A general overview of the Swedish approach to inclusive education

Una panoramica generale dell'approccio svedese all'educazione inclusiva

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abstract

This article is set to inform about the Swedish school system, parts of the Swedish teacher education, didactical considerations using co-teaching for inclusion and some ongoing Swedish research about simulation training within teacher education for special needs teachers and ways to improve pupils reading skills. The work has been done as literature studies of earlier research and regulatory documents as well as case studies of teacher education at Linköping University where they use simulation training and ongoing research in a municipality in Sweden where they use response to intervention (RTI) to support pupils to become faster and more confident at coming up with answers to addition and subtraction problems. The case study about simulation training showed how simulations could be used to train the ability for teacher for special needs training and teachers for special educational needs ability to observe, a skill that is of great importance in taking stock of a situation and carrying out an investigation in school practices. The influence of the instructor/teacher when using different ways of teaching such as simulation was also showed. The case study about RTI showed that fewer pupils than expected have automatic recall of number combinations, which has the consequence that a larger group than expected will carry on practice with help of adapted computer program.

Keywords: Collegial Collaboration, Didactical Considerations, Educational System, Inclusion, Simulation Training.

Riflessione teorica 110

a. incontro con la storia
b. questioni epistemologiche

Aims and Scope

This article contributes to a general overview of the Swedish approach to inclusive education by describing (a) the regulatory documents for the Swedish educational system (b) the Swedish teachers' education programme (c) the application of simulation (d) the experience of collaboration and (e) didactic considerations for mathematics as support for inclusion.

The Swedish Educational System

The scope of this article is limited to Swedish compulsory education, which begins at the age of six with kindergarten. The purpose of kindergarten is to prepare children for primary school, which they begin at the age of seven. In kindergarten the children learn by playing and are encouraged to be creative. The following nine years of primary school are also compulsory. Traditionally, primary school is divided up into three stages: (a) grades 1-3, (b) grades 4-6, and (c) grades 7-9.

According to the Swedish Education Act (2010: 800), Chapter 1 Section 8, all pupils shall have access to the same quality of education regardless of their socioeconomic background and regardless of where they live in Sweden. Hence, Swedish schools have an obligation to compensate for inequalities. In concrete terms, this means that in Sweden it is acknowledged that children come from different backgrounds and that schools should make it possible for all children to develop to their greatest potential. This is in line with Wubbels' (2011) goal of ensuring that all teachers choose the correct teaching style for each child on any specific occasion, the idea being that this is the best way to bring about development and learning.

The Swedish school system is tasked with ensuring that lessons are adapted so that all pupils' various backgrounds are taken into consideration and any disadvantages are counterbalanced (The Swedish Education Act, Chapter 1, Section 4). To give pupils the opportunity to develop to the best of their ability, instruction should be organised on different levels – individual, group, and school levels – so that development toward educational goals is promoted (The Swedish Education Act, Chapter 1, Section 4). Every school must also see to it that the pupils have access to a healthcare provider through the school. There must be medical, psychological, psychosocial, and special needs professionals who work with preventative care and follow-up care, making the pupils' schooldays coherent, manageable, and meaningful (Antonovsky, 1991).

One key aspect of the support for pupils' progress toward educational goals is that the school must provide access to special needs professionals. This requires personnel who have special needs competence (The Swedish Education Act, Chapter 2, Section 25). If a pupil has trouble acquiring the skills and capabilities for satisfying the criteria for passing, his or her teacher shall report this to the principal who in turn sees to it that an evaluation takes place. These evaluations are usually carried out by the class teacher or a teacher with special needs training / a teacher for special educational needs (The National Agency for Education, 2014). If the outcome of the evaluation is that the pupil is in need of support be-

yond the ordinary lessons, the proposed measures must be put in writing (The National Agency for Education, 2014).

There are two different kinds of support that are provided: (a) extra learning accommodations or (b) special support. *Extra learning accommodations* is a form of support that can be provided within the framework of ordinary lessons and does not require formal approval by the principal. For example, it can be a question of the pupil using digital aids as support or that the pupil receives extra training in skills through a teacher with special needs training (The National Agency for Education, 2014). *Extra help* is a form of aid that the teacher or other personnel cannot provide in an ordinary classroom. The principal decides whether this sort of extensive, long-term assistance is needed. Examples of this sort of aid might be regularly scheduled support provided by a teacher with special needs training, who over a long period of time carries out an intervention to help the pupil acquire skills and capabilities, or that the pupil receives support in the form of a teacher's assistant who accompanies the pupil throughout the school day (The National Agency for Education, 2014).

Ever since the 1960s teacher's assistants have been working in Swedish schools to support pupils with special needs both in ordinary classrooms and in special education schools such as schools for the blind (Gadler, 2011). Östlund (2012) described the teacher's assistant's work as a task that is varied and carried out in close coordination with the pupil. Östlund (2012) outlines the teacher's assistant's work as being made up of three different tasks: (a) the teacher's assistant as 'caregiver', meaning that he or she helps pupils with the shift between different activities or at mealtimes (b) the teacher's assistant as a 'one-on-one instructor', a task that is similar to the teacher's but without formal responsibility for planning and assessment or (c) the teacher's assistant as a 'positioner' of pupils. The teacher's assistant as a 'positioner' is a task in which the teacher's assistant functions as a link between the teacher and the pupil – for example, communicating information and even explaining tasks that the pupil is supposed to carry out (Östlund, 2012).

Extra help is first and foremost provided so that the pupil can be part of what goes on in the ordinary classroom (The Swedish Education Act, Chapter 3, Section 7). If there is a particular reason for it, the principal can decide that the pupil should receive private instruction or get help in a special group (The Swedish Education Act Chapter 3, Section 7). In some cases, this sort of group is arranged by the school, but there are municipalities that have decided to organise these groups to consist of pupils from the same municipality, keeping the groups small and with a low pupil-teacher ratio (Schools Inspectorate, 2014).

The Swedish government's school inspection authority, the Schools Inspectorate (2014) examined how well schools work with pupils with special needs and found that it was either: (a) exclusionist and (b) inclusive. They exemplified exclusionist support as looking like the city-wide groups. To be included in this programme, the pupil was judged to be lacking the ability to reach the goals set for pupils in the ordinary classroom. This is followed by an evaluation, after which action is taken and a special programme is set up (Schools Inspectorate, 2014). If the measures to be taken at the pupil's school do not have the desired effect, it is unusual for the programme to be changed. It is more common that the principal contacts the central authority for educational support (Schools Inspectorate

2014). This can mean that the pupil is placed in another school and gets a new teacher, new classmates and principal. They ensure that the pupil receives a so-called *accommodated course of studies*, which often means that one or more subjects are eliminated. Continual evaluation of these special education measures takes place and is offered to the pupil, but there is seldom an evaluation of the placement. Thus, there is seldom any discussion of whether the pupil should return to his or her regular school, the consequences of which are that the placement becomes permanent (Schools Inspectorate, 2014).

Inclusive education means that at certain times the pupils with special needs are taken out of class and taught in a separate group, but that the pupils are in the regular classroom for as many subjects as possible. The pupils who are taught separately are nonetheless under the supervision of their class teacher, who is responsible for their learning and development. In this way, the pupils continue to have contact with their class teacher and the regular lesson plan. In these cases, there is follow-up, and if the special education measures that were undertaken have not had the intended effect, changes are made to the intervention. When necessary, the class teacher is provided with skills development to facilitate the pupil's knowledge acquisition. The pupil's development is documented and placement in a special needs group is flexible. The goal is that the pupil will return to the regular classroom as soon as that is feasible (Schools Inspectorate, 2014).

Swedish teacher training

In Sweden there are two programmes that aim to provide special education competence. These two programmes are: (a) Special Educational Needs and (b) Special Needs Training. Both of these programmes are one-and-a-half-year postgraduate degree programmes. The teachers for special educational needs and those with special needs training have different tasks and are different specialisations, but examining the way these two professionals work, one sees that they have a good deal in common (Ahlefeld Nisser, 2009; Lindqvist, Nilholm, Almqvist & Wetso, 2011). The difference is that the teacher for special educational needs works more strategically on overarching tasks like consulting the teaching team and working with administration, while the teacher with special needs training is more involved in operational work, developing the individual pupil's skills and capabilities.

The teacher for special educational needs has, among other functions, responsibility for developing lesson plans that will eliminate obstacles and difficulties. Normally, this is done through pedagogical evaluations and analyses of the difficulties at both the organizational and the individual level. This task involves implementing measures and developing classroom strategies that provide the pupils with the support they need. These teachers support colleagues, parents, and other concerned parties. The principals see the teachers for special educational needs as key coordinators (Ahlefeld Nisser, 2014).

Teachers with special needs training who work in schools for challenged pupils consider it their task to work directly with pupils, while teachers for special educational needs who work in preschools and schools view their task as more overarching and advisory. This involves working together with administration to

discuss the organisation of the school from a special needs perspective. The teacher for special educational needs should serve as a qualified advisor to the rest of the staff as well (Ahlefeld Nissers, 2014).

From 2012 (SFS, 2011: 186) the task of the teacher with special needs training includes six specialisations: (a) language, writing, and reading development, (b) maths development (c) deafness or impaired hearing, (d) sight impairment, (e) serious language difficulties or (f) intellectually disability (SFS, 2011, p. 186). This job is more closely tied to teaching and working with individual pupils. It involves advising the teachers of a particular subject. By observing lessons and instructing pupils in small groups or individually, the teacher trained in special needs supports the pupils that need extra help (Ahlefeld Nisser, 2014). Teachers with special needs training teach smaller groups of pupils. The particular situation in each school or municipality can necessitate that both the teachers with special needs training and special educational needs teachers work with pupils individually, carrying out evaluations, and working with parents (Göransson, Lindqvist, Klang, Magnusson & Nilholm, 2015). The following diagram illustrates these differences and the overlaps between the work done by and the teacher for special educational needs and the teacher with special needs training:
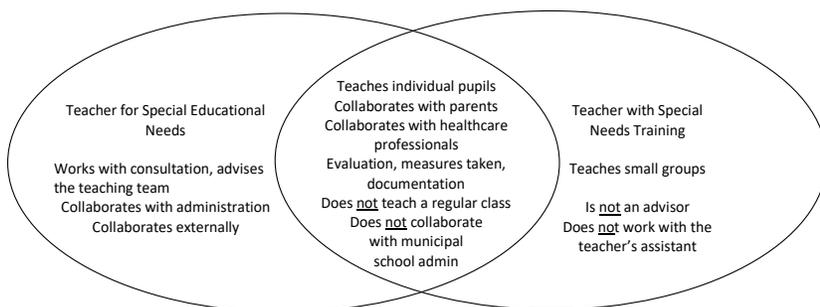
Teacher for Special Educational Needs

Works with consultation, advises the teaching team
Collaborates with administration
Collaborates externally

Teaches individual pupils
Collaborates with parents
Collaborates with healthcare professionals
Evaluation, measures taken, documentation
Does not teach a regular class
Does not collaborate with municipal school admin

Teacher with Special Needs Training

Teaches small groups

Is not an advisor
Does not work with the teacher's assistant

Figure 1. Teacher for special educational needs and Teacher with special needs training (Göransson et al., 2015)

The use of simulation in teacher training

Simulation can be described as a simplified, but nonetheless valid, dynamic model of reality that is meant to make it possible to practice decision making (Sauvé, et al., 2007). Using simulation is a complement to other forms of teacher education, such as lectures, seminars, or micro-teaching that provide training in other skills. Simulation training can in some cases also be the only possible form of training since other practical training would be logistically challenging, ethically dubious, dangerous, or too costly. Badiee and Kaufman (2014) came to the conclusion that there were very few studies of the way simulation is used to develop teaching skills. Svingby (2011) came to the same conclusion when she observed that 75% of teacher education programmes at six Swedish universities did not make use

of simulation for teachers' education. Furthermore, the studies found that 82% of teacher educators and 74% of those studying to be teachers were interested in making challenging situations and dilemmas part of the teachers' education programme. It is, however, not the case that training using simulation per se leads to the development of skills and capabilities. Research has shown that development through simulation results from the simulation having: (a) *adequate content* (Edman Stålbrandt, 2013; Presnilla-Espada, 2014; Samuelsson, 2016), a clear link to educational goals in the form of (b) *didactic framing* (Edman Stålbrandt, 2013; Ragnemalm & Samuelsson, 2016; Arvola, Samuelsson, Nordvall & Ragnemalm, 2018; Samuelsson, 2018) in a context under the supervision of a (c) *skilled instructor* (Dieker et. al., 2014; Sellberg, 2018).

Edman Stålbrandt (2013) studied 14 Finnish and 15 Swedish teacher education students who reflected upon and discussed animated audio-visual simulations about didactic dilemmas. The students worked independently with various case studies, dilemmas that had been generated after conversations with active teachers. Edman Stålbrandt found that sound in the form of teachers' and pupils' recorded voices, was the most important modality for the results of the study and the teacher education students' sense of authenticity. Furthermore, she found that simulating school dilemmas is a valuable resource that constitutes a kind of practice teaching, creating a situation in-between professional life and the academy. Relatively free from distractions and risks, teacher education students are offered the chance to reflect upon and develop perspectives on a teacher's work.

Presnilla-Espada (2014) studied 342 teacher education students who underwent simulation training together with mentors over a period of several years while studying on a teacher education programme. The purpose of this training was to get the students to think and act like actual teachers in the simulated environment, which was similar to the practice teaching that they would later be doing. The teacher education students claimed that it was possible to apply the experiences they had in the simulated environment to actual situations. Presnilla-Espada came to the conclusion that the simulations that were used prior to placement developed the students' pedagogical skills if the educator used well defined learning targets and offered a didactic framing. In addition, it was also important that the students felt that they had control over the lesson and the learning process.

Samuelsson (2016) studied what and how 12 teachers with special needs training and teachers for special educational needs, working in pairs of triads, identified and problematized classroom management in a text-based simulation. He found that the teachers with special needs training and special educational needs teachers had the ability to identify, outline and evaluate in terms of importance, how the simulated teacher performed, what information the teacher shared, what sort of classroom environment the teacher made possible and how much attention the teacher devoted to development of both the individual pupils and the groups. Samuelsson (2016) showed how the teacher education students reasoned out the importance of making it possible for pupils to understand what is expected of them at the beginning of the lesson, among other things

x) I usually write
y) Yes!
x) I usually write on the board
y) Yes!
x) Because I have this sort of pupil too
y) Like that, I sort of sit down
x) Yes, but I have the kind of pupils, I have to write it on the board

Based on their own teaching, these teacher education students raise the notion of how important it is to use other modalities than the spoken word and how important it is to adjust their management of the classroom to the pupils in a particular situation.

Samuelsson also found that students studying to be teachers with special needs training and teachers for special educational needs also had the ability to problematise, which, in his interpretation, requires not only knowledge but also empathy as well as analytic and linguistic competence – in this case relating to simulated content. Problematising required that teachers with special needs training and those for special educational needs challenged one another's understanding and interpretation of situations, which forced them to justify and argue for their own interpretation and understanding.

Samuelsson came to the conclusion that simulation like that which was tested can be used to train students in the ability to observe, a skill that is of great importance in taking stock of a situation and carrying out an investigation. This is something expected of teachers trained in special needs and special educational needs, while at the same time it also highlights the importance of having multiple observations of the same practice.

Dieker et. al. (2014) found that ARC (action-review-cycle) repeatedly helped education students have short virtual interaction with the simulation *TeachLivE*. Education students who had the opportunity to demonstrate and then discuss their own choices and measures obtained a sense of having reflected upon their practice. Interviews with education students who had used *TeachLivE* on their programme showed that virtual interaction contributed significantly to their sense of professional development as future teachers (Floyd et. al., 2013).

Ragnemalm and Samuelsson (2016) studied what is possible to learn with uncomplicated forms of simulation and examined, among other things, whether a hypertext simulation could generate sufficient variation of key aspects to teach education students something essential about classroom management. Twenty-five education students who tested a text-based simulation had the ability to differentiate between: (a) various leadership styles (b) the aspects (c) care, power and influence, as well as (d) the aspect of respect. These are essential parts of a teacher's classroom management (Samuelsson, 2017) around which the content is constructed. From this they came to the conclusion that text-based simulations made it possible for education students to develop their ability to assess and practice rapid responses in relation to their ability to take charge of a classroom. With this type of simulation, Samuelsson (2018) examined which leadership style the education students chose and how this choice could be understood. The results showed that education students related to the content like explorers or pathfinders. Explorers tested various types of leadership styles and were not hesitant to go back and change their mind once or twice based on the reactions or conse-

quences of their first choice. Pathfinders did not change their mind; instead, they moved along in a linear fashion throughout the text simulation. This meant that the amount of time and effort the groups spent on simulation content differed. Regardless of whether they were explorers or pathfinders the education students chose an authoritative leadership style, in which the teacher is in control, but in cooperation with the pupils (Wubbels et al., 2006).

Arvola, Samuelsson, Nordvall & Ragnemalm (2018) found that radio theatre simulation, which was tested by 43 first-year students, 48 third-year students and 38 mentors for education students had a substantial effect on their reflections and understanding but had a weak connection to critical thinking and habitual behaviours. The latter was not at all surprising since the participants only tried out the simulation on one occasion. Regardless of this fact, they observed that interaction before and after the exercise had significance for the development of knowledge, understanding, and reflections concerning classroom management.

Other than one small pedagogical teaching project, in which it was clearly shown that the teacher's/instructor's mind-set and attitude tend to affect education students' estimation of how meaningful simulation is, the influence of instructors on those who make use of simulation training has not yet been studied in a pedagogical context (Arvola, Samuelsson, Stenliden & Nordvall, 2017).

Sellberg (2018) had more robust results when studying how theory and practice are tied together in different phases of programmes taught by the instructors of naval officers. In her studies she identified: (a) a briefing-phase when exercises were introduced and related to learning targets for the group as a whole (b) a scenario-phase when the students practiced in authentic simulators with the support of instructors, and lastly (c) a debriefing-phase in which instructors made general assessments and gave feedback to the group as a whole. It turned out that it was of great importance that the instructor systematically demonstrated what was relevant and irrelevant for a naval officer's knowledge development. It is highly probable this is also the case when training education students.

Collaboration between professionals in schools

For many years every teacher in Sweden was responsible for his or her own lessons. Any collaboration that existed was more of an organisational nature, aimed at themes that applied to all subjects or activities outside the regularly scheduled ones, such as days for playing sports or field trips. With the new primary school curriculum, adopted in 1962, this changed for Swedish teachers. Collaboration became a heading in its own right, under which focus was placed on everyone working together: pupil-pupil collaboration, teacher-pupil collaboration, teacher-teacher collaboration and teacher-parent collaboration.

In 2010 there were once again changes made to the way people work together in schools. An education bill was passed (2010, p. 800) that regulated healthcare for pupils and called for professional collaboration relating to preventative care and health promotion in the form of medical, psychological, and psychosocial support for pupils' basic development as well as the establishment of a good learning environment.

Johansson-Gaimer and Kreitz-Sandberg (2018) found that teachers in general

felt that collaboration with the health team functioned well but they also experienced a lack of follow-up and feedback in cases involving pupils. Among other things, the teachers felt that it took too long to get feedback from the health team and when they finally received it, it was too theoretical and not the practical advice they needed. Most importantly, the teachers desired support in the form of extra resources in the classroom or help with adapting lesson plans for pupils with difficulties (Johansson-Gaimer & Kreitz-Sandberg, 2018).

Current research among effective primary school teachers who have succeeded well in teaching and stimulating the development of their pupils shows that their intention to collaborate are one thing, but reality is another. These teachers report a general lack of time for planning, carrying out, and following up as the reason that collaboration does not work. Instead of collaborating as co-teachers (Friend, Cook, Hurley-Chamberlain & Shamberger, 2010; Friend & Cook, 2016), they often work parallel to one another, side-by-side, and ideally toward the same goal. But not even that is always the case, which becomes clear when pupils who have difficulties (Göransson & Nilholm, 2015) start acting out, demanding attention:

> A boy way back in the corner of the classroom is looking around, discovers the teacher for special educational needs behind him, but doesn't seem to care. He shoves his books to the side so they fall on the floor. The special needs teacher waits a second before she asks him to pick up the books. The sound of books falling on the floor is noticed by the class teacher by the whiteboard at the other end of the classroom. She glances at the boy, who doesn't seem to see her. The teacher remains focused on the class. The boy gets up from his chair and glides in underneath his desk. He sits still for a while and then begins crawling toward a round table used for group work. The special needs teacher seems surprised and looks perplexed. She says the boy's name and asks him to come sit at his desk. The boy gets up and has started for the door when the class teacher reaches his desk. She goes toward him, gets his attention and speaks to him directly, in a way that shows she has control. Her words remind him of the agreement they have. The boy seems to listen but continues to go toward the door. The class teacher spreads her arms wide to stop him and guide him back to his desk. Without speaking, the boy picks up his books and with the teacher's help, he gets back to work. The class teacher leaves the boy and the special needs teacher returns to her position behind him.

This excerpt about a child's resistance could have been an example of teachers working together in the *one teach – one assist* model, which earlier research (Scruggs, Mastropieri & McDuffie (2007) has described as the most common, but this was not the case. The excerpt brings to the fore a common obstacle for co-teaching: time for lesson planning together (Murawski & Lochner, 2011). It illustrates a common situation where the special education teacher functions as the *classroom supporter,* an extra resource for individual pupils (Holmström Wirf, 2013). Beyond this category, Holmström Wirf (2013) also found that there were various expressions used to speak about collaboration between the class teacher and the teacher with special needs training / teacher for special educational needs that took place in- and outside the classroom: (a) backboard, (b) classroom colleague, (c) collaborator, (d) time-planner, (e) dispatcher, and (f) surveyor.

These days teachers with special needs training or teachers for special educational needs don't always work together with the class teacher to ensure inclusive lessons. One second-grade teacher was working with a recreation instructor who served as a classroom colleague during some of the weekly lessons.

> While all of the 23 pupils were working with various parts of the maths lesson, which was adapted according to their ability, the class teacher and the recreation instructor went around to pupils who had raised their hands and asked for help. When they went to a pupil they asked what he or she needed help with or what the pupil was having difficulty with. Depending upon which pupil it was, they used different approaches. If it was a pupil who was off-task but actually able to manage the task, the pupil got rather direct and precise advice as to how to find his or her way back to the task. If it was a pupil who was having difficulty understanding the task, then they asked questions and, in this way, invited the pupil to explain what it was that he or she didn't understand or couldn't manage to do. Then they looked at the pupil's calculations together. At the same time, they posed new questions to the pupils that had the purpose of supporting them and helping them put into words how they were thinking about the next step. Both the recreation instructor and the class teacher stayed by the pupils while they worked on some more problems to ensure that they had understood the instructions.

This excerpt shows that the class teacher and the recreation instructor had agreed upon similar approaches that would give the pupils confidence by creating a routine. Their accommodating style and the extra attention provided all the pupils with the sense that the maths lesson was a shared concern for both the pupils and adults in the classroom. Right from the start of term, the class teacher devoted a great deal of time and energy to establishing and then maintaining a secure atmosphere for all the pupils. Differences among the pupils during the lesson were accepted and no one was stigmatized or marginalized because they had difficulties. This attentiveness on the part of the teacher and the recreation instructor meant that there was just as much interaction with these pupils as there was with the other ones, which has not always been the case, according to previous research (Colnerud, 1998; Göransson & Nilholm, 2015). This also meant that within an accommodating framework, the teacher and the recreation instructor tried to treat everyone equally, based upon a democratic perspective on participation, making it possible for pupils with difficulties to accept others, for the pupils themselves to be accepted, and in this way for them to have a sense of belonging in the class that is grounded in collaboration and discussion (Haug, 1998).

Didactic strategies to promote inclusive education

One way of providing support for pupils with difficulties in maths is called 'response to intervention' (RTI). This is a method that was developed in the United States in the first decade of the new millennium. It is aimed at early detection of pupils who need extra help (Johnson, Mellard & Byrd, 2005). It is a pupil-centred

model that makes use of problem-solving and research-based methods to identify and help pupils who are at risk of not fulfilling knowledge requirements (Johnson, Mellard, & Byrd, 2005). What is characteristic for RTI is that: (a) intervention is research-based and it intensifies and adapts to each pupil's specific needs (b) the pupil is tested during the intervention so that his or her development is well documented (c) the pupil is offered adequate opportunities to develop with the help of intervention and (d) there is follow-up after the intervention to respond to the pupil's needs in the best way possible (Bender & Shores, 2007). This method is designed both for pupils with difficulties in reading and writing as well as for those with difficulties in maths (Bradley, Danielson & Doolittle, 2005). We will limit our discussion to maths and exemplify the method through descriptions of ways one can help pupils with difficulties in that subject.

There is a three-stage process through which RTI is implemented. In the first stage, all the pupils participate in lessons that research has shown to be successful in helping them develop skills and capabilities that are the aim of the lesson content. All the pupils are repeatedly tested during this period that lasts at the most eight weeks. The tests are designed to identify pupils who have not gained knowledge at the expected rate. The tests can either be: (a) standardised tests such as national tests or (b) tests that are designed with criteria that can measure knowledge development in pupils during this period. At the end of the eight-week period, pupils that do not measure up to the expected knowledge development are selected to go on to the next stage.

In the second stage the pupils receive adapted instructions as a group. The lessons intensify and are based upon their achievement in the first stage. In one study the first-grade pupils received extra exercises in simple addition and subtraction problems over a period of 23 weeks. The results showed that the pupils who were selected to go on to the second stage succeeded in catching up with their classmates and had reached a satisfactory level after the 23 weeks (Bryant, Bryant, Gersten, Scammacca & Chavez, 2008).

The pupils who did not respond well enough to the second stage of the intervention are plucked out to go on to the third stage. In stage 3 the intensity of the exercises increases and what is being practiced is adapted for each pupil's needs. The lessons can take place in smaller groups or in a one-on-one tutorial with a teacher trained in special needs. (Berkeley, Lindsay, Peaster & Saunders, 2009).

In Sweden, at Linköping University, a study is being carried out in which fifth- and eighth-grade pupils are participating. The purpose of the study is to investigate two different models of maths exercises meant to help pupils become faster and more confident at coming up with answers to addition and subtraction problems using the numbers between 0-20 and to multiplication problems using the numbers between 0-100. The two models involve either simply memorizing the answers or practicing with the goal of increasing the conceptual comprehension of numbers.

There are studies that point to the fact that if conceptual comprehension improves, the pupils become more confident and faster at coming up with the answers, what is called *fluency* (see, for example, Fuson, 2003; Star & Madnani, 2004). The studies begin by testing the pupils to see how well they have achieved automatic recall of number combinations in addition, subtraction and multiplication. Those who cannot do this as well as expected go on the second stage, in

which they practice this in two ways: (a) by memorizing number combinations and (b) by practicing with visual aids. What can be seen up until now after the tests have been carried out is that fewer pupils than expected have automatic recall of number combinations, which has the consequence that a larger group than expected will go on to the second stage. The pupils remain in the same class and participate in the regular lessons, but during part of the lesson they practice with help of adapted computer programmes.

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