Scaffolding in teacher-student interaction: exploring, measuring, promoting and evaluating scaffolding
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CHAPTER 8
GENERAL CONCLUSION
AND DISCUSSION
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SUMMARY AND CONTRIBUTIONS OF THIS DISSERTATION

Scaffolding, grounded in sociocultural theory (Vygotsky, 1978), is a powerful concept that represents the essence of high quality support; namely support that is adapted to the learner’s needs and that is temporary. Scaffolding fully acknowledges and connects to the potential of a student while aiming to transfer the responsibility for learning or for a task to the student. Adapting support to a learner’s needs or acting contingently is one of the key characteristics of scaffolding and is crucial in promoting learning.

This dissertation aimed to contribute to the conceptualisation and characterisation by exploring the concept in theory and practice, to the measurement of scaffolding, to the promotion of scaffolding and to our understanding of the effects of scaffolding on students’ engagement and achievement (evaluation of scaffolding). We combined theoretical investigations and development of measurement instruments with empirical studies and managed to make the abstract concept of scaffolding measurable for researchers and gaugeable for teachers.

In Chapter 1 of this dissertation, the theoretical background of the concept of scaffolding was elaborated and the outline of the dissertation was presented.

Phase 1: Exploring Scaffolding

In the first phase of this dissertation, i.e., exploring scaffolding, we investigated the conceptualisation and appearances of scaffolding, both looking at theory and previous research and by investigating classroom practice. The central research question of this phase was: How can scaffolding be conceptualised and characterised?

In Chapter 2, a review of the last decade’s scaffolding literature was presented. The starting point was a key article of Stone (1998a) on scaffolding in which he argued for the salvation of the concept. He argued to only use the concept within its theoretical background so that it would not lose its discriminating function. In the decade that followed, scaffolding stayed a popular subject of study in education. Most of the studies were descriptive and small-scaled, most often focusing on literacy. However, many studies still equated just any support with scaffolding support and no generally accepted
definition was available.

Analysing and synthesising definitions that were encountered throughout the studies resulted in a characterisation of scaffolding as a support process having three (interconnected) key features: (1) contingency, (2) fading, and (3) transfer of responsibility. Contingency refers the degree to which a teacher adapts support to the understanding or needs of the student. Fading refers to the decrease of support over time in order to transfer the responsibility for learning or for a task to the learner. This theoretical conceptualisation is meant to contribute to the harmonisation of the discourse on scaffolding.

Analysing appearances of scaffolding was another aim of the review study. Most studies included in the review described the helping behaviour of the teacher, often in terms of scaffolding strategies (e.g., Brophy, 1999; Silliman, Bahr, Beasman, & Wilkinson, 2000). To get a grip on the variety of appearances encountered in the reviewed articles, a framework for the analysis of scaffolding strategies was developed, making a distinction between scaffolding means (e.g., questioning, giving feedback, or modelling) and scaffolding intentions (e.g., focusing on students’ metacognitive or cognitive activities or on students’ affect). Note that performing these strategies is not considered scaffolding when the support is not contingent, not faded or when the responsibility for learning is not transferred.

Finally, we aimed to investigate the extent to which scaffolding is found to be an effective teaching method. Although scaffolding is often presented as an effective instructional method (e.g., Hogan & Pressley, 1997), few effectiveness studies appeared to be available (only nine studies). These studies provided indications for the positive effects of scaffolding on students’ cognitive and metacognitive activities; the results of (the two encountered) studies on the scaffolding of students’ affect diverged. A reason for the scarcity of effectiveness studies on scaffolding could lie in the fact that measuring and enacting scaffolding is rather difficult due to its dynamic nature.

In Chapter 3, a case study into patterns of contingent teaching was described. This study aimed at investigating the process of scaffolding in a classroom setting as few systematic analyses of scaffolding in naturalistic settings were available. One of the key aspects of scaffolding, namely that of contingency, was focused upon in this study. If support is faded in a noncontingent way and if the responsibility for learning or for a task is transferred in a noncontingent way, we cannot speak of scaffolding. Therefore, contingency of support is seen as a necessary condition for scaffolding and therefore the most crucial aspect of scaffolding. A model of contingent teaching, representing observable phases of scaffolding, was presented (based on Ruiz-Primo & Furtak, 2007). This model built upon the idea that scaffolding and contingency entail two aspects, namely diagnosing students’ understanding and giving adaptive support.
to the students’ understanding. The aspect of diagnosing students’ understanding was, however, divided into two separate steps: (1) using diagnostic strategies (discovering and establishing students’ current understanding), and (2) checking the diagnosis (checking with the student whether the diagnosis is correct). The third step was that of using (contingent) intervention strategies (this is the actual support).

Because scaffolding is found to be scarce (e.g., Ruiz-Primo & Furtak, 2006; 2007), we investigated the classroom practices of teachers at innovative schools. In innovative pedagogies, the teacher is expected to stimulate students’ active knowledge construction and to differentiate support. Scaffolding addresses these issues to a great extent. Therefore, we observed three lessons of three social studies teachers of innovative (prevocational) schools because we expected to observe much scaffolding in these lessons. A stimulated recall interview was held with each teacher after filming the last lesson. The teachers’ scaffolding behaviour was analysed using the model of contingent teaching and the framework for the analysis of scaffolding strategies (that was developed in the review study, Chapter 2). The degree of the teachers’ contingency was established by checking whether the teachers helped the students with exactly that which was not grasped yet by the students. All three teachers showed, surprisingly, little scaffolding or contingent teaching. This finding is similar to studies conducted in more traditional types of education (Nathan & Kim, 2009; Ruiz-Primo and Furtak, 2006; 2007). Noncontingency was often related to a lack of diagnostic strategies, little variation in intervention strategies and providing (steering) instructions. Using diagnostic strategies to establish students’ understanding before giving support appeared to be scarce (see also Elbers et al., 2008). However, if used, this appeared to facilitate contingent teaching.

Phase 2: Measuring Scaffolding

In the second phase of this dissertation, i.e., measuring scaffolding, the aim was to develop analytic instruments for the measurement of scaffolding. The research question that stood central in this phase was: How can classroom scaffolding in teacher – small-group interactions be analysed from a contingency perspective that takes the interactive nature of scaffolding into account? The dynamic nature of the scaffolding process makes it difficult to measure and no measurement instrument – that takes into account the dynamic nature of the concept – appeared to be available. Such an instrument, however, is needed for several reasons. First, it will enable us to compare the results of different studies in different classroom contexts. Second, it enables research, and thus understanding, of the effects of classroom scaffolding on student learning. Third, a deeper understanding of what scaffolding looks like and how it can
be measured will facilitate teacher training; scaffolding can be more easily explained, taught, and assessed. In developing two frameworks, we aimed to provide the research field of scaffolding with useful and innovative instruments for the measurement of scaffolding in classroom situations. In developing these frameworks, we focused on the most important feature of scaffolding, i.e., contingency.

In Chapter 4, the instruments were presented. The first – more general and qualitative – framework was the model of contingent teaching that was introduced in Chapter 3. This model (based on Ruiz-Primo & Furtak, 2007) was further elaborated (as a result of the study in Chapter 5) and consisted of the steps of: (1) using diagnostic strategies to establish the students’ existing understanding, (2) checking the diagnosis to promote mutual understanding, (3) using intervention strategies for the actual support, and (4) checking student learning to verify whether the support given has resulted in student understanding\(^{19}\). In developing this instrument, we synthesised knowledge from the highly interrelated fields of formative assessment and scaffolding.

The second – more micro-level and quantitative – framework was the contingent shift framework. This instrument is based on the seminal work of Wood and his colleagues (e.g., Wood, Wood, & Middleton, 1978) and the work of those who used it to analyse parent-child interactions (e.g., Mattannah et al., 2005; Pino-Pasternak et al., 2010) and in one-to-one tutoring situations (e.g., Pratt et al., 1998). With this framework, the teacher’s adaptation of the level of control, exercised in the support given, to the students’ developing understanding was scrutinised. This was done by examining three-turn-sequences consisting of a teacher turn, a student turn and a teacher turn. First, the degree of control a teacher is exercising in his or her support was determined. A low degree of control is for example to ask an open-ended question whereas a high degree of control is for example to give an explanation or the answer. Thereafter, the students’ understanding was determined (good understanding, partial understanding or poor/no understanding). Finally, following Wood and his colleagues (e.g., Wood et al., 1978), the contingency of each three-turn-sequence was determined, using the following contingency rules: increasing control upon poor students’ understanding, decreasing control upon good students’ understanding and keeping control the same or increasing control upon partial understanding. In previous research, the framework had only been applied in one-to-one (parent-child or tutoring) situations with structured task: this study showed that the framework proved useful in analysing teacher – small-group interactions, also with less structured tasks. The latter, more micro-level analysis, is in our view necessary to reveal whether a teacher is truly adapting his or her support and is thus truly acting contingently. The model of contingent teaching seemed especially

\(^{19}\) The fourth step of the model of contingent teaching (checking students’ learning) was developed and added to the model of contingent teaching in chapter 5.
useful for practice and for teacher’s professional development whereas the contingent shift framework seemed more useful for research purposes.

Phase 3: Promoting Scaffolding

In the third phase, i.e., promoting scaffolding, we aimed to find ways of stimulating teachers’ scaffolding skills. Scaffolding is found to be scarce in classroom practice (e.g., Oh, 2005; Ruiz-Primo & Furtak, 2006; 2007). Thus, in order to be able to study (the effects of) scaffolding, scaffolding needs to be promoted. However, surprisingly little research has focused on the promotion of scaffolding. The research question that stood central in this phase was: How can scaffolding be effectively promoted?

In Chapter 5, the development of a professional development programme (PDP), aimed at promoting scaffolding, was discussed. The model of contingent teaching, that was introduced in Chapter 3 and 4 (consisting initially of the steps of: (1) using diagnostic strategies, (2) checking the diagnosis, and (3) using intervention strategies), was used as a starting point in the development of the PDP. We hypothesised that this concrete step-by-step model, that was previously used as a measurement framework, could facilitate teachers in learning how to scaffold. In this exploratory study, we collaborated during two terms with four social studies teachers (year 8) of two innovative secondary prevocational schools. We evaluated the teachers’ developing scaffolding knowledge, use of scaffolding in practice and reflections on practice. They were videotaped during nine lessons and each observation was followed by a video-stimulated reflection of the teacher and the researcher on that lesson in terms of the steps of the model of contingent teaching and in terms of scaffolding. The teachers’ contingency was determined by checking whether the teachers helped the students with exactly that which was not grasped yet by the students.

Mainly teachers’ understanding and use of the first step, namely that of diagnostic strategies appeared to increase; the occurrence of the second step (checking the diagnosis) stayed somewhat low, which is similar to the finding of Knežić (2011). The teachers’ understanding of this step was somewhat more variable. Furthermore, the contingency of the teachers’ support increased noticeably. While working and reflecting with the model of contingent teaching, the teachers showed the following key insights: (1) openness of teachers to students’ ideas and openness of students to share their understanding, (2) focusing on students’ understanding and what students already know as opposed to what they do not know yet, and (3) co-constructing knowledge together instead of transferring knowledge. These insights may have fostered the teachers’ scaffolding development. Finally, an important fourth step was added to the model of contingent teaching, namely that of checking students’ learning. This entails checking
whether the support given has resulted in students’ understanding. This exploratory study showed that promoting scaffolding and especially the use of diagnostic strategies was possible (in contrast to the outcomes of e.g., Bliss et al., 1996) and the model of contingent teaching appeared to be a powerful tool for this purpose.

In Chapter 6, the effectiveness of (a shortened version) of the PDP was tested in an experimental study with a pretest-posttest design. The model of contingent teaching (now with all four steps: (1) using diagnostic strategies, (2) checking the diagnosis, (3) using intervention strategies, and (4) checking students’ learning) was the central element of the PDP. Thirty prevocational social studies teachers (year 8) participated in this study. Seventeen teachers formed the scaffolding condition (and participated in the PDP); thirteen teachers formed the nonscaffolding condition (and did not participate in the PDP). All teachers taught the same five-lesson project on the European Union (Appendix A). In the scaffolding condition, all lessons were filmed for professional development purposes whereas in the nonscaffolding condition, only the first (premeasurement) and last (postmeasurement) lessons were filmed. The development of the quantity of the teachers’ diagnostic strategies (step 1), checks of the diagnosis (step 2), and checks of students’ learning (step 4) was tested. Additionally, we compared the quality of all of the steps of contingent teaching (including step 3, intervention strategies) at both measurement occasions. For step 1, 2, and 4 we investigated both the focus of the step (deeper conceptual understanding or more simple factual knowledge) and the mode of expression the step elicits from the students (an invitation of or request for a more elaborate demonstration of understanding such as an explanation or only for a short claim of understanding such as “do you get it?”). The quality of the support (step 3) was established by looking at the contingency of the support in two ways. First, we determined the degree to which the control was adapted to the students’ understanding (contingency-control) using the contingent shift framework that was developed in Chapter 4. Second, we investigated the degree to which the teacher used or took up students’ understanding in his or her support (contingency-uptake), using the coding scheme of Nystrand et al. (2003) and Wells (2010).

Working with the model of contingent teaching appeared to affect teachers’ scaffolding behaviour. Especially the quality (rather than the quantity) of their diagnostic strategies (step 1) and checking students’ learning (step 4) – in terms of the mode of expression that was elicited in students’ answers – appeared to improve more compared to teachers who did not participate in the programme. More elaborate answers (i.e., demonstrations) were elicited when using step 1 and step 4. Moreover, the contingency of the support of the teachers who participated in the programme improved substantially, both in terms of the adaptation of control and in terms of uptake. These teachers appeared to adapt the degree of control that they exercised in their
support contingently to the students’ understanding, that is: giving more control upon poor understanding, giving less control upon students’ good understanding, and giving more or the same amount of control upon students’ partial understanding. Furthermore, these teachers also appeared to act contingently in terms of uptake (cf. Nystrand et al., 2003), that is, they connected to what students said in interactions by using students’ conceptions and wordings in subsequent support.

The model of contingent teaching appeared, again, to be a powerful tool in promoting teachers’ scaffolding behaviour. To our knowledge, no effective professional development programmes on scaffolding existed yet. Bliss et al. (1996) conducted one of few studies on how teachers learn to scaffold. However, their results were rather disappointing: Although the participating teachers felt more confident in discussing scaffolding, their teaching practice did not change considerably. Seymour and Osana (2004) report teachers’ behavioural changes towards scaffolding. However, the actual contingency of the support of the participating teachers was not measured so – while adhering to our definition of scaffolding – we cannot ensure that their intervention was actually effective in terms of contingency. In addition, they did not adopt an experimental design and therefore no causal conclusions can be drawn. The professional development programme developed in this dissertation, based on the model of contingent teaching, appeared to contribute to teachers’ scaffolding skills and thus contributed to future scaffolding research as well as teacher education.

Phase 4: Evaluating Scaffolding

In Phase 4, the effects of scaffolding on students’ engagement and achievement were investigated. We aimed to contribute to the current research field on scaffolding as this was one of the first large-scaled effectiveness studies on scaffolding taking place in classroom practice while establishing the actual contingency of teachers’ support. In addition, we analysed the effects of our intervention both on the teacher level and on the student level which is rare (Van Veen, Zwart, & Meirink, 2012). However, to actually establish the effectiveness of an intervention, student outcome measures should be included as improving students’ learning is the ultimate aim of teacher professionalisation (Fishman, Marx, Best, & Tal, 2003). The question that was focused upon in this phase was: What are the effects of scaffolding on students’ engagement and achievement?

In Chapter 7, a large-scaled, classroom-based experimental study into the effects of scaffolding on students’ engagement and achievement was described. Thirty prevocational social studies teachers participated with their 768 students (year 8); 455 students in the scaffolding condition and 313 in the nonscaffolding condition.
The intervention on scaffolding appeared successful (see Chapter 6): the students in the scaffolding condition were exposed more to scaffolding in the postmeasurement (compared to the premeasurement) than students in the nonscaffolding condition.

The effects at the student level were evaluated by measuring the students’: (1) on-task behaviour as an indicator of behavioural engagement (questionnaire and observation), (2) appreciation of the support and the task as an indicator of emotional engagement (questionnaire), and (3) achievement (using a multiple choice test and an assignment, see Appendix B). Students appeared to appreciate contingent support. However, surprisingly, students in the scaffolding condition appeared to show a greater decrease in on-task behaviour than students in the nonscaffolding condition. Finally, no direct effects of scaffolding on students’ achievement were found. However, when controlling for the negative effect on on-task behaviour (i.e., when keeping this variable constant in the analysis), scaffolding did have a positive effect on students’ achievement. The negative effect of scaffolding on students’ on-task behaviour was possibly due to practical issues: scaffolding support might take longer so other students might have to wait longer for help and might get off-task more easily. From previous one-to-one research (both tutoring and parent-child studies) scaffolding and more specifically contingent support is known to have positive effects on learners’ engagement and achievement (Mattanah et al., 2005; Pino-Pasternak et al., 2010; Pratt et al., 1998). This study demonstrated the potentially positive effects of scaffolding in classroom settings, but also suggested that issues of classroom management may need to be solved before the potential of scaffolding can optimally be utilised.

LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

Exploring Scaffolding

Although the review of the literature has resulted in a useful conceptual framework which can contribute to the harmonisation of future scaffolding research, the studies in this dissertation yielded a number of new conceptual questions and did not address others.

First, our review resulted in a definition of scaffolding in which three key features were distinguished. However, in our empirical studies, we focused mainly on the contingency aspect of scaffolding and less on the aspects of fading and transfer of responsibility. The aspect of contingency is considered a necessary condition for scaffolding to occur: If support is faded noncontingently, i.e., decreased while the student cannot yet perform a task, scaffolding is not taking place. Similarly, when the
teacher at that point hands over the responsibility for a task to the student, scaffolding is also not necessarily taking place. Contingency is a crucial aspect of scaffolding and we therefore mainly focused on this aspect. More explicit attention, however, should be paid in future research to the conceptualisation and processes of fading and the transfer of responsibility. Questions such as “Does fading mainly involve a decrease in the amount of support, cognitive complexity of support or both?” or “How can transfer of responsibility be measured?” are questions that could be addressed in future research.

Second, whether or not support was successful (i.e., whether or not it resulted in learning) did not determine whether support was considered contingent. However, some researchers have included proof of the scaffolding’s effectiveness in their definition of scaffolding (Mertzman, 2008; Mercer & Fisher, 1992; Meskill, 2005; Oh, 2005; Reigosa & Jimenez-Aleixander, 2007). Mercer and Fisher (1992), building on Maybin, Mercer and Stierer (1992), for example only considered help as scaffolding when there was – amongst other criteria - (a) “evidence of a learner successfully accomplishing the task with the teacher’s help” (p. 188), and (b) “evidence of a learner having achieved some greater level of independent competence as a result of the scaffolding experience” (p. 188). When studying scaffolding in all its aspects including fading and transfer of responsibility in addition to contingency, it seems sensible to take the effectiveness of the scaffolding into consideration in defining scaffolding.

Third, scaffolding is sometimes criticised for being a teaching method that guides students with small steps, providing little challenge for learners. However, we think that scaffolding is exactly representing a teaching method in which students are always challenged and encouraged to do as much as they can themselves. Scaffolding support lies in the Zone of Proximal Development (Vygotsky, 1978) and focuses not on what a student can already do (actual level) but focuses on what a student cannot do yet on his or her own (the potential level). Vygotsky (1978) argued that good support is that which is ahead of the learners’ actual development. The starting point of scaffolding is thus to challenge students as much as possible.

Measuring Scaffolding

Although the development of the instruments presented in this dissertation advanced the measurement of scaffolding by accounting for the interactive nature of scaffolding, some measurement issues remain that are important to consider in future research.

First, in analysing contingency, we only used information that was – at that moment – visibly available to both participants of a certain interaction. Mercer (1995) mentioned the concept of *long conversation* that refers to the conversation over lessons within
the same class between the same participants. Things that have been said or have happened in previous lessons or between lessons while marking students’ work might affect how a teacher responds to certain students (e.g., Smit, van Eerde, & Bakker, in press). Using our contingent shift-framework (micro-level coding), a certain sequence might appear noncontingent whereas – knowing what the teacher knows, for example by having had a look at the student’s work in between lessons – such a sequence might actually be contingent. Future research could investigate to what extent such information – that is not visible in interactions – determines the contingency within interactions.

Second, timing of giving or withholding support is sometimes mentioned as an important issue in the scaffolding process (Hammond & Gibbons, 2005). In our studies, we did not particularly pay attention to this issue. Yet, the decision to start an interaction with a group of students has to be made first before even giving support. Cohen (1994) for example advised to not help small groups of students too often as the group process might be disturbed. In our studies, we did not particularly instruct the teachers on deciding when to help a group; the interactions we studied were both teacher-initiated and student-initiated. Future research should therefore focus on how teachers can (learn to) decide when groups need help. Observation as a first diagnostic strategy could provide teachers with a first indication of whether help is needed or not.

Third, one important coding issue was the coding of the students’ understanding (i.e., into no understanding can be determined, poor understanding, partial understanding, or good understanding). In the studies of this dissertation in which the contingent shift framework was used (Chapter 4, 6, and 7) students’ understanding was not determined in an independent and abstract sense just by looking at the students’ utterances; the teacher’s reaction determined how the student’s understanding was coded. We thus adopted the perspective of the teacher. If the teacher for example asked a follow-up question after a student response, a student’s answer that was in principle correct but not fully complete was coded as partial understanding as the teacher apparently assessed this answer as not complete. This is in contrast to for example the coding manner of Pino-Pasternak et al. (2010); they coded the child’s understanding independently from the parent’s reaction. However, a further elaboration, explanation or follow-up question upon an objectively correct answer almost automatically then results in a judgement of noncontingency. Yet, giving an elaboration or explanation after a student’s answer is quite a common practice and seems to indicate that the teacher is still not entirely satisfied with the answer (Koole, 2010). In our coding manner, an elaboration, explanation or follow-up question upon a student’s (apparently) incomplete answer was considered contingent as we adopted the teacher’s point of view. A very same answer by two different students of two different classes could in our coding manner thus be
coded differently according to the respective teachers' reactions. Nevertheless, we do not think this is a problem as all utterances should be seen (and coded) within the context in which they were made. In future research, the validity of both approaches could be further investigated. Perhaps, the usefulness and validity of the method also depends on the activity and the goal of the activity the student and the teacher are involved in. Coding scaffolding while using the reaction of the teacher in determining the students' understanding can for example only be done if we can rely on the sincerity of the teachers' reaction. Especially with younger children, teachers can possibly give positive responses upon partial or even poor understanding to motivate students and in those cases, using the reactions of the teacher might not be a valid way to determine students' understanding.

Promoting Scaffolding

Changing classroom cultures is known to be difficult (Lyle, 2008, Skidmore, 2006, Wegerif, 2005). Regarding the length of interventions, Slavin (2008) recommended that interventions should at least take 12 weeks to establish strong effects. The intervention that was developed and used in this dissertation took about eight weeks for the teachers and the students participated in a five-lesson project (one lesson per week) on the European Union (and the first lesson was a premeasurement). In the remaining four lessons, the teachers practiced their scaffolding skills. Therefore, the amount of scaffolding the students experienced might have been somewhat limited. At the teacher level, however, the effects of the intervention were very strong; they actually changed their former routines of helping students before having diagnosed their understanding. Yet, at the student level, a longer implementation might be useful for future research. Future research could then also use more measurement moments including a retention measurement to discover possible delayed effects (Howe, McWilliam, & Cross, 2005).

In addition, we worked closely and intensely with the teachers. In its current form, the professional development programme is a fairly labour-intensive programme with many observation and reflection occasions. Although exactly this intensity might have contributed to the strong effects, future research could focus on ways to make the programme more feasible and efficient without losing its effectiveness. Peer observations and reflections amongst teachers could for example be a valuable addition that makes the programme less labour-intensive for the supervisor.

Evaluating Scaffolding

The effects of scaffolding on students' achievement appeared to be impaired
by the negative effects on students’ on-task behaviour (i.e., the on-task behaviour of students in the scaffolding condition decreased more compared to the on-task behaviour of students in the nonscaffolding condition). Scaffolding thus seemed to be potentially an effective way of supporting students in classroom situations. However, future research should focus on ways to make scaffolding more feasible and efficient in classroom practice. Facilitating factors – important for future research – could be to improve students’ capacity to work autonomously in groups while other students are being helped, to ask concrete questions and to first help each other before asking the teacher. Furthermore, the intervention was implemented without notifying the students. However, a sudden change from being helped immediately to being diagnosed first before receiving help might have caused confusion and frustration for the students which also might have contributed to the negative effect on their on-task behaviour. Future research should therefore also explore whether involving students in the implementation of scaffolding is more fruitful.

Furthermore, more attention for the investigation of effects of the support received (i.e., in subsequent group-work, when the teacher walks away) as opposed to the more indirect effects as measured by assignments and tests, could also enhance our understanding of the scaffolding process and the effects of contingent and noncontingent support on students’ learning. Noncontingent support might not be taken up or applied by students in subsequent group-work whereas contingent support might be more easily taken up or applied as it connects to students’ understanding and utilises their competencies and ideas. Future research could deepen our understanding of the scaffolding process and its direct effects by investigating this mechanism of students’ uptake.

Finally, all empirical studies of this dissertation took place in the context of small-group work. However, we did not pay particular attention to whether the teacher scaffolded just one student within a group or more or all students within a group. In looking at the interactions, we saw that some teachers mainly conversed with one student in the group and thus mainly acted contingently upon that one student whereas other teachers involved more students and acted contingently not specifically upon one group member but upon the group. As we have no reason to assume that the teachers of both conditions differed systematically in their approach, we do not think that this affected our results. Nevertheless, a more precise analysis that would track on an individual student basis, which student has been scaffolded (or not scaffolded) could still provide us with a deeper understanding of the effects of scaffolding.
IMPLICATIONS

In innovative pedagogies – that are related to sociocultural theory and/or social-constructivism – teachers are expected to stimulate students’ active knowledge construction and to differentiate support (e.g., McWilliam, 2008). However, this role is often described in quite vague terms (e.g., Hargreaves, Moyles, Merry, Paterson, Pell, & Esarte-Sarries, 2003) and it is therefore not always clear to teachers what exactly is expected of them. One of the studies of this dissertation (Chapter 3) showed that scaffolding was scarce, even though the participating teachers taught at innovative schools. This finding is consistent with findings of for example the study of Lockhorst et al., (2010) that also took place in an innovative setting (Montessori secondary education). Teachers, although working at innovative schools, thus not seem to automatically adopt the role that is expected of them. The concept of scaffolding and the model of contingent teaching provide teachers with guidelines in shaping their new role. The beauty of the scaffolding concept is that it balances between more traditional forms of guiding learning in which the teacher is regulating the learning and newer or innovative forms of guiding learning in which often mainly the student is supposed to regulate his or her learning. In scaffolding, the teacher provides the support that is necessary, while still acknowledging and stimulating the students’ active role in the learning process as the ultimate goal of scaffolding is to transfer the responsibility of learning to the learner.

Adopting that new role is definitely learnable, as shown in this dissertation. However, time and effort are needed to realise change. If schools want to implement innovative pedagogies, they should help and facilitate teachers in learning to master this new role. Furthermore, good classroom management skills seem also needed in order to be able to implement scaffolding. Scaffolding support might take longer than nonscaffolding support in which students are often helped right away; their knowledge is not first diagnosed. This means that students might need to wait longer before being helped. Therefore, good classroom management skills and self-regulative skills of students will probably facilitate the implementation of scaffolding.

This dissertation not only has implications for continuing professional development, but – as scaffolding is potentially effective and much valued by researchers and teachers (Saban, Kocbeker, & Saban, 2007) – also for (initial) teacher education. It could be discussed and practiced both in more general pedagogic subjects and in relation to more specific subjects. All elements of the intervention programme developed in this dissertation could be applied in initial teacher education; the model of contingent teaching, practicing the steps of contingent teaching in classroom practice, and guided reflection on classroom practice with the use of video. The concrete step-
by-step model of contingent teaching manageably captures the complex and abstract idea of scaffolding. This model of contingent teaching appeared to be highly effective in learning how to scaffold. Although step-by-step models have the danger of resulting in mechanic execution of just the steps, we found that using the steps resulted in true contingent behaviour. Several factors might play an important role in learning how to scaffold.

First, reflecting on (recordings of) own classroom practice appeared to result in fruitful insights and this reflection process is known to be crucial in the learning process (cf. McLean, 1999). In addition, teachers need to be willing to share and discuss their practice with others; this appears to be a crucial factor in effective change (Timperley, 2007).

Second, it seems crucial that teachers are receptive to the idea of scaffolding. Guskey (1998) for example indicated that no innovation is likely to succeed if teachers do not support the idea. Learning to scaffold implies changing one’s automatic reaction of giving support into first listening to students. One needs to be genuinely interested in students’ ideas and prepared to use these in the ongoing lesson.

Third, good knowledge of the subject-matter also seems to be crucial in learning to scaffold. Diagnosing students’ understanding is a crucial part of scaffolding. To be able to both focus on a student’s understanding of a particular topic and to simultaneously compare that to the (complex) subject matter itself requires a deep understanding of the subject matter (Feldon, 2007). However, as Epley et al. (2004) indicate; if the level subject-knowledge is too high, teachers might suffer from egocentric bias (i.e., they find it hard to take on a novice’s position). Bliss et al. (1996) report that the failure of their scaffolding intervention was probably due to the poor knowledge of the subject-matter of the participating teachers. In our study, the subject-knowledge of the teachers appeared to be good, which probably has facilitated the implementation of scaffolding.

All implications discussed in this section do not only apply to the particular context in which the studies were conducted (i.e., social studies in prevocational education), but also apply in our opinion to a certain extent to other educational settings (e.g., other levels and other subjects). Teacher-student interaction always plays a crucial role in the learning process, regardless of the level or the subject. Because scaffolded support is adaptive, all students of all levels and in all subjects can benefit.
GENERAL CONCLUSION

Scaffolding is an appealing concept that represents a complex process. The dynamic nature of the process makes the measurement difficult. Nevertheless, this dissertation provided a solid starting point for the dynamic measurement of contingency. Scaffolding appeared to be scarce in classroom practice, however, teachers appeared to be able to learn how to scaffold effectively with the use of the model of contingent teaching. Students appreciated scaffolding support and, although it had a negative effect on students’ on-task behaviour, it appeared to be potentially effective with regard to student achievement.

Scaffolding is a powerful concept that should receive continuing attention from researchers and practitioners. It represents a way of supporting students while fully acknowledging their potential. The student is empowered but never left to his or her own devices.