. The third and last research question will concentrate on how fading and transfer of responsibility take place on a more comprehensive way during interactions with students.

To clarify these three research questions, each question is mentioned below with the corresponding hypotheses. The first research question: '*What distinguishes interactions that entail the application of step 2 (checking the diagnosis) from other interactions?'*. This research question concentrates on the differences of using step 2 during interactions with a teacher and a student. It is expected that the teacher will not always apply step 2 in a correct way (checking the diagnosis) because he thinks he understood the student correctly during step 1 so it will be not necessary to use this step. An element of using step 2 is that the teacher will give the student a moment to give a reaction. It will be expected that the teacher not always aware that he has to pay attention to the student (Van de Pol, 2012). Previous studies by Van de Pol (dissertation, 2012) about the analyzing of this model and the study by Knežić (2011) about the Socratic dialogue, a way of using specific questions in an interaction was found that teachers use this step less often than the other steps because it was difficult to master this step during interactions. The focus of attention will be on getting more insight information in how this step or something like this step will be used during different scaffold processes with students. A description of interactions in which step 2 or something that resembled step 2 will be reported to illustrate how the teacher applied this step.

The second main question will focus on another step of the model of contingent teaching, checking students' learning: '*What distinguishes interactions that entail the*

application of step 4 (checking students' learning) from other interactions?'. This step was added to the model of contingent teaching later on in the study by Van de Pol (2012). This step is important to receive information about the effect of the other steps that were already applied. The participating teachers clarified that this step was essential for the scaffolding cycle. Due to the fact that it gives more insight in the cycle of the model contingent teaching. The researchers Freud and Kasten (2012) found that in the case of students, it might be difficult for them to be aware of what they already know or overestimate their understanding so this step, checking students' learning, might be also very helpful for students to get an idea of their own understanding because the teacher challenge students by asking to give a demonstration of what they learned.

It is expected that if the teacher thinks that he has a 'good' understanding of the concept of the student he will not use this step and occasionally use this information also in other interactions with this particular student. According to Van de Pol (2012) further research has to be done to examine how this step can be used in the scaffolding process and how to teach this step to the teacher. In that case, the focus will be on how step 4 or something like this step will be used during different scaffolding process with students and also a bit of attention will be on how students experienced this question based on short semi-structured interviews.

The last main question examined: *"How do fading and transfer of responsibility take place during interactions with students and how does the teacher experience these processes?"*. These two components are interrelated to each other when there is a question of scaffolding support. The support that is given by the teacher has to help a student to performing a task and will gradual remove by the teacher. Transfer of responsibility takes place if students are able to finish their tasks on their own without the scaffolding support. Wood et al. (1976) established that fading promotes the process of transferring the responsibility back to the student. Van de Pol (2012) focused on how fading and transfer of responsibility toke place in a contingent or non-contingent way. The focus for this research question will be on the processes of fading and transfer of responsibility because conform the results of Van de Pol (2012) more attention should be paid to the processes of fading and transfer of responsibility. Another study by Puntambekar and Hübscher (2002) about scaffolding in learning environments also mentioned that it would be useful to investigate how transfer of responsibility occurred. Following these outcomes and for the reason that not much research has been done on the process, the researchers hypothesized that the processes

of fading and transfer of responsibility take place on a more overall level within a teacher-student interaction and can be offer some insights into scaffolding in general.

Moreover, a semi-structured interview with the teacher will be conducted to get more information about his way of teaching and how the teacher tries to handle interactions with his students. The aim of attention in the semi-structured interview will be on fading and transfer of responsibility and how the teacher experienced these processes.

In the next part, the method part of this study will be discussed. The method part will contain the procedure, participants, data analysis and the analytical plan of this study

Method

Procedure

Various classroom observations were done to collect data of instructional practices. This is part of observational research on generic aspects of classroom teaching (Brophy, 2006).Besides observational research, a case study was another design that was used in this study. The goal of a case study is to make a reconstruction of the whole context. It is helpful to capture the complexity in the context of a classroom. Different methods like observations, training sessions and interviews were used in the hope that the researchers are able to interpret the processes of the particular case (Hamilton & Corbett-Whittier, 2012; Thomas, 2011). The whole study has been done in the work environment of the participating teacher. For practical reasons, the researchers used one HD-camera and an external microphone that was carried by the teacher himself. The use of an external microphone was helpful to record a clear sound of the teacher if he was interacting with a student. The data of this study was collected during the months of May and June 2015.

First a pre-observation of a regular lesson was done to get an idea of the situation how a normal lesson was organized. After the first pre-observation was done also a second pre-observation was scheduled to get more insight in the normal classroom situation and the interactions between the teacher and his students. Students were informed by means of an announcement of the teacher about this study. Subsequently there were two training sessions of one and half hour with the teacher (90 minutes). The two training sessions were based on the professional development program of Van de Pol (2012). The first training session contained information about scaffolding in general, the theory and an explanation of step one (diagnostic strategies) regarding to the model contingent teaching (Van de Pol et al., 2010;

Ruiz-Primo & Furtak, 2007). In the second training session, the other three steps of the model were explained and examples of teachers who participated in the dissertation of Van de Pol (2012) were used to show cases of scaffolding in the classroom. These examples were examples of scaffolding and non-scaffolding. The teacher got an overview of the important things that were discussed at the end of the training sessions and watched a video from the website Leraar 24 about scaffolding.

After the pre-observations and training sessions were done, post-observations and reflections sessions were scheduled. First two post-observations were done. These post-observations were done immediately after the training sessions. The post-observations were done to examine if the teacher was able to accomplish the steps of contingent teaching during his lessons. One short reflection session was done a couple of hours after the second post-observation. During the reflection session, questions were asked about how the teacher experienced the way of using the steps and reflected on specific interactions with students regarding to the steps. These reflection sessions might be helpful for the teacher to help him to learn more about what is happening during interactions with students and how scaffolding could be implemented. A crucial part of teaching is the way of noticing what is going on in the context of the classroom. The researchers Sherin and Van Es (2005) found that teachers developed, after a lot of video meetings, new approaches of noticing and interpreting classroom interactions.

To gain more insight in the way the teacher tried to use the steps regarding to scaffolding two other post-observations were done. Throughout one post-observation two students were interviewed about recent and previous interactions with this teacher. They were selected because of interactions they had with the teacher. The short semi-structured interview contained questions about the way they experienced these interactions, the process of explaining and how did they feel about it. Also an interview with the teacher was done to get more information about the way he experienced the implementation process and how it affected his way of teaching. Other post-observations were done after the summer break to collect more information of interactions and to examine if the teacher was able to use the steps of the model of contingent teaching after a period of time.

In accordance with Van de Pol (2012) only applying and demonstrating the steps of the model during an interaction cannot link to be scaffolding. It’s important that teachers will learn the whole concept like the theory and the content of the steps. Only then teachers get familiar with using the steps during interactions. In this study, a lot of attention was paid to

organization of the training, reflection sessions, pre and post observations and the interview. That might be helpful the teacher to learning how to scaffold.

Participants

For this research, a convenience sample was used. Via personal contacts, a secondary education school in the area of Leiden was contacted and asked if they wanted to participate. This school is an innovative school with special attention to beta subjects, arts and culture. Due the fact that the researchers chose a case study as research design, only one teacher was needed for this research. This teacher has an academic background in English and 23 years of teaching experience. His 27 students, with the age between 12 and 14 years old, of a first havo/vwo class (combination of senior general secondary education and pre-university education) participated. These students are taught at the highest level pre-university (vwo) but the other level is taken into account. Before the complete study had started a passive informed consent was posted in the online environment of the students so that parents were able to read about the study in general and react if their child wasn't allowed to participate. Another first pre-university class was selected after summer for two post-observations. Providing that the teacher perspective was the starting point during the observations, it was possible to analyze the teacher in a different classroom context. Each lesson that was observed lasted 50 minutes.

Design and measurements

Qualitative data was collected through mostly video-observations in the classroom and on the other hand semi-structured interviews with the teacher and two students. Before analyzing the video-observations, the researchers first constituted definitions of how an interaction between a teacher and student should look like. The formulation of the definitions was partly based on the definition that Van de Pol (2012) used in her dissertation. The researchers made two criteria for two different interactions. An interaction begins when the teacher approaches a group of student (a small group of 2 to 4 students) or one student (one-one interaction) when students of the group or the student itself have a specific question about the content and ended when the teacher left. The other interaction starts when a student or students have a question about the content or when the teacher checks if the students' work and finds a mistake. Important to note is that interactions between teacher and students are about the content were selected and not interactions about practical things, for example when the teacher explains how to use a dictionary.

After the researchers made two criteria, the observations were watched to select fragments where interactions took place. Then transcripts of selected interactions were made by the researchers first in Dutch and, later in the process, in English. The video fragments of the selected interactions were first coded separately to find out to what extent the researchers had the same interpretation on different interactions. All teacher turns were coded within the selected interaction fragments. This procedure was done based on the definition of steps and examples of coding schemes from the dissertation of Van de Pol (2012). Furthermore, the researchers also coded teacher turns in which the teacher used something that resembled a particular step. These turns were found due to the fact that it these teacher turns were different from the definitions and examples but contained some elements of a step.

After watching the coded selected interactions, the researchers discussed the fragments and measure the inter-coder reliability by calculating the percent of agreement. If the researchers corresponding in one of the four steps for a teacher turn, they used (1 = completely corresponding, 0 = not corresponding) this method for coding. The inter-coder reliability was selected to determine the degree in which the two researchers agree about the coding of the steps. The next step was to determine a sufficient level of percent agreement. This sufficient level of percent agreement had to determine for checking the reliability among researchers. The guideline for percent agreement that was demonstrated in Neuendorf (2002) was used for this study. According to Neuendorf (2002) coefficients of .80 or higher are acceptable. Coefficients between .80 and .70 are appropriate for explanatory studies similar for this case study in which the researcher tries to make a reconstruction of how scaffolding takes place.

In the first place, the percent agreement per step within each interaction was measured. This was done to get an idea of how the steps within each interaction were coded and how an interaction was constructed. Next the percent agreement per step without paying attention to the interactions was coded. This was done to find out if the researchers had the same of interpretation of coding the four steps of the model. There were four possibilities for coding each teacher turn. If the two researchers coded the same step for a teacher turn, a turn was coded as hundred percent for each researcher otherwise the researchers had a disagreement. If each researcher coded a teacher turn as a different step, they set a hundred percent for the step that they coded but a zero percent for the step the other researcher had coded. The other disagreement contained if one of the researchers didn't code a teacher turn as a step. At last the overall agreement in percentages was measured to find out if the researchers had the same interpretation of the steps in general.

After the researchers had done the video-observations, an interview with the teacher was arranged to ask him questions about the whole project. The semi-structured interview of the teacher concentrated on three particular subjects. These subjects were subdivided into questions about the post training observations, post-summer observations and about the processes of fading and transfer of responsibility. The post training questions were about the diagnosing phase, using the steps if there was a difference between scaffolding in traditional lesson setting or with a group with students and how kind of support the teacher provided do his students. The post-summer questions were more general questions about scaffolding related to the technique of scaffolding, the basic elements and if each step was necessary to use. The last questions were about the progress of fading and transfer of responsibility. For example: '*Were there moments when you thought a student need more support even though you faded the support already?'* and *'How do you know a student has progressed the support and now he or she is able to continue on his own?'*

Whereas the teacher interview concentrated on the way how he experienced the way of using the steps, the student interviews focused more on interactions that students had with the particular teacher. During this question, other sub-questions were asked like how they experienced an interaction with the teacher, which kind of steps the teacher used and how the instruction of the teacher helped the student to move on. The other question was a continuation of the first question. Students were asked if interactions were comparable with previous interactions. Sub-questions like: '*If so, can you me explain why?'* and '*If not, what was different? And can you explain to me why?'* The other sub-questions of question number two were the same as mentioned on the first question.

Analytical plan

In order to find in what kind of way the teacher applied the concept of scaffolding during face-to-face interactions with a student or a group of students, this study will analyze in what way the teacher managed step two (checking the diagnosis), step 4 (checking students' learning) and the processes of how fading and transfer of responsibility took place. In this following section of this study, the results will be examined. Firstly, the inter-coder reliability will be discussed to get an idea how the researchers coded the steps. A rating sheet with the criteria and examples of the steps of the model contingent teaching was used for coding each

teacher turn. Next the first two research questions about the step 2 and step 4 of the model of contingent teaching will be examined. A few transcripts of interactions will be presented to support the research questions. Finally, the processes of fading and transfer of responsibility will be discussed by reviewing the interactions and analyzing the interview questions.

Results

Inter-coder reliability

The inter-coder reliability was measured in order to find out if the researchers had the same interpretation of the steps within teacher-student(s) interactions. There were a lot of differences between interactions in the number of teacher turns. This had to do with the length of the interactions. The length of the interactions depended on the two criteria that the researchers made before they had done the analyses of the interactions. Concentrated on teacher-student(s) interactions where the teacher approached a group of two or four of students or one student when the students of the group itself had a specific question about the content en ended when the teacher left and interactions where student(s) had a question about the content or when the teacher checked students' work and found a mistake, the researchers found eighteen interactions in total. Particularly in the relatively shot interactions some steps did not occur in particular interactions. Some interactions contained few steps 2 or a lot of steps 3. This affected the percent agreement per step within each interaction.

The researchers were more interested in the inter-coder reliability of the steps without paying attention to the interactions. The inter-coder reliability of steps was measured by counting the times that the researchers agreed and multiplied this by hundred and divided by the total of numbers that the researchers counted. The researchers coded most of the time step 3 (applying intervention strategies) for which the agreement was .82 which is acceptable percentage according to Neuendorf (2002). In order of coding, step 1 was coded thirty times in total and had an agreement of .81 which is also acceptable. Step 2, checking the diagnosis, was only coded four times in two interactions and there was an agreement of 100 %. Researchers coded step 4 (checking students' learning) fourteen times in total. Step 4 had an agreement of .79. This percentage was a bit lower than for the other three steps of the model of contingent teaching. This percentage is appropriate for studies like this one (Neuendorf, 2002). Also, the overall agreement was calculated by the two researchers. The overall agreement of all the four steps was .82 which is a sufficient percentage.

Checking the diagnosis

The first research question concerned: *"What distinguishes interactions that entail the application of step 2 (checking the diagnosis) from other interactions?"*. First an example of an interaction in which step 2 is used will be given. An explanation will be given why the teacher used step 2 (checking the diagnosis in the interaction). Also an example including a description will be presented in which the teacher used something that resembles checking the diagnosis to get an idea of the differences between the applications of this step.

Step 2 was only coded four times by the researchers within two teacher-student interactions. On the other hand, teacher-turns were found in which the teacher used something that resembled checking the diagnosis. There weren't a lot of fragments in which the teacher used something that resembles step 2

T= What is the question? Can you show me the answer?	S3= Look.... I said [in Dutch: zal ik een cadeau voor haar kopen].. and then I said something like…. Shall I bought her a present.. That's correct right?
T=Shall I?	S1+2= Buy
T= Shall I buy right? But did you say that....buy? **[step 2]**	S1= I think so
T= Shall I.... Buy her a present? [looked at student 1] **[step 2]**	S1= No.. Oh I mean yes.... S4= But 'Bought' is also right though?
T= Shall I buy… is a very good sentence (correcting student 4 because 'bought' isn't the right answer)* **[step 3]**	
* Own remark of what happened during this teacher-student interaction.	

This given example[1], which is part of the post-observation fragments, demonstrates an interaction with a group of four students in which the teacher approached them. The students had to construct a game where different grammar and translating questions were the point of focus. The teacher, in this example, approached a group of students by looking at their work and asking them a question so the teacher checked students' work. In this part of the interaction, the teacher used step 2 (checking the diagnosis) twice in a row.
Initially, the teacher failed in using a diagnostic strategy (step 1). Maybe the teacher already diagnosed the students in some indirect way but that's difficult to determine.

[1] All the given examples of interaction parts have been translated from Dutch to English. Names of the students have been made anonymous.

After failing a diagnosis strategy, the teacher was able to apply step 2 in this interaction. The teacher tried to check if he constructed the right 'indirect' diagnosis by asking questions to the students. By asking the question: *"Shall I buy right?"*. *But did you say that… buy?"*, the teacher attempted to get more information of the current understanding of the students about the conjugation of the verb 'buy'. A prerequisite for checking the diagnosis is that students get the possibility to respond to the question of the teacher. In this example, one student was thinking of this question and tried to answer it. Student 1 answered this question with: "I think so". Because of this answer the teacher wasn't sure that the student had a good understanding of the concept so the teacher applied step 2 again to assure that he got an idea of the current understanding of student 1. Again, there was a moment for the student to respond to the question of the teacher. The same student responded to the question of the teacher as a consequence that student four didn't understand why the other answer wasn't the right answer. Subsequently the teacher applied an intervention strategy (step 3) giving a hint.

Next an example and explanation will be given of a fragment in which the teacher used something that resembles step 2 (checking the diagnosis).

T= You went to the swimming pool. Okay, that's clear… Let's take a look at this question. And then you say… Do you go to the swimming pool? **[step 3]**	
	S1= It is then… Do you went… right?
T= Let me see….Do you went… You realize that this part of the sentence should be in the past tense. **[something that resembles step 2]**	
	S2= When it is past tense… it should be 'did' right?
T= Yes, good… and then? And what should we do with the verb 'go'? **[step 3]**	
	S1= Went…
T= And why do you think that?	
	S1= Because this should be in the past tense.

This example, which is also a post-training fragment, demonstrates a part of an interaction where the teacher something that resembled step 2. The giving interaction example is part of a large interaction with a group of students. This interaction also began when the teacher approached the group of students but directed attention to one student. He tried to get more insight information of how the student made the exercise by reading students' work.

However, he did not use a diagnostic strategy (step 1) to get an idea of the student already knows. The teacher immediately applied an intervention strategy by giving feedback and a steering question: *"And then you say…Do you go to the swimming pool?"*. The next teacher turn shows something that resembled checking the diagnosis of the student. In this situation, the teacher tried to check the diagnosis of student 1 by taking note of things that the student wrote down and want to make clear that he understand it correctly.

In comparison with the example in which the teacher checked the diagnosis of the student, in this example the teacher didn't ask a question to the student but looked for a conformation. With this question the teacher tried to find out what the student already knows by saying: "You realize that this part of the sentence should be in the past tense". For the student there was a moment to give an answer, but it isn't in accordance with the previous teacher turn. So for the student, there wasn't a moment to give a reaction.

Checking students' learning

The second research question involved: *"What distinguishes interactions that entail the application of step 4 (checking students' learning) from other interactions?"*. For this research question about checking students' learning also two examples will be given. The first example that will be showed is an example where the teacher used step 4 (checking students' learning) including an explanation. A second presented interaction part will be given to show an example in which the teacher used something that resembles step 4 because also teacher-turns where found where the teacher used something that resembled checking students' learning. At last, the two semi-structured interview with the two students will be discussed.

In order of least coded steps, step 4 was coded fourteen times within teacher-student interactions. An interesting thing is that checking students' learning wasn't applied in the pre-observations of the teacher (before the training). In one interaction, step 4 was coded 5 times. Comparable to step 2, there were more situations in which teacher used something that resembled checking students' learning. Most of the time the teacher used step 4 or didn't.

T= Eh.. something that you always do… there is another word that you can use…(Dutch word… ge…) **[step 3]**	
	S= A habit… (in Dutch: een gewoonte)*
T= A habit… so the present simple is always a fact or a habit.. When you say… I'm talking to you.. that is a…. **[step 3]**	
	S= Right
T= In this case… can you tell me the right answer? **[step 4]**	
	S= A habit…
T= No.. it is a …. **[step 3]**	
	S= A fact?
T= I'm talking.. okay… I'm doing it right now… I'm talking... literally in English…. Do you get it? You're doing it right now… Uh… wait.. can you give me a sentence with a fact? **[step 4]**	
***** Own remark of the Dutch translation of a habit.	

In the extract above, the teacher applied step 4 (checking students' learning) twice during a post-training interaction. The example that is given is part of a large interaction with a group of students including two girls and two boys. They had to play a self-made game (game of the goose) that contained translating and grammar exercises. This example illustrates a face-to-face interaction with one student and the teacher about the difference between a fact and a habit. For checking students' learning, the teacher used questions like: *"Can you tell me the right answer?"* and *"Can you give me a sentence with a fact?"* to find out if the student learned something. This way asking questions will help the student to recall the knowledge because the student has to repeat something that he had learned.

First the teacher asked the student if he was able to give the right answer. The answer of the student was: *"right"*. The given answer implies that the student had some difficulties with answering the first recall question as a result of his own understanding of the concept. Or in another way, the student answered the steering question of the teacher by saying: *"Right"*. Owing to this answer of the student, the teacher applied an intervention strategy by saying: *"No it is a… "*. Next the student tried to give the right answer but wasn't sure of his answer. The question mark implicates that the student wasn't sure of this answer. The teacher applied the step 4 again because possibly the teacher got the idea that the student didn't improve his

knowledge by asking the question: *"Uh… wait.. can you give me a sentence with a fact?"*. First the teacher gave an explanation (intervention strategy) about an example that the teacher gave. With this sentence, the teacher tried to check if the student understands the difference between a fact and a habit. The student had to construct a sentence so the teacher notices or least thinks that the student learned the difference between the construction of a habit or a fact.

As mentioned above, the first example was about a part of an interaction in which the teacher used step 4, checking students' learning. The next example will demonstrate a part of an interaction in which the teacher something that resembled step 4.

T= What do you think?	
	S= I think it's true… S2: Me too
T= And why do you think this is the right answer? **[something that resembles step 4]**	S= Because… its' after this sentence..
T= Yes… what's still uncertainly.. in this part of this sentence? (…) That he said… that he perhaps didn't do it… **[step 3]**	S= incomprehensible (student gives the right answer)
T= Yes, exactly.. That's what I thought.. Let's take a look what's mentioned right here… So twelve.. isn't the right answer… And probably, that has to do with…	

In the extract above, an example is given where the teacher used something that resembles step 4 (checking students' learning). This interaction part involved again a group of students. The students had to exchange and discuss their answers with each other about reading comprehension texts. The interaction began when the teacher approached the group with students. The teacher found out that the students had some different answers during exchanging their answers and asked why some of them had different answers.

First the teacher used any diagnostics strategies to figure out what the students already know. Subsequently, the teacher helped the students with reading loudly the part where the answer of the question was given. Later in the interaction the teacher used a step that resembled step 4 checking students' learning. The teacher tried to get information of one student of the group by asking: *"And why do you think this is the right answer?"*. In this case, the teacher used something that resembled step 4 but isn't step 4. By asking this question, the intention of the teacher was to receive information if the student understands how he or she can connect information in the text to a particular answer. In such manner, this question is related to practical stuff the student had to do by working on the comprehension exercises and

not about recalling new information whereas the student had to give an elaboration of a thing that he learned. The student answered the question with: "*Because it's after this sentence..*". This answer implies that the student in the first case answered the question of the teacher by saying that the right answer is after the sentence (pointed the sentence). Conform, the definition of checking students' learning is not about creating a common understanding in teachers' understanding of students' comprehension but it's about the student understanding. The practical question that was asked implicates that the teacher wanted to know if the student was able to connect the question with the right part of the text. In the next teacher turn, the teacher gave a steering question to help student answering the question.

For this instance, the teacher used something that resembles checking students' learning. If the teacher had waited with applying this step and asked it a different way, the focus will be more on the students' understanding with the consequence that the teacher gets a better idea of the effect of the other steps.

The interview with the two students focused on how the students experienced interactions with the teacher with a bit of attention on how the teacher checked students' learning. The first student mentioned this teacher gave extensive explanations to him. First the teacher started with a classical explanation. Then the teacher asked whether everyone has understood it correctly. During a specific interaction with this student, the teacher first asked a diagnostic question. The student noticed that the teacher tried to find out if he made any mistakes. When the student didn't understand something, the teacher tried to explain it again in an extensive way (using intervention strategies). The intervention strategy that the teacher used in this specific interaction with this student was useful according to the student.

The second student also mentioned that the teacher gave extensive explanations. The teacher elaborated more on something will help the student to understand. Sometimes these explanations are too extensively. Student two talked more about how the teacher approached her by first asking what she doesn't understand (diagnostic strategies). Then the teacher wanted to make sure that he got a good perception of what the student needs by asking a lot of questions like: *"Do you get that? "*. This way of instruction was really helpful according to the student. Because of that and indirect diagnostic strategies, the teacher has a good understanding of the needs of the students and knows what the student needs. Comparable to interactions that this student had with the teacher in the beginning of the year, she noticed that the teacher had another way of explaining things (more intensive).

Process of fading and transfer of responsibility

The third research question involved: *"How does fading and transfer of responsibility take place during interactions with students and how does the teacher experience these processes?"*. For this last research question, interactions parts in which the process of fading of responsibility toke place will be described to get an idea of this process. These interactions parts will be tried to link to the interview with the teacher to clarify the way how the teacher handled interactions with his students.

The semi-structured interview focused on questions about the processes of fading the support and transfer of responsibility during interactions with his students. In the training sessions, the three characteristics of scaffolding had been discussed. The interview started with a question to let the teacher think about the characteristics of scaffolding and especially the last two (fading of support and transfer of responsibility). The teacher pointed out that he forgot the basic principles of the concept for the reason that it's becoming part of his teaching repertoire. Next, the two concepts were mentioned by the researcher and a question about differentiating in fading of support was asked. The teacher started with trying to think of the concept by repeating it. Then he clarified how he differentiates his support.

> *Yeah, and I think that is what I do. I notice when I…ummm….have set a task and the students are working on it and I've been asking to and throwing.. working out exactly how much they understand of it, and at that point I'll say it.*
>
> *Now you're going to do it on your own..because I can see and I would also externalize what I think they do… I can see that you understand this and this… and be specific just being teaching. That's a thing I would certainly do.*

This explanation emphasizes that the teacher is aware of what a student needs. Sometimes when it's not clear for the student, according to this teacher, the teacher can come back to it by asking a question in a different manner (using an intervention strategy) and then fade his support.

T= Ah, that's annoying. Is there something that you find it hard to understand?	
	S= It says something with two manners (incomprehensible)*
T= Which manners are mentioned in the text? You have to look for examples There must be mentioned something about two manners. Where do we find that in the text? I'm going to read that part and you have to say stop when I read the part.	
Read the text ----------	S= Oh… yes… over there…
T= Exactly okay… so focus… at this point they are going to present the two manners. Let's take a look at what the examples are… and where can you find them in the texts…	

T= Yes, and can you tell me which one belongs to that one?	
	S=competition belongs to uh…..

T= Do you get it? What do you got right now.. what did you do earlier in the process so it was difficult to find the right answer?	
***** Audio recording was too noisy. Because of that some parts were incomprehensible	

In comparison with the explanation of the teacher about how he differentiated his support. These interaction parts also show how the teacher differentiated his support and that is he aware of what the student needs. This interaction started when the teacher approached the student. First he asked a diagnostic question: *"Is there something that you find it hard to understand?"*. By asking this question, the teacher got an idea of what the student already knows so the teacher can start with differentiating his support focused on the student. Part of the diagnostic cycle is also checking this diagnosis but the teacher forgot to check his diagnosis. Next the teacher helped the student by giving a lot of intervention strategies that vary in level from high to low, like reading the text together, asking questions about the text and trying to help the student to connect the right fragment of the text with the given answers. By applying varies levels of intervention strategies during the interaction with this student, the teacher is aware of what the student needs and tries to respond to that.

The next question was about how the teacher knows when it's a good moment to fade his support.

> *Well, I think I hinted that…by asking about it…something you have to check…otherwise you don't know! Umm… another way perhaps could be a test or something like that…that you know and then you understand everything and you might think..well, this is a moment to look it up now.. otherwise it qualifies as a different moment and it would be after a formal testing moment..that's different from a classroom situation right? Yeah..*

In the extract above, the teacher mentioned two ways of knowing how it's a good moment to fade his support. The first technique the teacher mentioned can be related to step 4, checking students' learning. The teacher had to ask if the student learned something new and he or she is able to recall his or her knowledge. When the teacher considered that the student learned something he can fade his support. The second technique the teacher can use to know when a good moment to fade his support is using a sort of pre-test to find out if the student can move on. Implicit the teacher also mentioned the way of transfer the responsibility back to the student: *"then you understand everything and you might think… well, this a moment to look it up now…"*.

During interactions with students, there were some moments where the teacher used step 4 (checking students' learning). In the given example about how the teacher differentiated his support and his awareness of what a student needs. The teacher also used step 4 of the model of contingent teaching to get an idea when it's a good moment to fade his support. By asking the question: *"Do you get it? What do you got right now.. what did you do earlier in the process so it was difficult to find the right answer?"*, the teacher wanted to make sure that the student understood it correctly. The way of checking the student is also what the mentioned in the interview. The teacher mentioned that he used the way of checking sometimes. When he checks the understanding of the student the teacher knows it a good moment to fade his support and also transfer the responsibility back to the student.

When the teacher had to think about an example of how he faded his support during an interaction with a student, he emphasized that it also had to do something with the initiative of the student. Especially for the older students because they are asking for particular support and according to the teacher they are more aware of what they already know or don't. The teacher also suggested that you can discuss things with these 'older students' like: "*Do you feel know enough at this moment?"* or *"Do you think I can stop explaining..?"*. In other

words, if the student is telling the teacher that he or she is 'okay' the support can be faded and the scaffold can be taken away.

The fourth question concentrated on moments when the teacher thought a student needed more support even though he faded the support already.

> *Here will always be those moments. Because they, like I said, you may misinterpret the signals you..it's okay...it looks like the student understood it could be your own lack of understanding at that moment of what the student needs..it could also because it's very busy in the class, in a classroom that you think I have to go somewhere else, then you are not really, you know that kind of thing..and then later on you find that it wasn't all that clear*

Misinterpreting signals, lack of own understanding and lots of activity in the classroom makes it difficult sometimes to define if the teacher had to fade his support or not to a particular student. If the teacher noticed that a large part of the students still don't get it, he will explain it again but in a slightly different manner. The teacher faded his support but realized that the support that he gave didn't help the students so he decided to increase his support starting with explaining things in a different way.

An example of what the teacher mentioned in the extract above was found in one of the interactions. The teacher was standing in front of the classroom and explained why underlining words are useful during reading comprehension exercises. The teacher asked a girl which words she had underlined. In the extract below, the teacher used a lot different of intervention strategies.

T= (incomprehensible. The teacher said something to the student to answer the question of the student)*. And in this question… which word is very important?	
	S= assertion?
T= yes, and do you know what you to do with the word assertion? What should it be?	
	S= I don't get it….
T=Uhm… Read the sentence if you want… which word is important for assertion? Which assertion…	
	S= (student reads the question) Which assertion is true about Debbie according to paragraph two?
T= Okay, and can you tell now.. which word is very important if you read that question?	
	S= uh… Debbie
* Audio recording was sometimes incomprehensible because it was very noisy in the classroom.	

This interaction part reflected what the teacher mentioned in the interview about moments when the student needed more support. The teacher tried to use different ways of intervention strategies (explanations and hints) in the hope that she understands it. Because the teacher stood in front of the classroom it was difficult to help the student with interpreting the question. The student in this example needed more support after: *"Uh… Debbie"*. The teacher already faded his support because he asked the same question as in the beginning of this interaction part. When the teacher asked: *"Uhm… Read the sentence if you want… which word is important for assertion? Which assertion…"*. He tried to manage the student. This is a high level of support because the student had to read the question and had to name the important word. The student read the question and the teacher started with an intervention strategy on a low level with the effect that the student still didn't get it.

The last two questions concentrated on the consciousness of fading of support and transfer of responsibility during interactions and if there were any difficulties with fading and transferring the responsibility. The teacher mentioned that he is aware of fading and transfer the responsibility back to the student. However the example that the teacher described referred to the transfer of responsibility and the older students. Expected that he already discussed the way how he fades his support. Lastly, the teacher pointed out that he hadn't difficulties with fading and transfer in interactions with student(s) because this process was already part of his teaching style. Besides that, there are lots of teaching techniques according to the teacher. It had something to do with finding out when it's the right moment to use these techniques.

Conclusion & discussion

The aim of this study was to explore how the teacher used two steps of the model of contingent teaching and the process of fading and transfer of responsibility. The focus was on two steps, checking the diagnosis and checking students' learning, and the process of fading and transfer of responsibility. First the research questions about checking the diagnosis and checking students were studied. Thereafter, the processes of fading and transfer of responsibility were investigated. Limitations of this study will be discussed after the discussion of the research questions. Finally, implications for future research will be presented.

Examples of teacher turns in which the teacher used checking the diagnosis or something that resembled this step were showed to get an idea of how this step was constructed by the teacher. Regarding to the first research question about step 2, checking the diagnosis, the findings for this question confirmed the hypothesis that the teacher will not always apply step 2. In contrast to the other steps, checking the diagnosis (step 2) was coded only four times. It was also difficult to find teacher-turns in which the teacher used something that resembled checking the diagnosis. Checking the diagnosis is part of the diagnostic cycle and wasn't applied that many times. A possible reason for that could be that the teacher already had an understanding of the student when he used a diagnostic strategy (Van de Pol, 2012; Van de Pol, Volman, & Beishuizen, 2011). Remarkably, in all the situations the researchers coded step 2 or a teacher turn which used something that resembles checking the diagnosis the teacher didn't use a diagnostic strategy (step 1). Although, the teacher didn't use a diagnostic strategy he could already have an understanding of the student. For this reason, the teacher tried to check something during interactions which were sometimes an adequate way of using this step. Previous research of Van de Pol (2012) and Knežić (2011) indicated that checking the diagnosis was difficult to master this step during interactions. It was demanding to find out why checking the diagnosis might be so challenging.

In conclusion, it could be said that the findings indicated that the teacher didn't apply the step checking the diagnosis that many times and the teacher used something that resembled checking the diagnosis during interactions with his students. In cases where the teacher checked the diagnosis of a student(s) or something that resembled this step, he didn't use a diagnostic strategy.

The second research question concerned how the teacher used checking students' learning in comparison to something that resembled this step, during teacher-student interactions. It was expected that if teachers already had a 'good' understanding of the concept of the student he wouldn't use this step. In comparison with step 2 (checking the diagnosis) there were more teacher-turns in which the teacher used something that resembled checking students' learning and it was coded fourteen times. The results gave some interesting insight information of how this step is used during teacher-student interactions. Questions in which the teacher used checking students' learning or something that resembled this step ended with a question mark. This question marked implicated that the teacher tried to get information understanding. There was a difference in the way the teacher asked this type of question. If the teacher used the step checking students' learning with introducing a

question, it helped to recall the knowledge of the student. This type of questions concentrated on the understanding of the student about a particular concept. According to Koole (2010) checking the understanding of the student is not about the teacher understanding of the comprehension of the student but it is concentrated on the students' learning. There was also a moment for the student to give a reaction to answer the question of the teacher. Different types of questions were asked in teacher-turns in which the teacher used something that resembled step 4. These were more practical questions, the teacher asked the student and were about the teachers' understanding like if the student understands everything. In both the examples, students had some difficulties with answering the questions of the teacher. An explanation might be that the students were not always aware of what they already know or estimate their comprehension according to Freud and Kasten (2012).

Checking students' learning was added to the model of contingent teaching to get an idea of the impact of the other steps the teacher applied during interactions (Van de Pol, 2012). It's difficult to determine if the teacher already had a 'good' understanding of the concept of the student because of the impact of other steps, which also vary in using. Maybe for that reason the teacher didn't use checking students' learning a lot of times.

The interviews with the two students focused on their experiences with this particular teacher during classical and individual instructions. The two students didn't talk explicitly about how the teacher used checking students' learning during interactions they experienced. One of the students mentioned that the teacher applied something that resembled checking students' learning during interactions. The teacher wanted to make sure he had a good understanding of the students' learning. That is not what checking students' learning is about because it's about the comprehension of the student. Students have to explain what they have learned. Both talked more about the extensive explanations and how the teacher approached them to find out if there were any questions. In brief, the students talked indirectly about step 3 (intervention strategies) and step 1 (diagnostic strategies).

Briefly, it could be concluded that there were differences in how the teacher applied the step checking students' learning. Teacher-turns in which the teacher used something resembled students' learning were more about the teacher understanding of the student and not about the comprehension of the student itself. This way of checking was also mentioned in the interview with a student.

The last and third research question focused on the process fading and transfer of responsibility during teacher-student interactions by linking the interactions parts with

interview extracts. Linking the interactions parts with the interview answers gave some interesting insight information of how the process of fading the support and the transfer of responsibility looked like. It was expected that the process of fading and transfer of responsibility take place on a more overall level within teacher-student interactions. The outcomes support this expectation. The teacher mentioned that he is aware of what a student needs. During interactions in the classroom or reading homework for example, it could be that the teacher already constituted an indirect or direct diagnosis of this student (Smit, Van Eerde, & Bakker, 2013) so the teacher realizes what a student needs. Because the teacher is aware of what a student needs he can respond to it by differentiating and fading his support. During interactions with the student, the teacher asked if a question to the student where the student have to respond to. This question is related to step 4, checking students' learning. After the teacher checked students' understanding is can fade his support. This is in line with Wood et al. (1976) that fading of support promote the process of transferring the responsibility. Another way of knowing how it's a good moment to fade the support is to use a sort of pre-test. This way of fading the support wasn't noticed in the observed interactions. However, the teacher mentioned that there are some moments when the student needed more support even though the teacher already faded the support already although he discussed earlier that he is aware of what a student needs. What the teacher mentioned in the interview was also found in an interaction part with the student. Because of misinterpreting signals and activity in the classroom the teacher had difficulty with determining how the fade his support.

Remarkably, the teacher said he was using the checking part sometimes and he didn't experience any difficulties with fading and checking students' learning because it's already part of his teaching style. However the teacher used checking students' learning not that many times during the interactions. An explanation of this finding might be that the teacher had other perception of checking students' learning that differs in the way of using. Interesting is that the teacher mentioned that there are differences in transferring the responsibility when it comes to 'younger' and 'older' students. According to the teacher, these older students are more aware of what they already know.

In conclusion, it could be said that fading of support and transfer of responsibility took place during interactions. The process of fading and transfer of responsibility within an interaction depends on different components. The teacher plays an important role because he needs to know when to fade his support and transfer the responsibility back to student by interpreting signals and responding to the students. More importantly, fading of support and

transfer of responsibility during face-to-face interaction is an essential part of scaffolding. It's difficult to obtain this via computer-based scaffolding (Holden & Sinatra, 2014).

The measured intercoder-reliability of each step and especially for and the overall inter-coder reliability were suitable according to Neuendorf (2002). Further, by interpreting the results attention has to be paid on the ecological validity. The ecological validity was covered by the external validity. The ecological validity of this study was high because this study was done in the working environment of the teacher. In such manner this study was done in the 'natural' environment (i.e. the classroom of the teacher. The teacher and also the students acted more naturally in this classroom setting in comparison to studies in the laboratory settings. For this reason, the outcomes of this study could be helpful to derive how other classroom situations with a teacher and student should look like (Stangor, 2014).

Limitations

Due to practical reasons, this case study consisted of only one participated teacher. Initially, there was a plan to enlist more than one teacher then possible, but only one English teacher responded that he would like to participate. Because of only one participating teacher, it's difficult to declare if other teachers would implement the steps and process of scaffolding during teacher-student interaction. Future research including more teachers will give interesting information how other teachers will use the steps of the model of contingent teaching. There could be differences in the way other teachers implement the steps or fading their support. The same goes for the short semi-structured interviews with two students. These interviews helped to give more insight information of how the teacher checked the learning of the students and how he handled the way of fading and transfer of responsibility. Extensive interviews with more students will give insight in how the teacher apply fading and transfer of responsibility.

Another limitation of this study was that the two training sessions were relatively short. Because of time pressure these training sessions lasted each thirty minutes. During these training sessions, general information of scaffolding explanation of the steps were discussed and examples of were showed. In comparison to the scaffolding intervention program by Van de Pol (2012) these training sessions were more intensive (took about eight weeks). These training sessions included more reflection sessions and had spread over several weeks instead of short two training sessions and one reflection session. Because of the short training sessions and reflection session it could be possible that the teacher had difficulties with

applying particular steps (for example step 2) during teacher-student interactions. More structured training sessions and reflection sessions consisting of peer observations and reviews can be helpful for teachers because they will learn the theory of scaffolding, learn how they implement the steps and maybe more useful teachers can learn from each other (Van de Pol, 2012).

Implications

An important implication of this study is the connection between the scientific theory and the practice in the educational context. The findings of this study discussed and demonstrated how the teacher used scaffolding in interactions with his students. This data will help to how to construct the steps of the model of contingent teaching and the process of fading of support and transfer of responsibility can be applied within the educational context but also will help for a deeper understanding of the scaffolding theory.

As previously stated, as a result of the introduction of ‘Passend Onderwijs’ students with special needs to be integrated into the regular educational school systems. If teachers know how to adapt their instruction to fulfill these students’ needs, it will cater their individual needs. Previous research that has been done stated that scaffolding is an effective teaching method (e.g. Stone, 1998a). The combination of these outcomes leads to an implication for the educational sector. In that case, learning how the scaffold can be part of the professional developing program of teachers so that they will learn to manage the needs of each individual student.

In sum, this study has shown that there were some interesting and notable processes in how the steps of the model of contingent teaching and fading and transfer of responsibility took place during teacher-student interaction. More importantly, for the reason that scaffolding is an effective teaching method this study is valuable and useful for a deeper understanding of the process of the concept of scaffolding.

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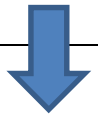
Appendices

Schedule

- Teacher

Activity *Duration*	**Pre-observations** 1 lesson (50 min)	**Training sessions** 1 session (30 min)	**Observation 1** 1 lesson (50 min)	**Observatie 2** 1 lesson (50 min)	**Reflection sessions** (About 20-30 min)	**Observations 3+4** 1 lesson (50 min)	**Post-observations** 1 lesson (50 min) + interview (30-40 min)
Description	Observation of a regular lesson	Two training sessions in which the theory and the model of contingent teaching will be discussed.	Observation of a regular lesson after the training	Observation of a regular lesson after the training n.b. between the first and second observation contains a number of days	Reflection sessions about teacher experiences and the observations	Observations of a regular lesson after the training and the reflection sessions	Post observations after seven weeks. Interview with the teacher about particular topics.



Semi structured interview
Two semi-structured interviews with two students about their experiences.

- Students

[redacted]
2334 CP Leiden
Tel: 071-5154121

Internet: [redacted]
E-mail
Retouradres : onderzoekmotivatie1Leidenuniv@gmail.com

Ouder(s)/verzorger(s) van leerlingen

uit de klas 1F

Datum 15-05-2015

Ons kenmerk

Behandeld door: [redacted]

Aantal pagina's 1

Bijlagen -

Onderwerp :

Onderzoek naar motivatieontwikkeling schooljaar 2014-2015

Geachte ouder(s)/verzorger(s),

Dit schooljaar zal het [redacted] meedoen aan een onderzoek naar de motivatie van haar leerlingen. Dit onderzoek wordt gedaan door onderzoekers van de Universiteit Leiden. In deze brief vertellen wij u meer over de inhoud van dit onderzoek.

Het doel van het onderzoek is om te kijken hoe de motivatie die de leerlingen hebben voor school verandert tijdens het eerste schooljaar. Wij willen deze informatie gebruiken om nog meer handvatten te krijgen om de leerlingen te motiveren voor hun schoolwerk.

De leerlingen van brugklas 1F (havo/vwo) zullen verspreid over de periode van dit onderzoek aantal keer een vragenlijst in invullen. Dit gebeurt in de klas, bij voorkeur tijdens de mentorlessen. Alle geleverde informatie is strikt vertrouwelijk. De school kan de antwoorden die uw zoon of dochter geeft niet inzien.

Naast het invullen van de vragenlijsten worden een aantal lessen Engels op video opgenomen. Het maken van deze video-opnames is belangrijk om een goed beeld te krijgen van de manier waarop in de klas wordt gewerkt. De video-opnames worden alleen door de onderzoekers bekeken. Alle informatie zal anoniem worden verwerkt.

Als u vragen heeft over het onderzoek dan kunt u een e-mail sturen naar het onderstaande adres. Mocht u bezwaar hebben tegen deelname van uw kind aan het onderzoek, dan kunt u dat voor woensdag 27 mei a.s. kenbaar maken door eveneens een e-mail te sturen naar het onderstaande adres.

Met vriendelijke groet,

[redacted]

Dhr. [redacted] docent Engels

Indien u vragen heeft over het onderzoek en bezwaar wilt maken aan de deelname van uw kind aan het onderzoek:

Contactpersoon: Mw. V.C. Robeer, BSc E-mail: onderzoekmotivatie1Leidenuniv@gmail.com

Outline semi-structured interview teacher - Thursday 24-09-2015

Post-training

- Were you mindful about using the steps while you trying to scaffold?
- Was it easier to scaffold with students in a group then in a traditional lesson setting or was there no difference?
- Do you think that you used diagnostic often enough?
- Was it easy to diagnose strategies?
- Where there moments/situations that step 1 wasn't necessary or knew already what the student knows so moved to step 3 and why?
- Were there moments that you should diagnosis and you didn't. Why do you think that happened?
- Where there situations were diagnosis happened but didn't go well? Can you remember an example?
- How did you experience going from the diagnosis phase to support?
- Do you think you generally provided low or high level of support?

Post-summer

- Do you think all the steps were necessary to use? And why?
- Do you think you were able to apply scaffolding as effective as before the summer?
- Do you think it is a useful technique for a teacher to use?
- Can you name the basic elements of scaffolding that come first to your mind?

Fading of support & transfer of responsibility

- Do you think you are differentiating in fading of support and why?
- How do you know it's a good moment to fade your support?
- Can you give an explanation of how do you fade your support during an interaction with a student?
- Were there moments when you thought a student need more support even though you faded the support already?
- How do you know a student has progressed the support and now he or she is able to continue on his own?
- Are you conscious of fading of support and transferring the responsibility during interactions?
- Do you find it difficult to fade and transfer?