Chapter 5
Training teachers of ID students in interactive instruction

A previous version of this chapter was published as:
Abstract

In the Netherlands, teachers of students with an intellectual disability do not instruct their students interactively. The teachers demonstrate assignments, but the students often fail to fully understand them and remain dependent on the teacher when working on their own (Blik, Harskamp & Kuiper, 2012). This instructional practice is also seen in other countries (Wehmeyer, et al, 2008). Research conducted by Swanson (2001) and Chung & Tam (2005) in special education shows that interactive instruction where students explain procedures or cognitive strategies to their teacher, has a positive effect on students’ independency during task performance.

In this study, we examined the effect of in-service training to change teachers’ routines into interactive instruction. The teachers could learn to teach more interactively in the form of instruction they preferred: individual guidance or group instruction. The training and coaching were developed especially for this study based on the principles of Joyce & Showers (2002), and Cornett & Knight (2008).

After the training, thirteen teachers participated in an investigation. In the first period, before the summer vacation, teachers succeeded in changing their instructional behavior towards much more interactive teaching and students worked more independently. In the second period, after the summer vacation with new classes of students, the effects of the training could still be observed.
5.1 Introduction

A number of different initiatives have been developed around the world to promote the professionalization of teachers working with ID students (Turnbull, Turnbull, & Wehmeyer, 2007). The aim of this study is to find out whether we could contribute to the professionalization of this particular group of teachers.

Previous studies show that most teachers of ID students prefer to give individual guidance to their students and some prefer group instruction (Blik, Harskamp, Kuiper-Bakker, 2012; Spooner, Baker, Harris, Ahlgrim-Delzell, & Browder, 2007). In both forms of instruction, the teachers instruct students through demonstration of the tasks they need to carry out. The tasks are often practical assignments to prepare students for basic level jobs. However, demonstration as a teaching method leaves students with little opportunity to actively participate in the instruction process. Especially when tasks are complex ID students find them hard to remember. As a result, many students cannot work on the tasks independently and often ask their teacher for help (see Chapter 2).

The question we set out to answer in this study was whether we could train teachers to use interactive instruction instead of demonstration. We wanted to find out whether this change in teaching method would help ID students to understand their assignments better and work more independently. In order to answer this question, teachers needed to be trained and coached. After the training was completed, we examined whether the teachers could carry out interactive instruction in their classes both short and long term and whether this improved their students’ ability to work independently.

5.2 Theoretical framework

Interactive instruction and current teaching practice

Several studies have examined whether the way in which an assignment is explained to ID students matters (Hughes, et al., 2002; Montague & Dietz, 2009). The conclusion from these studies is that, of all of the ways of teaching, students benefit the most from direct instruction (DI) or strategy instruction (SI).
In DI, new assignments are presented in small steps. The teacher demonstrates and explains how the assignment is performed, asks the students questions and lets them practice with guidance before they start working on the assignment independently. The students' learning activities are steered in the desired direction by asking questions, helping them, and giving corrective feedback (see Adams & Carnine, 2006; Graham & Bellert, 2004; Veenman, 1992).

Strategy instruction (SI) is recommended when teaching students how to apply procedures. SI consists of the teacher asking questions with the aim of creating a specific approach (strategy) together with the students. In order to do this, the teacher must interact heavily with the students and challenge them to think about the steps to carry out the assignment. According to Fuchs, Fuchs, Mathes and Martinez (2002), Ryder, Burton and Silberg (2006) and McLeskey and Billingsley (2008), SI has a positive effect on students' understanding of the sequence in which assignments need to be performed and their ability to perform them independently. Researchers generally agree that both DI or SI are effective teaching methods. It does matter, though, that methods are given interactively and that students can explain the procedures to the teacher and their peers. Explaining an assignment to themselves (self-explanation) and to others (explanation to another) increases their chances of understanding and performing assignments independently (Chung & Tam, 2005; Montague, 2007; Swanson, 2001).

Current teaching practice in education of ID students in the Netherlands as well as other western countries is that most students receive instruction in an individual setting. They choose their assignments and are given individual guidance. A minority of the teachers give group instruction with assignments for all students in a class and extra assignments for students who finish their assignment sooner (Blik, Harskamp, Kuiper-Bakker, 2012; Spooner, Baker, Harris, Ahlgrim-Delzell, & Browder, 2007). The explanation for the teachers’ focus on individual students is that it is easier for the teachers to keep students on track and they can give the students immediate feedback (Pinnell, et al., 1994; Wasik & Slavin, 1993). One of the problems, though, is that classes are generally too big for this type of instruction. Individual instruction with intense interaction is difficult to give to classes of eight or more students (Bosker & Doolaard, 2009). In larger classes, teachers are often...
unable to spend more than a few minutes per lesson on individual students. Their “fragmented” instruction focuses mainly on the practical execution of assignments (demonstrating the procedure) and not on students’ understanding and planning of assignments. Teachers who give group instruction, on the other hand, can spend more time on instruction and probing to make sure students understand an assignment. But just like the teachers who give individual guidance, these teachers also tend to take their students too much by the hand instead of asking the students to explain (Blik, Harskamp, Kuiper-Bakker, 2012; Woolfson & Brady, 2009; Allday & Yell, 2013).

In light of the above, the question we asked was whether lessons could be optimized for both ID students and teachers in the Netherlands. We tried to find the answer in the form of a training and coaching intervention aimed at changing the instructional behavior of teachers in the technical domain in Practical Education.

**Effective teacher training**

It’s not easy to change a teacher’s ways of giving instruction. In order to make any changes, teachers would first have to be convinced of the benefits and improvements. One way of doing this is by showing them their instructional behavior and putting them in a group (network) with peers who also want to change or see the need for change (Joyce & Showers, 2002; Shulman & Shulman, 2004). Researchers concluded that another favorable condition for change is that the group of like-minded professionals works in the same type of education and teach the same subjects because it stimulates them to exchange ideas quicker (Franke et al., 2001; Gregoire, 2003; Shulman & Shulman, 2004).

Joyce and Showers (2002) performed a meta-analysis of some 200 studies and concluded that the professionalization of teachers is built on five components of actions the trainer-coach should take:

- **Provide information on the theory of the teaching skills to be acquired.** In both of our conditions (group and individual), the researchers address theory first. According to Joyce and Showers, it is key that concrete examples of the presented (subject) knowledge and skills are given together with demonstrable improvements in the
classroom. In the teachers' perception, this makes the content of the training convincing and feasible (see also Gregoire, 2003).

- **Let teachers observe the skills they need to acquire.** The teachers are shown video examples of interactive instruction. The videos were made before the seminar in classes for ID students. The videos show that students can be instructed interactively in an individual condition by working more systematically. In the group condition, the videos show how teachers can increase the amount of interactive instruction and differentiation in the classroom. The teachers of the two groups watch the videos with a checklist for individual or group interactive instruction. The videos make it possible for teachers to compare their current and desired state of affairs and to discuss the feasibility of changing their teaching method and the benefits of more interactive instruction.

- **Let teachers practice the skills in simulated classrooms.** Joyce and Showers (2002) show that role play can provide a better understanding of new teaching methods. The participants are given student assignments that they can use to prepare a short lesson. They then give the lesson to their peers in the form of role play. Teachers in individual condition practice in systematic instruction with questions for the students. Teachers in the group condition practice strategy development by a question-and-answer method. The coach demonstrates how the teachers can differentiate within their group so that students who work fast have a more complex assignment than the other students, but can still benefit from the group instruction.

- **Give teachers feedback about the way they use the skills they learned and discuss the results with them.** In both conditions, teachers receive feedback from their fellow participants and trainer-coaches. By practicing in the training environment and receiving feedback, teachers gain better insight into the changes they need to make to their own teaching method. With the trainer-coach and their fellow trainees they discuss how they can apply the changes in their classrooms and which adaptation they can make (Zimmerman & Schunk, 2004; Gabelica, Bossche, Segers, & Gijselaers 2012).

- **Coach the teachers in their classrooms by observing lessons and giving feedback to them.** Joyce and Showers’ fifth component, coaching in a realistic classroom environment, is
also referred to as *instructional coaching* (Knight, 2004, 2007; Cornett & Knight, 2008). Knight and Cornett (2009) showed that teachers must not only be involved in the issue that needs to change, but they must also have ample opportunity to influence the change process and its practical implementation. In the coaching phase, the teacher plans the interactive lesson together with the trainer-coach. The teacher gives a lesson that the trainer-coach observes and discusses. During the discussion, the teacher is explicitly asked to find and implement improvements for the next lessons. After this intensive coaching period, teachers and researchers map out subsequent actions on whether and how the support will be continued.

Instructional coaching can also take place through video recorded lessons. The teachers send the videos of their lessons and their self-evaluations to the trainer-coach. The trainer-coach can watch the teachers’ videos, check the teachers’ self-evaluation sheets, and give feedback. Research conducted by Sherin and Han (2004) shows that this form of remote coaching is an effective supplement to “face-to-face” coaching.

**5.3 Research questions**

The aim of the teacher training and coaching (done by the researchers) was to enhance teachers interactive instruction during classes in practical skills so that their students got a better understanding of the assignments to be performed and worked more independently. The research questions were:

1. *Would training and instructional coaching enable teachers of ID students to give their lessons more interactively and would such training have a lasting effect on their instructional behavior?*
2. *Does more interactive instruction increase students’ ability to work independently?*
5.4 Method

The study was carried out in 11 schools for Practical Education (PrO) of ID students in the four northern provinces of the Netherlands. Based on a previous study on teaching methods in secondary education of ID students in the Netherlands (Blik, Harskamp, Kuiper-Bakker, 2012), we chose to carry out this study with woodworking teachers. A total of 13 teachers took part in the training and the corresponding study, which was carried out in two periods: before and after summer vacation (Table 5.1).

Period I centered on the implementation of the five components of Joyce and Showers: theory development, demonstrations by the coach, simulated practice, real classroom practice, and feedback from the coach. In Period I, all of the teachers gave lessons to one group of second-year students (age 13-14). A total of 135 students from 13 classes took part in Period I.

In Period II, the teachers applied the interactive instruction skills they had acquired in Period I to classes in the next school year. A total of 165 students from 16 classes took part in Period II. Three teachers taught two classes the other teachers taught one class. In both study periods, a group consisted of approximately 10 students. Two-thirds of the students were boys. The girls were proportionally spread across the classes.

Teacher training

Starting situation

Before the training started, the teachers filled out a short questionnaire on their teaching methods. Based on the answers, the teachers were grouped into two preliminary training groups: eight teachers appeared to have a preference for the individual approach and five teachers for the group approach.

Then, a first lesson was organized to establish the teachers starting situation. Teachers were asked to present the same woodworking assignment to all of their students and teach as they normally would (i.e. following their own teaching method). To prepare the lesson the teachers were given a card with the steps needed to perform the assignment. The observations of the lessons were used as the baseline measurement, of to what degree
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the teachers used interactive instruction in the “individual condition” and in the “group condition” (see Table 5.1). The lessons were video-recorded by the researchers.

The training

The teachers were already familiar with using an individual or a group approach in their lessons. To give them better insight into their own teaching method, the lessons were broken down into lesson stages and key aspects (Table 5.2). Five lesson stages with ten key aspects of interactive instruction were distinguished (see Scruggs & Mastropieri, 2003; Swanson & Deshler, 2003).

The first stage of the training consisted of explaining the theory of interactive instruction using video examples. The videos contained exemplary lessons to ID students that was recorded especially for the training. The sample lessons were delivered in individual and group settings and displayed the use of the ten key aspects of interactive instruction in Table 5.2.

In the training, the teachers observed the sample lessons and, after each one, filled in a checklist with questions about the lesson stages in Table 5.2: 1. Orientation: description/discussion of the assignment, 2. Instruction: the way it was explained and the presentation of (sub)assignments, 3. Guided Practice: offering help, 4. Processing: the extent to which students were able to work without help, 5. Closing/Review: the use of the lesson closing and process evaluation.

When the teachers finished watching the videos, they practiced the lesson in the form of role play. The lesson was discussed with the teachers using the checklist with the 10 key aspects. They role played and discussed the lesson twice. In the second session, the teachers and the researchers worked out six assignments with blueprints and assignment cards. The cards showed the steps needed to carry out each assignment.

After the role play, each of the teachers’ starting situations in their own classrooms was discussed with the trainers-coaches and peers and ideas on how they could improve instruction were put forward.
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### Table 5.2

**Lesson stages and key aspects of the interactive instruction model in an individual or group condition**

<table>
<thead>
<tr>
<th>Lesson stages and key aspects</th>
<th>Individual Guidance</th>
<th>Group Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Orientation (1 key aspect)</td>
<td>1.1 Teacher gives a short description of the assignments and the assignment cards. Students work on their assignment from the previous lesson or choose a new assignment to work on. Prior knowledge is activated by asking about the corresponding assignment card.</td>
<td>1.1 Teacher discusses the basic and extra assignment with the students with help of examples and the assignment cards. They ask students questions (what are we going to make; what do we need to make it). Activate prior knowledge in the group using previous lessons and techniques.</td>
</tr>
<tr>
<td>2. Instruction (2 key aspects)</td>
<td>2.1 Teacher walks around and demonstrates individual students how the assignment is executed (using the assignment card, photo card and the end product). 2.2 Teacher determines whether the students have understood. Asks questions about the assignment card with photos.</td>
<td>2.1 Teacher demonstrates the assignment to the whole group (using the assignment card with photos and the end product). Teacher asks different students to explain the step that is shown. 2.2 Teacher asks different students to repeat the steps and explain them.</td>
</tr>
<tr>
<td>3. Guided practice (1 key aspect)</td>
<td>3.1 Students practice a subtask under the teacher’s guidance and the teacher corrects using the assignment card.</td>
<td>3.1 Students practice a subtask individually. The teacher monitors the students’ work. Teacher discusses the subtask by asking questions to the students and discusses the extra assignment with the stronger students.</td>
</tr>
<tr>
<td>4. Processing (4 key aspects)</td>
<td>4.1 The students are at work individually and the teacher answers questions by referring to the assignment card. 4.2 Teacher walks around the room and gives feedback by indicating what students are doing well and correcting what they are not doing well. 4.3 Teacher differentiates by giving more attention to weaker students and referring to the assignment card; pointing out more efficient techniques. 4.4 Teacher differentiates by helping stronger students prepare for the next assignment.</td>
<td>4.1 The students are at work individually and the teacher answers questions by referring to the assignment card. 4.2 Teacher walks around the classroom and asks questions about the assignment cards: “where are you and what do you still have to do?” 4.3 Teacher differentiates by giving more attention to weaker students and referring to the assignment card; by pointing out more efficient techniques. 4.4 Teacher gives the small group of stronger students extra instruction (if necessary) for a subtask (step) of the extra assignment.</td>
</tr>
<tr>
<td>5. Closing/review (2 key aspects)</td>
<td>5.1 Teacher reviews the work process and evaluates what went well and what didn’t with each student. 5.2 Teacher evaluates the end product individually with the students.</td>
<td>5.1 Teacher reviews the work process and evaluates what went well and what didn’t with the whole group. Which steps were hard and which were easy? Teacher lets the students explain. 5.2 Teacher evaluates the end products in the group.</td>
</tr>
</tbody>
</table>
In the *individual condition* the Pretest showed that most of the teachers used direct instruction in the Orientation and Instruction stages. But, they paid little attention to interaction with the students. The teachers decided to change their teaching routine and instead explain and demonstrate the assignment to the students in pairs. This would increase efficiency in instruction. For further improvement, the researchers suggested that the teachers would give the students a sub assignment to perform after the Instruction stage. This would enable the teachers to determine whether each student understood the sub assignment and had the ability to perform it. The teachers were advised to help students find the strategy to execute an assignment, by referring to the assignment cards and prototypes of the assignments. They should not do the students’ sub assignments for them.

The teachers were also given advice on how to evaluate the assignments the students finished and the way students worked at the assignments. The researchers indicated that an evaluation is more effective if it focuses on the steps on the assignment card and the process itself.

In the *group condition*, most of the teachers used direct instruction in the Orientation and Instruction stages. They were advised to guide students through the steps and make the instruction more interactive by asking questions such as: “What should the next step be?”, “Which materials do you need?”, “Which tools should you use?” In order to determine whether students understood the instruction, teachers decided to let the students demonstrate sub assignments and think about the sequence of the steps. During their training, teachers learned how to correct students by letting them explain the steps on the assignment card rather than by demonstrating or performing the steps for them, and to only help students when they asked for help, and thus to give as little unsolicited instruction as possible.

At the end of the training sessions, all of the teachers were given a video camera and instructions on how to record their own lessons.
Coaching and implementation of interactive lessons in Period I (week 1 to 7)

In the individual condition, the teachers let each of the students chose an assignment from the selection of assignments the teachers had designed together with the researchers (see Table 5.1). The teachers let the students start working on a next assignment as soon as they finished the one they were working on and it had been evaluated by the teacher. In the group condition students used the same assignments as in the individual condition. But, the teachers chose the assignment, gave instruction and the students finished one assignment per lesson. In order to differentiate, next to the basic assignment a more elaborate "extra" assignment was added to the assignment card. For example, if the basic assignment consisted of making a wooden box, the extra assignment consisted of making a lid for it.

In both conditions, the three lessons in Period I were recorded on video and analyzed. The first lesson was always attended by a researcher. The observations, made during the first lesson, showed that a small number of teachers in both conditions did not correctly perform some of the steps in the interactive instruction model in Table 5.2. They demonstrated the sub assignments instead of asking the students how to do it. Their instruction was not question-driven and students worked at the assignments without first verbalizing or practicing. The teachers were again convinced that to demonstrate or perform sub assignments for the students did not enhance the students skills. Interactive instruction requires that the teacher lets the students ask questions and find the answers and correct their errors themselves.

In the second and third lessons that were recorded by the teachers themselves, the teachers improved in interactive teaching. They appeared to apply the Orientation and Instruction stages almost entirely according to the interactive instruction model. During these lessons, teachers were better at letting the students perform the sub assignments with their guidance.

The teachers sent their videos and completed self-evaluation sheets to the researchers and received feedback on the recorded lessons. In Period I, a total of 13 x 4 lessons (Pretest and three normal lessons) were recorded on video and evaluated.
The first effect measurement at the end of Period I (Post1) was done on the students and teachers in week 7 of this experiment, before the summer vacation. Every teacher used the same assignment, which was given to them by the researchers. The researchers observed the lesson in the classroom.

Further implementation of the lesson in the classroom in Period II

Ten weeks after the end of Period I, the 13 teachers gave a lesson series of 6 assignments to 16 new groups of second-year students using the interactive instruction model (see Table 5.2). The six assignments with instruction cards and photos for the students were provided by the researchers. Of the six lessons that a teacher gave two or three were used to measure the teacher’s retention of the use of interactive instruction. In Period II, teachers received no more coaching and feedback with the exception of a few comments on the first lesson.

The teachers recorded 45 lessons of their 96 lessons on video. The researchers watched the videos and coded them using an observation form.

Observational Instrument and Interobserver reliability

An observation form was used based on an instrument from previous research (see Chapter 2). A lesson of 100-minute lesson was divided into observation blocks of five minutes. The teacher was observed in the first four minutes of each of the five-minute blocks. The students’ activity was monitored in every fifth minute (see Table 2.2).

Both researchers observed three lessons in Period I and three lessons in Period II. The observation data of the two researchers from these lesson were compared to test interobserver reliability of:

a. The use of the interactive instruction model by the teacher,
b. The students’ independency during the processing stage of the lesson in three aspects: teacher’s answers to students’ questions, teacher’s unsolicited help and students’ inactivity.
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Both researchers observed the use of interactive instruction model of Table 5.2 during the lesson in either individual guidance or group instruction. The extent to which teachers in the individual condition or group condition applied the five lesson stages and the corresponding ten key aspects were measured. A maximum of two points could be scored for each aspect: 0 (not applied), 1 (partially applied) or 2 (applied according to plan). The scores of the researchers of the six lessons they observed were compared through calculation of Cohens’ Kappa. We found a high agreement of $K = 0.88$.

Student independence

In order to determine student independence during the processing stage of a lesson three indicators were used (see Chapter 2): a) the mean number of inactive students, b) the number of questions the teachers answered and c) the number of times the teachers gave help. The reasoning behind this is that the fewer inactive time of students, the fewer questions the teachers had to answer and the less help they had to give, the more independently the students would work.

The total number of students that were inactive during processing, the total number of questions teachers answered and the total of times the teachers gave help was divided by the number of observation blocks in the processing stage (every five minutes of observation). This is how the average number of inactive students, questions asked and help given was determined. The agreement between the two researchers on these three aspects of students’ independence was good. The scores of the researchers for the mean number of inactive students in each of the six lessons was very high; the correlation was $r = 0.99$. The agreement between the researchers in mean number of questions answered by the teachers during processing in each of the six lessons was also high: $r = 0.97$. As was the agreement in scores of the researchers for the mean number of unsolicited help given by the teachers: $r = 0.90$.

We reported data about the percentage of inactive students during the processing stage. The percentage was calculated by dividing the mean number of inactive students through the total number of students in a class.
Data analysis

The sample in this research was relatively small. Although this does not mean that meaningful conclusions cannot be drawn from the outcome, we believe that it would be irresponsible to use measurements such as significance tests and reliability intervals. The number of participants was also relatively low. To answer research question 1, whether training and coaching of teachers would lead to more interactive instruction in the short and longer run, descriptive statistics were used for the ten aspects of the interactive instruction model. To answer research question 2, whether more interactive instruction increases students’ ability to work independently, descriptive statistics were also used to determine the degree of student independence during the processing stage: average percentage of time that a student was paying attention to the assignment, average number of questions that a teacher had to answer and the average number of times a teacher gave help.

Based on these descriptive data, only preliminary conclusions can be drawn on the effects of teacher training.

5.5 Results

Baseline measurement (Pretest) for the teachers in Period I

Using a checklist, the extent to which teachers in the individual or group condition applied the five lesson stages and the corresponding ten key aspects (Table 5.2) was measured in the baseline measurement (Pretest).

Table 5.3 shows that in the Pretest on a scale of 0 to 2, the aspects “Orientation” (Key aspect 1.1) with average scores of 0.88 and 0.40 respectively and “Guided practice” (Key aspect 3.1) with average scores of 0.38 and 0.20, were hardly applied by the teachers. They did not really check whether the students had understood the instruction (“Checking understanding” – Key aspect 2.2 ) and scored 0.38 and 0.60 respectively. The aspect that was applied the most was “Presentation” (Key aspect 2.1) of how the assignment was made, the average pretest scores were 1.13 and 0.80. In the Processing Stage, teachers spent most of their time helping students. In the individual guidance condition, help consisted mainly
of instruction and correction and mainly of questioning in the group condition. When differentiating, teachers seemed to spend more time on weak students (0.88 and 1.20) than on strong students (0.25 and 0.40).

Verbalizing the actions on the assignment card (Key aspect 2.2) was hardly applied in both groups. Teachers also gave insufficient attention to the discussion of the assignment in the Review-Closing Stage (Key aspect 5.2), especially in the guidance group (0.50). Finally, the teachers in both groups spent very little time on evaluation (0.63 and 0.40 respectively).

As expected, the Pretest indicated that teachers hardly used the model of interactive instruction: teachers in both the individual and group condition scored an average of 0.66 of the maximum 2.00 points.

Effect measurement (Post1) for teachers in Period I

Table 5.3 shows that the teachers in both conditions strongly improved on application of the 10 aspects of interactive instruction. On a scale of a maximum of 2.00 points, teachers in the individual condition scored on average 1.43 points per aspect (an increase of 0.77) and in the group condition on average 1.48 points (an increase of 0.80). This is more than a doubling in both conditions.

There were differences in development between the groups of teachers. With the exception of the already mentioned application of Guided practice, there was also a difference in the extent to which teachers differentiated for weak students. This was greater in the individual condition than in the group condition (2.00 versus 1.60). The key aspects of the closing stage (review of processes and evaluation of products) seemed to have a more prominent role and function than in the individual condition.

There are very large effects for the use of the interactive instruction model. For coaching in individual guidance Cohen’s $d$ is 3.85 and 3.72 for coaching in group instruction.
Table 5.3  
Teacher development before (Pretest) and after (Posttest) the training in period 1

<table>
<thead>
<tr>
<th>Teaching stage and aspect</th>
<th>Individual Guidance (n=8)</th>
<th>Teachers (n=13)</th>
<th>Group Instruction (n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretest</td>
<td>Posttest</td>
<td>Pretest</td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>Differ. score (SD)</td>
</tr>
<tr>
<td>1.1 Orientation</td>
<td>0.88 (0.83)</td>
<td>1.88 (0.35)</td>
<td>1.00 (0.55)</td>
</tr>
<tr>
<td>2.1 Presentation</td>
<td>1.13 (0.64)</td>
<td>1.75 (0.46)</td>
<td>0.62 (0.45)</td>
</tr>
<tr>
<td>2.2 Checking understanding</td>
<td>0.38 (0.52)</td>
<td>1.38 (0.52)</td>
<td>1.00 (0.55)</td>
</tr>
<tr>
<td>3.1 Guided practice</td>
<td>0.38 (0.74)</td>
<td>1.25 (1.04)</td>
<td>0.87 (0.45)</td>
</tr>
<tr>
<td>4.1 Respond to requests for help</td>
<td>0.63 (0.74)</td>
<td>1.75 (0.46)</td>
<td>1.12 (0.71)</td>
</tr>
<tr>
<td>4.2 Feedback and extra instruction</td>
<td>1.00 (0.00)</td>
<td>1.25 (0.46)</td>
<td>0.25 (0.45)</td>
</tr>
<tr>
<td>4.3 Differentiation weak students</td>
<td>0.88 (0.64)</td>
<td>2.00 (0.00)</td>
<td>1.12 (0.45)</td>
</tr>
<tr>
<td>4.4 Differentiation strong students</td>
<td>0.25 (0.46)</td>
<td>0.50 (0.93)</td>
<td>0.25 (0.89)</td>
</tr>
<tr>
<td>5.1 Review of process</td>
<td>0.50 (0.53)</td>
<td>1.38 (0.52)</td>
<td>0.88 (0.00)</td>
</tr>
<tr>
<td>5.2 Evaluation of product</td>
<td>0.63 (0.74)</td>
<td>1.13 (0.83)</td>
<td>0.50 (0.55)</td>
</tr>
</tbody>
</table>

Average total score

<table>
<thead>
<tr>
<th>Individual Guidance (n=8)</th>
<th>Teachers (n=13)</th>
<th>Group Instruction (n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>Posttest</td>
<td>Pretest</td>
</tr>
<tr>
<td>M (SD)</td>
<td>M (SD)</td>
<td>Differ. score (SD)</td>
</tr>
</tbody>
</table>

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**Delayed posttests for the teachers in Period II**

After using interactive instruction before summer vacation the teachers applied their skills in teaching again after the summer vacation with new classes of students. There were three classroom observations during this period with the same checklist as in period I. The (delayed) observations measured the teachers’ use of interactive instruction. Again, the scores could range from 0 to 2. In Figure 5.1 Pre is the pretest and Post1 is the posttest of Period I. The first delayed measurement (Post 2) seemed to indicate that the training had a lasting effect if one compares Post1 mean scores to the depicted Post2 mean scores.

<table>
<thead>
<tr>
<th>Teaching stage</th>
<th>Teachers (n = 13)</th>
<th>Individual Guidance (n = 8)</th>
<th>Group Instruction (n = 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post1</td>
<td>Pre</td>
</tr>
<tr>
<td><strong>Differ. score</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orientation</td>
<td>1.00</td>
<td>0.40</td>
<td>1.60</td>
</tr>
<tr>
<td>Instruction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>0.62</td>
<td>0.80</td>
<td>2.00</td>
</tr>
<tr>
<td>Checking understanding</td>
<td>1.00</td>
<td>0.60</td>
<td>1.40</td>
</tr>
<tr>
<td>Guided practice</td>
<td>0.87</td>
<td>0.20</td>
<td>0.60</td>
</tr>
<tr>
<td>Processing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respond to requests for help</td>
<td>1.12</td>
<td>1.20</td>
<td>1.80</td>
</tr>
<tr>
<td>Feedback and extra instruction</td>
<td>0.25</td>
<td>0.40</td>
<td>1.50</td>
</tr>
<tr>
<td>Differentiation weak students</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differentiation strong students</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closing/Review</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Review of process</td>
<td>0.88</td>
<td>1.00</td>
<td>1.80</td>
</tr>
<tr>
<td>Evaluation of product</td>
<td>1.00</td>
<td>0.40</td>
<td>1.40</td>
</tr>
</tbody>
</table>

**Average total score**

<table>
<thead>
<tr>
<th></th>
<th>Individual Guidance</th>
<th>Group Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>0.66</td>
<td>1.43</td>
</tr>
<tr>
<td>Post1</td>
<td>1.48</td>
<td>1.43</td>
</tr>
<tr>
<td>Post2</td>
<td>1.39</td>
<td>1.63</td>
</tr>
<tr>
<td>Post3</td>
<td>1.30</td>
<td>1.50</td>
</tr>
<tr>
<td>Post4</td>
<td>1.17</td>
<td>1.64</td>
</tr>
</tbody>
</table>

In the individual condition the execution of the instruction model used during the first delayed measurement (Post2) produced a score of 1.39, that is almost the same as in the posttest (Post 1) in Period I. But, in the delayed Post3 and Post4, when teachers had done most of the six lessons, the measurement showed a declining trend, overall (to 1.17). Although teachers had taught more lessons in Period II, their application of the 10 aspects
of interactive teaching had declined somewhat compared to Post1 in Period I (from 1.43 to 1.17). But, teachers in the individual condition still used more of the interactive instruction aspects at the end of Period II (Post4) than at the pretest (1.17 versus 0.66).

In the group condition there was continuous development (from 0.68 in the pretest to 1.64 in Post4). The teachers made sure students had a good understanding of what they were supposed to do before letting them work on their own. This created more time during the processing stage for individual guidance for both weak and strong students.

Students’ independence during the processing stage
We report on three indicators of students’ independence: a) the percentage of inactive students, b) the average number of questions the teachers answered and c) the average number of times the teachers gave help.

Active involvement during processing

Figure 5.2. Average percentages of students that are active and inactive in Period I and Period II
To measure how actively students participated in the lessons, data from 13 groups (8 individual guidance and 5 group instruction) in both periods before and after the summer vacation were used. We show the percentages of inactive students during Period I and during Period II.

Figure 5.2 shows that in the group condition in the lessons during period I, 14% of the students were not actively involved in their assignment. In the individual condition this was 29%. During period II students' inactivity was 3% in the group condition and 9% inactivity in the individual condition. So, it seems that students in the group condition spent their time more actively, both in period I and period II.

The average number of questions the teachers answered during the processing stage

The average number of student questions the teachers answered in an observation block, broken down by condition and period, is shown in Figure 5.3.

![Figure 5.3](image)

**Figure 5.3.** Mean number of student questions that teachers answered during the processing stage across both groups

In Period I, teachers in both conditions had to answer fewer questions from their students. In the individual condition teachers answered on average 4.67 questions in an observation block of 4 minutes during the baseline measurement (Pretest) and only 1.54
questions during the first effect measurement (Post1). For group instruction, the average number of questions answered by the teacher decreased from 3.44 to 1.19.

Figure 5.3 also shows that the questions answered in Period II (Post2, Post3, Post4). At the beginning of the new school year, we expected new students to ask more questions. Indeed, the new students in period II (Post2, Post3, Post4) still had more questions during the processing stage than the more experienced students in Period I (Post1).

Overall in Period I and II, students in the group condition asked fewer questions compared to students in the individual condition.

*Teachers' help during the processing stage*

![Figure 5.4](image)

*Figure 5.4. Mean number of times the teacher gave students help during the processing stage across both groups*

Figure 5.4 shows the help the teachers gave students during the processing stage of their lessons in Period 1 (from Pretest to Post1) and in Period II (from Post2 to Post3 and Post4).

Figure 5.4 indicates that in Period I, as intended, the teachers gave less help during the processing stage. In the individual condition, during the baseline measurement (Pretest), teachers gave on average 1.69 times help in an observation block of 4 minutes
and 1.53 times during the post test. For group instruction, the average times help was given decreased from 2.62 to 1.55.

In Period II the amount of help given by the teachers in the new classes was lower than in the more experienced classes before the training (see Pretest). This is an indication that the new students understood the instruction better and needed less technical or content related help while executing the assignments.

In conclusion, throughout the lesson series we observed in the processing stage: a decrease in the average number of questions the teacher had to answer and in number of times students had to be helped. This outcome seems to indicate that the application of interactive instruction throughout the lesson series was fruitful. As expected, student independence increased as they needed less support from their teacher.

### 5.6 Conclusions and discussion

The question we asked in this study was whether training and coaching of teachers of ID students would result in sustained use of interactive instruction in the classroom. And also if interactive instruction would enable their students to work more independently.

At the time of the baseline measurement (Pretest), on average, the teachers applied one-third of the ten aspects that effective interactive instruction must meet. After the baseline measurement, teachers were trained and coached in interactive instruction. During their training, teachers were shown videos of interactive instruction. They gave each other short lessons on the application of the examples they were shown, discussed how to plan interactive instruction in their own classrooms and how they could use the assignments they prepared during the training. After the training, the teachers taught nine lessons spread over two periods. Three lessons were given to second-year students before the summer vacation. The teachers received “face-to-face” coaching for one lesson and remote coaching for two lessons by submitting the video recordings of their lessons and receiving feedback on their self-evaluation of the lessons. After the summer vacation, six more lessons using assignments developed in the training were given to different classes of second-year students.
After the first series of three lessons, all of the teachers were better at applying the ten key aspects of interactive instruction. The scores doubled for the application of the ten aspects. This seemed to show that a short but intensive period of training and coaching can result in substantial positive changes in instructional behavior.

After the summer vacation, the teachers’ instructional behavior in the new series of lessons given to second-year students showed a high level of retention. The scores for the teachers in the group condition seemed to be higher and more consistent as the lesson series progressed than for the scores of the teachers in the individual condition, but all of the teachers continued to teach interactively up till the last lesson.

The study also examined the independence with which students performed assignments. There are positive indications, the students participated more actively, the number of questions the teachers answered during the processing stage and the amount of help to students was substantially lower before the training and coaching than direct after one month (period I) or after five months (period II).

But, it remains to be seen whether a positive conclusion can be drawn. The positive effects could also be the result of the students' spontaneous development and the influence of more motivated teachers because of the intervention. However, there are reasons to assume that het changes in teacher and student behavior were initiated by the intervention. At the beginning of the new school year, it quickly became apparent that younger students in both conditions, after interactive instruction, asked less questions than the "old," experienced group before the summer vacation. We have reason to assume that interactive instruction had this effect on the students' participation and independence. Our observations support the argument that interactive instruction gives students opportunities to explain to other persons the steps to make an assignment. This would increases the students' insight into the teachers instruction of the assignment and thereby the students’ independence in executing it. Research by Chung and Tam (2005), Montague and Dietz (2009) and Swanson (2001) with young students in special education supports this hypothesis.

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The positive results in changing teacher behavior were in support of Joyce and Showers' (2002) training model and the instructional coaching principles of Knight and Cornett (2009). Knight and Cornett's principles of “dialogue,” “equality” and “reciprocity” as fundamental parts of the training may have contributed to the great change in teachers behavior we observed. In this study, feedback on the execution of the innovation in the lesson was based on video recordings of the classes: first, the current teaching method and later the teaching method used during the innovation. The coach discussed the feedback with the individual teachers as equal partners and again in the group of teachers. Thoughts were exchanged on how the practical application of the innovation could be improved and decisions were made by the teachers. However, from our research one cannot conclude that the teaching skills based training and coaching on teachers had a positive effect on teachers. The research is only descriptive in nature. But, there is also little research from other sources to support our observations. There is a general lack of empirical evidence on the effect of training and coaching on teachers' change in instructional behavior. Little experimental research has been done, and the available studies are not clear which training approaches were implemented (Fletcher and Mullen, 2012). The research designs of the studies also leave a lot to be desired as regards the control of disturbing factors in the implementation of the innovations at the classroom level (Desimone et al., 2009; ; Sailors and Price, 2010).

5.7 Recommendations
As the results of our training are positive for teachers changing towards more interactive instruction and higher student independence, this study is cause for follow-up research.

This research should have a bigger sample of teachers and a comparative design with a training group and a control group for both the individual and group conditions. The teachers and the classes can be randomly assigned to a training in their instruction condition (group or individual). Such a comparative study can be undertaken to examine the possible effects that training and coaching of teachers has. We recommend not only studying the effect that teacher training has on the teacher's ability to instruct interactively and the students' ability to work independently, but to also examine the effect interactive instruction has on the quality of the assignments students make. The students can be
submitted to independent assignment construction tests before and after the training. This would enable the researchers to estimate the indirect effects that the interactive instruction training and coaching of teachers might have on the quality of the assignments the students make. Little research has been done in this area (e.g. Chung and Tam, 2005; Montague and Dietz, 2009; Swanson, 2001), but we expect that when teachers become skilled in letting ID students explain the processing of tasks to another person their students’ independent performance will increase.
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Independent processing