Design, Development and Implementation of Inclusive Education

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ABSTRACT In inclusive education different pupils, including pupils with special educational needs and high ability pupils, can be stimulated to learn according to their capacities and potentials. The research question concentrates on the design features of inclusive education that will optimally promote the motivation and learning processes and outcomes of all pupils, and how relevant changes can be developed and implemented in educational practice. A model of guidelines concerning 'multilevel contextual learning theory’ was expected to aid in designing psychologically appropriate learning processes and motivating educational, organisational, and managerial characteristics and procedures for all pupils. From 2003 to 2005, a pilot in which researchers and teachers collaborated was carried out in three Dutch pre-schools. Initial findings resulted in the development of a prototype of a pedagogical-didactic kernel or competence structure and a prototype of Internet-based software. Using these results, the screening of children’s entry characteristics by infant day care teachers, parents, and pre-school teachers was developed and implemented in practice. Construction and use of diagnostically based instructional, playing and learning procedures were first based on the screening results. The pre-schools differed much in rates of development and implementation. It is concluded that the proposed approach to the design, development and implementation of inclusive education that was applied seems promising in realising desired progress with pupils in early educational practice. However, policy and financial support are necessary to make more progress.

Introduction

In many countries, specific instructional or organisational provisions are created for children with special educational needs such as some kind of disability or lack in the area of cognitive, social, physical, or motor development (Organisation for Economic Cooperation and Development [OECD], 1997). On average, 2% of all pupils in European countries are educated in special schools or special classes (Meijer et al, 2003). Meijer et al grouped European countries into three categories according to their policy with regard to inclusion of pupils with special educational needs (SEN). First, in the ‘one-track approach’, almost all pupils are included in mainstream education. Second, in the ‘two-track approach’, two distinct education systems exist: the mainstream school system and the special school system. In this case SEN pupils are usually excluded from mainstream education and placed in special schools or special classes. In the third, ‘multi-track approach’, various services between mainstream and special education are provided.

Meijer et al (2003) also showed that different SEN definitions and categories are used across European countries. Most countries distinguish six to ten types of special needs. Trends in European education illustrate that countries with a two-track approach are moving towards a multi-track system, offering a continuum of services between the two approaches. There is a focus on inclusion of SEN pupils in mainstream schools (cf. also Meijer, 2003). Simultaneously, special schools are developing into resource centres to support mainstream schools with regard to the provision of education for SEN pupils. This means contributing to professional development, the development and dissemination of materials and approaches to support pupils as well as teachers,
Design, Development and Implementation of Inclusive Education

and providing short-term or part-time help for individual pupils (cf. also Watkins, 2003; Duru-Bellat & Suchaut, 2005).

A concrete example is the situation in the Netherlands. In line with international movements, the Dutch Government promotes inclusive education in mainstream schools. This policy is based on the belief that SEN children should be given the opportunity to participate in mainstream schools. Governmental directions were specified with respect to the diagnosis of disabilities, based on the use of specific instruments and specified norms. These specifications also clarify which psychological phenomena have to be recognised and included in the diagnosis, to result in a budget allocated to an individual SEN pupil.

An important question is whether mainstream schools are indeed able to provide education to SEN pupils or, in other terms, to function as inclusive schools. Empirical Dutch results show that in 2002, 10 years after the start of the operation, the percentage of pupils in separate schools added up to 5.2% of all pupils, which turned out to be exactly the same proportion as in 1992 (Smeets, 2004). This indicates that efforts to include a larger percentage of SEN pupils in mainstream schools have failed until now and that other types of efforts are probably needed in the process of establishing mainstream schools that cater also for the needs of SEN pupils (cf. also National Conference of State Legislatures, 2005).

Another point should be added, however, with respect to a second group of pupils who are developmentally ahead of most of their peers. Such highly able or 'gifted' pupils may experience motivational, cognitive, and social problems in education as a result of having to work below their potential with the result that they underachieve (cf. Durkin, 1966; Butler-Por, 1987; Mooij, 1992; Lloyd, 1999; Hoogeveen et al, 2005). In the long run, this forced underachievement may cause serious personal problems, including school and societal failures (Colangelo et al, 2004).

Parallel to the problems of SEN pupils, those of highly able (HA) pupils in mainstream education seem to be based in the 'yearly grading system' in which educational evaluation and achievement norms reflect the pupils' mean performances in various school subjects. Generally, SEN pupils perform much lower and HA pupils perform much higher than their peers on one or more areas of competence in school. Both 'extreme' categories of pupils therefore run a clearly higher risk than other pupils of experiencing that their school functioning is evaluated as not adequate. With both SEN and HA pupils this may cause demotivation and activate disturbing or aggressive behaviour, or lead to final drop-out (cf. Garnier et al, 1997; Loeber & Farrington, 2001).

From pedagogical, social and budgetary points of view, then, it may seem desirable to integrate the various pupils in 'inclusive education'. However, from learning, motivational and school career perspectives, specific conditions have to be fulfilled in order to realise the pedagogical and social goals in ways that really promote the learning and motivation processes and outcomes of these seemingly 'opposed' SEN and HA target pupils. In this respect specific conditions and processes at different levels of analysis seem necessary in order to design inclusive education in such a way that it will optimally fit the various needs of all pupils.

Theoretically, inclusive education should improve different types and levels of motivation and learning achievement, and prevent traditional system-based problems both in and outside school (cf. also Cronbach, 1983; Collier, 1994). Only in developing and implementing these design features in educational practice, however, can we evaluate and determine whether the effects with pupils in the inclusive education system are 'better' than in the former mainstream and special systems. Pupils, their teachers, other practitioners, parents, but also educational designers, scientists, and policy makers all have to know whether the proposed educational changes or interventions really lead to the anticipated positive effects with the two target groups. Therefore, our question for research is twofold: (a) what are the design features of inclusive education that will optimally promote the motivation and learning processes and outcomes of all pupils, including SEN and HA pupils; and (b) how can relevant changes be developed and implemented in educational practice?

To answer the first question, we focus on some of the ongoing changes with respect to Dutch mainstream and special education at multiple levels. We then introduce theoretical guidelines which constitute a general model meant to improve multilevel contextual learning processes and effects. In using this model, systemic improvement can be located in preventative screening or diagnostics and consequent instructional differentiation at multiple levels, to match the various learning characteristics of the pupils actually present in class. The guidelines also specify features of
Internet-based information and communication technology (ICT) to support the integration of pedagogical-didactic information, evaluation, and management of learning in and outside schools.

To answer the second question, we concentrate on user-based development and implementation of inclusion characteristics and procedures in early educational practice. In a three-year pilot during 2003-2005, we collaborated with pre-school teachers in three Dutch pre-schools to develop and implement some characteristics of pre-school inclusive practice. The resulting practice changes illustrate the system improvement that may become possible by further implementation of the multilevel contextual learning guidelines. Finally, we discuss organisational, policy and budgetary conditions that seem necessary to further develop and implement inclusive education.

Design of Inclusive Education


In the course of the twentieth century, Dutch mainstream and special education facilities were constituted as relatively separate educational systems. A two-track system evolved, with special schools that were rapidly expanding. The SEN target group of pupils was, and still is, not properly defined, however. It includes children with attention deficit hyperactivity disorder (ADHD) (cf. Cooper & Ideus, 1996, 1998), autism, dyslexia, as well as children with mild learning disabilities or behavioural difficulties, and children with severe learning or behavioural disorders. The Dutch Inspectorate of Schools, for example, considers pupils in mainstream schools with an individual education plan (IEP) to be SEN pupils. Van Dijk et al (2003) defined SEN pupils as those who need considerably more care and attention than the other pupils in the same group. Estimates are that 20% of the pupils in mainstream primary schools have special educational needs (Algemene Rekenkamer, 2005). Primary school teachers feel that, on average, 30% of their pupils require considerably more attention as compared to the others in class (van Dijk et al, 2003).

As for the larger part of the SEN target group, i.e. pupils with relatively mild disorders, whether or not a pupil is considered to have special educational needs is predominantly determined by the school or the respective teacher. The criteria that were developed for the diagnosing of special needs in order to benefit from additional funding do not apply to these pupils, so their needs have to be met within the available regular budget. This also applies to HA pupils. For a smaller part of the SEN pupil group – those with severe learning disabilities, behavioural disabilities and/or handicaps – additional facilities may be obtained on condition that their disabilities are officially diagnosed and recognised (the ‘Statement’ of needs in the United Kingdom).

The Dutch Government obliges mainstream and special schools to collaborate in regional clusters and – simultaneously – allocates financial resources to these clusters. This approach stimulates the flexibility of response by the organisational and curricular structures of the education system in which the schools operate (cf. also Evans et al, 1999). Typically, a regional cluster consists of about 28 mainstream schools and one or two special primary schools (Smeets & van Gennip, 2004). Within almost all mainstream primary schools, ‘special educational needs coordinators’ (SENCOs) have been appointed. SENCOs are responsible for the system of pastoral care, the support of teaching staff, and the contacts with external experts as well as with parents of SEN pupils.

The policy of regional or community authorities also relates to facilities for youth, including social work and health care, as well as funding of schools directed to disadvantaged pupils, i.e. pupils of low socio-economic status, from ethnic minority groups, or whose parents are low-educated. This policy also affects the activities and funding of youth care organisations. Such organisations are expected to give support to schools, in order to prevent the increase of behavioural difficulties of pupils. Important institutions in this respect are the Youth Care Agency, Social Welfare and Youth Health Care. These institutions may participate in Youth Care Advisory Teams that meet in schools or may be consulted by schools, and provide advice to teachers with regard to pupils at risk.

Typically, a Youth Care Advisory Team consists of representatives from Youth Care, Youth Health Care, a remedial educationalist from a School Support Service, and the school’s SENCO. These teams provide advice to school staff and in some cases to parents; the teams may provide short-term support to parents or pupils, or they may refer pupils for support to care organisations.
Design, Development and Implementation of Inclusive Education

(Bosdriesz & Berkenbosch, 2003). Another type of support to the mainstream schools comes from a school social worker, who may provide a link between the school and youth care agencies and between the school and parents (Smeets & van Gennip, 2005; see also Maras, 2005).

Although the national, regional and community policies with respect to schools yield many collaboration processes between schools and between schools and other institutions, the development of inclusive education encounters many problems. Regional and many organisational characteristics of mainstream schools and schools for special education have changed during the last 10 years, but the diagnostic and related instructional procedures for both SEN and HA pupils are still relatively unclear, unrelated, and not timely. Van der Leij et al (1998) developed a scheme for a system of detecting, diagnosing and remedying problems, but a systemic relationship with learning materials or procedures seems to be lacking. In addition, the expertise of parents regarding their own child is of considerable importance to school staff in meeting special educational needs of pupils (cf. Wolfendale, 1992), but this expertise does not seem to be integrated systemically. The importance of the attitudes and roles of teachers and school principals in the required innovation processes is acknowledged (cf. Guzmán, 1995; Doyle, 2002; Fullan, 2002; Meijer, 2003), but a systemic bottom-up construction of inclusive education based on pupils’ early characteristics and learning processes is not yet provided for. Desired results with pupils are still lacking, as noted above.

Modelling Three Types of Contextual Conditions

Differentiation of learning procedures and materials. From a systemic point of view the pedagogical-didactic, diagnostic, psychological, learning, registration, evaluation and organisation functions of education should be integrated early, and smoothly, to serve all pupils from the start of their schooling. Therefore, the development and implementation of inclusive education for mainstream, SEN, and HA pupils requires a comprehensive redesign and transformation of education. This redesign first of all requires the adequate differentiation of learning procedures and materials, to better support and integrate individual or small groups of exceptional pupils (cf. also Bennathan & Boxall, 1996; Nadolski et al, 2001; Merrill, 2002). Central to this process is the linking of diagnostic but curriculum based concepts and their flexible relationships with the diversity of motivation and learning processes and outcomes of individual pupils or different groups of pupils.

A main concept to order such a comprehensive differentiation is Pedagogical-Didactic Kernel Structure (PDKS). Mooij (2004) used this concept to denote the overall hierarchical structure of competence domains which is characterised by normed tasks and activities to assess associated levels of competency. A PDKS represents concepts and subconcepts from different disciplines, with normed and criteria based indicators from different competence domains. The database of the structure informs educators, parents and pupils, and other professionals involved, about age-related performance levels and other indicators of learning progress (cf. Doolaard et al, 2002). In this respect a PDKS can be compared to most monitoring systems. However, identification and structuring in the PDKS serves more functions in actual practice, i.e. flexible grouping of individual or small groups of pupils and teachers or coaches, assignment of specific learning activities, and specific evaluation processes.

Both target groups of SEN and HA pupils can then be integrated at different educational levels. The relevance of this feature is demonstrated by, for example, van Eijl et al (2005), who reviewed materials and procedures for HA pupils in elementary and secondary education. These authors could not link the HA materials and procedures to mainstream education, however, which would be of great practical value to pupils, teachers and parents. In the framework of a PDKS this linking seems possible and the resulting information could support pupils, teachers, schools and communities or regions with comparable activities or programmes throughout the country. This is the more important as, generally, development or implementation of special educational facilities for HA pupils is not provided with extra funding.

This differentiation condition was elaborated with respect to diagnostic, instructional, managerial and systemic (DIMSS) aspects of learning (Mooij, 2004, in press). The specification resulted in a set of five guidelines concerning differentiation of learning procedures and materials, reflecting a first part of a model as given in column 2 of Table I.
Table 1. Model of guidelines of multilevel contextual learning theory.

<table>
<thead>
<tr>
<th>Learning aspect (DIMS)</th>
<th>Type of contextual condition</th>
<th>Improvement of development and learning progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differentiation of learning procedures and materials</td>
<td>Design and use of integrating ICT support</td>
<td>3.1. Use a learner's entry characteristics to assign instructional (sub)lines</td>
</tr>
<tr>
<td><strong>Diagnostic</strong></td>
<td>1.1. Identify a pedagogical-didactic kernel structure with competence (sub)domains</td>
<td>2.1. Facilitate construction and use of a pedagogical-didactic kernel structure</td>
</tr>
<tr>
<td></td>
<td>1.2. Structure competence (sub)domains into (sub)skills and instructional lines</td>
<td>2.2. Facilitate structuring, transparency, and flexible use of instructional lines</td>
</tr>
<tr>
<td></td>
<td>1.3. Include psychometrically valid indicators to evaluate learning progress</td>
<td>2.3. Facilitate individualised instruction, collaborative learning, and self-regulation</td>
</tr>
<tr>
<td><strong>Instruction</strong></td>
<td>1.4. Organise and match flexible groups of learners and teachers/coaches</td>
<td>2.4. Facilitate multilevel organisation and differentiated evaluation of learning</td>
</tr>
<tr>
<td><strong>Management</strong></td>
<td>1.5. Use integrated systems for monitoring, evaluation, and administration</td>
<td>2.5. Integrate instruction and learning in different contexts, in longitudinal designs</td>
</tr>
<tr>
<td><strong>System</strong></td>
<td>1.6. Facilitate construction and use of a pedagogical-didactic kernel structure</td>
<td>3.1. Use a learner's entry characteristics to assign instructional (sub)lines</td>
</tr>
<tr>
<td></td>
<td>1.7. Structure competence (sub)domains into (sub)skills and instructional lines</td>
<td>3.2. Create and control pro-social relationships in and around school</td>
</tr>
<tr>
<td></td>
<td>1.8. Include psychometrically valid indicators to evaluate learning progress</td>
<td>3.3. Use collaborative didactic procedures to support learners' self-regulation</td>
</tr>
<tr>
<td></td>
<td>1.9. Organise and match flexible groups of learners and teachers/coaches</td>
<td>3.4. Concentrate teacher coaching on those learners who most need this</td>
</tr>
<tr>
<td></td>
<td>1.10. Use integrated systems for monitoring, evaluation, and administration</td>
<td>3.5. Use multilevel indicators to improve instruction and learning progress</td>
</tr>
</tbody>
</table>

**Design and use of integrating ICT support.** Adequate design and use of supporting ICT greatly enlarges the theoretical and practical potentials for improving education, which of course has to be demonstrated in practice (see Sinko & Lehtinen, 1999; Blumenfeld et al, 2000; Kemp, 2000; Mooij, 2002). Closely related to the first type of condition, then, the design and use of integrating ICT support implies a second main type of condition which can help to diagnose, enable, or evaluate various instructional or learning processes. ICT can, for example, connect a normed conceptual reference structure (e.g. PDKS) at the national level while related competencies integrated in instructional sets or activity lines are used or measured with individual pupils or groups of pupils in psychometrically reliable and valid ways. ICT can then assist in providing assessment and management of individual or group learning progress in different instructional or organisational contexts, at multiple levels.

As illustrated in the third column of Table I, Internet-based software can be designed and created to support relationships between pedagogical-didactic or diagnostic, instructional and managerial information across different types of situations, for example, at home, at school, or at a youth health organisation. The same software can also provide links and diagnostic feedback to each learner, a small group of learners, or a broader group of learners either in or outside school, to support collaborative learning or self-regulation in learning. Moreover, longitudinal progress or portfolio information can be linked to others such as parents, other coaches, school management and school administration, or researchers.

**Improvement of development and learning progress.** A third type of condition implies systemic improvement of development and learning progress (see column 4 of Table I). This improvement can occur by realising conditions that promote the multilevel learning processes of individual learners and groups of learners. For example, use of a learner's entry characteristics to assign play materials or instructional (sub)lines just above the actual achievement levels is important to stimulate pupils adequately (Bennathan & Boxall, 1996; Walker et al, 1998). Moreover, creation and control of pro-social relationships in and around school is necessary to build and maintain constructive learning processes, both individually and in small groups of learners (Alschuler, 1980).
Instructionally supported collaboration between pupils in small groups is another condition that may enable more motivating and more self-regulated learning processes and outcomes. This approach also requires the matching of specific curricular contents to organisational procedures (see also Kirschner, 2002). In a European study focusing on effective inclusive classroom practices (Meijer, 2003), the main approaches found in classes with SEN pupils were: cooperative teaching; peer tutoring (pupils assigned to homogeneous or heterogeneous ability pairs or small groups while pupils give feedback to each other); collaborative problem-solving programmes (pupils are asked to solve problems together in a climate of shared responsibility); and curriculum-based measurement (CBM) (pupils' progress is monitored and stimulated using a computer programme based on different types of tests).

Moreover, collaboration between pupils may enable the teacher or coach to give more support to the pupils who need this help most. This of course depends on the pupils actually present in class. SEN and HA pupils differ considerably with respect to their initial level of development or learning, magnitude of relevant learning steps, the degree of self-regulation during learning, and the use of meta-cognitive strategies (Bearne, 1996; Kerry & Kerry, 1997). SEN pupils generally need much more learning support than HA pupils, but this difference can be very detailed e.g. restricted to only one competence area or school subject. Given the potentials and capacities of HA pupils, Colangelo et al (2004) and King et al (1985) made clear that curricular contents, didactics, coaching, and evaluation processes of HA pupils differ radically from those for SEN pupils. Inclusive education should therefore use the various interests, learning characteristics and learning potentials of pupils to create a common but very differentiated multi-level structure, to organise and improve learning processes and effects for different types of learners, across different types of situations.

**General model and hypothesis.** It is assumed that, when operating together, the three types of contextual conditions assist to improve pupils’ learning processes and effects in a systemic multi-level way. The combination of conditions and learning aspects generates a structured set of guidelines which conceptualises a general model of a multi-level contextual learning theory: see Table I. The relevance of the model is to clarify how pedagogical, psychological and educational responsibility is demonstrated when, from the beginning, all young children are supported in a secure environment at home, at pre-school, and at school (cf. also Bogenschneider, 2002). It is expected that pupils learning according to these conditions will do better than pupils in traditional education; the difference will be most pronounced for SEN and HA pupils.

**Method**

Recent methodology supports a strategy in which users, for example teachers, school staff and parents, collaborate with researchers and other specialists to raise the quality and validity of educational innovation processes (Clark & Estes, 1999; Kensing et al, 1998; Blumenfeld et al, 2000; Remillard, 2000). Wilson (1999) expected that so-called use-oriented strategies ‘increase the likelihood of successful implementation because they take the end use into account at the beginning design stages’ (p. 13). In line with this methodology, the further specification and implementation of a concept of a PDKS and the relevant diagnostic or evaluation characteristics, learning materials or procedures, and corresponding instructional lines for different types of learners, had to be worked out in close collaboration with teachers, pupils, parents and management in school practice.

For this reason a pilot study was planned in three Dutch pre-schools for children aged four to six, from 2003 to 2005. The pre-schools were located in two middle-sized cities in the eastern part of the country. Pre-school A contained six classes with pupils from relatively higher level family or socio-economic status (SES) backgrounds; pre-school B had four classes but pupils from more heterogeneous backgrounds; and pre-school C was a recently founded school in a new suburb which began with some five pupils. In the Netherlands, pre-school for pupils aged 4-6 is organisationally integrated with elementary school for pupils aged 6-12. Within pre-schools A and B, facilities for teachers participating in the pilot were about half a day of development and
implementation time per week. In pre-school C, the pilot teacher was also functioning as a SENCO and was facilitated for about two days a week.

The researchers first constructed a prototype of a pedagogical-didactic or competence kernel structure (PDKS) and a prototype of ICT as indicated in Table I. Next, while using these prototypes, the pre-school teachers and researchers collaborated closely to design, develop, and implement specific practice features of an educational system according to the guidelines in Table I. In this process, intermediate results were tried out in classes and the relevant experiences were used to improve the next development and implementation steps.

Results

Prototypes of Competence Structure and Supportive ICT

In 2003, the researchers developed a prototype of a PDKS which resulted in a set of seven more-or-less hierarchically structured competence domains and sub-domains. Integrated within the PDKS, individual education plans can be drawn up for SEN or HA pupils in the form of instructional lines from their commencement in pre-school (cf. also Raver & Zigler, 1997; Tod, 1999). The PDKS prototype reflects a multidisciplinary, integrated classification based on measurable skills and subskills, if possible based on reliable and valid instruments. The seven domains contain skills and subskills with respect to subsequently:

1. language;
2. general cognition;
3. social-emotional performances;
4. mathematics;
5. physical-medical aspects;
6. general psychological characteristics; and
7. motor activities.

In relation to the functioning of the PDKS and corresponding instructional lines, a first prototype of Internet-based software was developed by the researchers in 2003-2004 (see guidelines 2.1-2.5 in Table I). Because of the diagnostic, instructional, managerial, and systemic (DIMS) functions of the software, this prototype was named DIMS (cf. http://www.dims.nl). The prototype of the PDKS was integrated in the DIMS prototype. With the aid of DIMS, a teacher is, for example, able to order specific concepts in a competence domain, to insert and order pictures of specific learning materials and activities, and assign different activities to different learners. An example of the structuring of concepts in the language competence domain is given in the screen shot in Figure 1. From left to right, the rectangles in Figure 1 illustrate that visual analysis influences discrimination (reading); both visual discrimination (reading) and auditory discrimination (reading) affect connecting sounds and letters (reading); and so on.

This conceptual ordering reflects learning processes common to most of the pupils. However, SEN pupils may require much more exercise and more refined diagnostics on these issues, whereas pupils gifted in the cognitive or language area may learn these language processes without any school assistance (cf. Mooij, 1999; Colangelo et al, 2004). HA pupils can then move on to higher-level language learning processes to encounter really challenging learning tasks or activities. To handle this individual support where indicated, the software prototype allows for an overview of the content of an instructional line, or variants of an instructional line, at a specified level of difficulty. Examples are given below. Furthermore, administrative information about a pupil or teacher can be included.
Figure 1. Part of the PDKS: language competence domain, some first concepts.

Screening of Entry Characteristics in Pre-school

Pre-school teachers and researchers looked for an instrument to measure relevant entry characteristics of the four year-old children (see guideline 3.1 in Table I). Most suitable was an instrument using a psychometrically controlled screening procedure developed in longitudinal research with 966 children of about four years old (see Mooij, 2000). This questionnaire can be administered on several occasions around the intake in pre-school: by an infant day care teacher when the child is about to leave infant day care; by the parents at the child’s intake into pre-school, and by the pre-school teacher after the child’s first months in pre-school. To indicate the child’s level of competency in a specific area, the observers compare the child’s behaviour with that of his or her peers. All in all, seven competency areas are assessed in the questionnaire. The behaviour categories and the corresponding scale means refer respectively to:

1. social interaction / communication;
2. general cognition;
3. language proficiency;
4. pre-arithmetic proficiency;
5. emotional-expressive competency;
6. sensory-motor competency;
7. expected educational behaviour.

This screening procedure was implemented in the DIMS prototype in the course of 2003. It was then used by the pilot pre-schools, parents, and some pre-school infant day care teachers collaborating with the pre-schools, in particular pre-school C. With respect to each of the three perspectives – infant day care, parent, pre-school – a child’s behaviour scores and diagrams can be requested. The scores may represent scale or item results. Scale mean or heterogeneity scores and scale mean diagrams represent, for example, the child’s mean behaviour rating as perceived by the infant day care teacher, the parents, or the pre-school teacher, the comparison with national norms, or the comparison with the mean of all pupils in class. If one or more of these scores is extreme on one or more of the response categories, this may be a sign for detailed communication and, if desired, further diagnostics. In the period 2003-2005, the entry characteristics of children in the three pre-schools were screened 357 times by either the infant day care teacher, the parents, or the pre-school teacher: see Table II.
Table II. Numbers of completed screening questionnaires in DIMS, by type of observer and year.

<table>
<thead>
<tr>
<th>Observer Type</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant day care teacher</td>
<td>0</td>
<td>28</td>
<td>9</td>
<td>37</td>
</tr>
<tr>
<td>Parents</td>
<td>18</td>
<td>69</td>
<td>52</td>
<td>139</td>
</tr>
<tr>
<td>Pre-school teacher</td>
<td>42</td>
<td>51</td>
<td>88</td>
<td>181</td>
</tr>
<tr>
<td>n per year</td>
<td>60</td>
<td>148</td>
<td>149</td>
<td>357</td>
</tr>
</tbody>
</table>

Prototypes of Instructional Lines and their Functioning

One of the possible outcomes of the screening procedure can be that, for an HA child, play and learning activities have to be provided on a much higher level than is the case for his or her peers. With respect to SEN children the opposite is at stake. An example of this last situation is illustrated in the screen shot in Figure 2. Use is made of a diagnostic social-emotional behaviour test (Bleichrodt et al., 1994) which is relevant throughout pre-school and elementary education. The concept to the left represents one of the normed concepts integrated in the PDKS. Pre-school and elementary school teachers of school A connected this concept to five social training activities available in the social-emotional curriculum, to be used in a small group of pupils. These five activities are followed by either a direct repetition of the same test or by another training activity and then the repetition. If the repetition result indicates that the degree of progress is not sufficient, the whole process is either repeated or followed by another set of learning activities or training: see Figure 2.

Figure 2. Example of an instructional line, using the PDKS and teachers' curricular choices.

This example of an instructional line (see guidelines 1.2-1.3 in Table I) clarifies how teachers can use the PDKS and DIMS prototypes to assist their teaching: Teachers are completely free to make their own choices in daily practice. The combination of PDKS and DIMS enables teachers to prepare and store instructional lines for one or more pupils in whatever form, and to use them at any time and place (see guidelines 1.4-1.5). Pupils can work on these assignments at desired times and places. Moreover, DIMS can suggest follow-up activities based on foregoing levels or results (cf. guidelines 2.1-2.5). Within the learner interface, a pupil is shown the materials he or she had been working with the previous time. It has to be noted, however, that the pupils usually play or work with the real three-dimensional materials that are available in or around the classroom, and not with their digital representation on the computer. This feature seems to suit pupils of this age best, and it also overcomes constraints with computer access (cf. Mooij, 2002).
Design, Development and Implementation of Inclusive Education

Differences in Pre-school Practice

At first, the pre-school teachers practised the most relevant characteristics and working procedures of instructional lines without using DIMS. In doing this, they also tried to create and stimulate a pro-social pedagogical climate within and between small learning groups in class (see guidelines 3.2.3 in Table I). This aspect was addressed in the specifications of concrete collaboration between pupils during instructional or play processes, and in the mutual control of conduct between pupils. This became visible in drawings and related texts on the wall in classrooms and corridors, and so on. However, in the course of 2004 and 2005, differences between pre-schools in development and implementation with respect to the design and use of instructional lines in practice became more and more apparent. Several aspects seemed to play a role here.

In pre-school A, the principal was a former teacher who had collaborated in an earlier school innovation project. In this (pre-)school he had to coordinate and manage traditional and strictly organised school practices. Although ‘unfreezing’ this pre-school with the support of the teachers was no easy task, he carried it out rather well. However, the new Dutch national educational policy of encouraging school managers to find sponsors or extra funding for additional or innovative school activities represented a barrier to full participation in the present project. The principal succeeded in getting extra funding for other goals. The pre-school continued to be very interested in the project, but the ‘problem’ was that this project did not raise extra money. This fact slowed down the relevant development and implementation activities.

In pre-school B, the two participating teachers collaborated well with respect to the screening of entry characteristics. However, they were not able to engage actively in the design and use of instructional lines. Moreover, their principal was not really involved and the pre-school as such was acting rather passively in the project.

The number of pupils in the newly established pre-school C grew from five in 2003 to more than 170 pupils by the end of 2005. The SENCO who participated in the project was very capable in developing and implementing the pedagogical-didactic concepts in pre-school and elementary school practice. She had received extra facilities from the school board, to inform other schools or institutions about the activities. The (pre-)school gradually became well-known as the pedagogical-didactic principles were integrated smoothly from the screening of entry characteristics until the end of elementary education. That is, work with variants of instructional lines and diverse small groups of pupils, independent of the pupils’ age, was taking place with each pupil. For this reason, the school attracted a lot of visitors, including the Minister of Education, Culture, and Science. This interest did not, however, result in any budgetary support for the project. Here the same thing occurred as in (pre-)school A, that is that much attention of school managers and the school board was spent on raising extra funds for the school, which were then spent on other related objectives. Moreover, because of national and regional policy changes aiming at the collaboration between educational and youth care institutions, the school manager and board gave much attention to meetings with other school managers, school boards, and other educational or youth institutions. This did not, however, lead to concrete results with respect to school development.

To conclude, the use of instructional lines was realised in (pre-)school C in particular, but this school did not actually use DIMS to assist the instruction, evaluation, or registration of pupils. The main reason was that – as long as the number of pupils was small – no problem existed with respect to the handling of information about pupils. But at the end of 2005 the teachers discovered that, as had been pointed out before by the researchers, the growth in the number of pupils could represent a turning point. The dilemma was now felt clearly by the SENCO: either involving a kind of supportive ICT system, or slowing down with the use of instructional lines because of a fast increasing number of pupils.

Evaluation

With respect to the screening procedure of entry characteristics, the pre-school teachers first had to be coached to become familiar with the meaning and relevance of the different perspectives in scoring. Moreover, they had to become experienced in using and interpreting DIMS in screening and applying the procedure with the parents in particular. However, once used to the ins and outs of the procedure, both pre-school teachers and parents gave positive feedback about the
instrumentation and procedure. According to the pre-school teachers, the screening helped both parents and teachers in getting a clearer view of a child's entry characteristics. Moreover, the common frame of reference facilitated communication about the pupil and the coordination of further development and learning processes, both at home and in pre-school.

In addition, the outcomes helped the pre-school teachers to better assign specific playing or diagnostic and learning activities to the pupils, as a basis to further pedagogical and didactic support. If present, actual or potential risk characteristics received more preventative pedagogical attention, if necessary by youth health specialists (e.g. speech specialist, psychiatrist) from outside pre-school. The teachers also discovered that the amount of learning and playing materials needed to be extended in order to take care of the initial levels of competence. The differences between pupils were generally larger than was accounted for in the existing learning materials, activities, and diagnostic tools. The new learning materials and educational play toys effected an increase in the level of inclusion within the pre-schools.

The findings on entry characteristics could also be used to develop and appoint particular instructional lines to individual pupils or small groups of pupils. In 2004 and 2005, pre-school teachers from all three pre-schools were experimenting with the prototype of the competence structure and the design and working of some first instructional lines in DIMS. Much attention had to be given to the coaching of the integration of diagnostic and progress indicators within sets of instructional lines. However, this resulted in pre-school teachers learning to differentiate and relate curriculum features on the one hand, and systemic ordering of learning activities and effects on pupils on the other. According to the teachers, this enabled them to select the learning materials much better than before to promote the optimal functioning of children.

Although the use of instructional lines was realised in one of the pre-schools in particular, the teachers did not actually use DIMS to assist the instruction of pupils. The main problem was that the pre-school teachers first had to get used to the meaning and functioning of instructional lines and wanted to try things out first in practice, without software. Related to this, they generally needed more time or facilities per week to make more progress. The only pre-school with relatively more facilities also made much more progress in development and implementation. A common problem in all three pre-schools was the experience that, during the three years, national and regional institutions refused to give financial support to the project or to the pre-schools. The effect was that school managers and school boards became more and more interested in projects that supplied extra funding rather than focus on the issues at hand.

Discussion

As in most European countries, Dutch inclusive education is an organisationally complex phenomenon with many features, operating at different levels, and including many different actors in mainstream and special education and other institutions. Empirical results show that in 2002, 10 years after the beginning of the effort to develop inclusive education, the percentage of pupils aged 4-12 not included in mainstream schools remains at 5.2%, the same percentage as in 1992. A first question for research therefore focused on the design features of inclusive education that will optimally promote the motivation and learning processes and outcomes of all pupils, including SEN and HA pupils. To answer the question, we introduced a model containing ‘multilevel contextual learning guidelines’ to consider educational and learning characteristics and processes that can help to realise inclusive education, in particular for SEN and HA pupils (see Table I). Our goal was to design and propose a systemic approach by which educational practice for pupils, teachers and parents can be improved in responsible and measurable ways.

A related second question for research was the specification of how relevant changes can be developed and implemented in educational practice. In a three-year pilot study with pre-school teachers of three Dutch pre-schools, parts of a prototype of a general competence structure (PDKS) and a software prototype referring to diagnostic, instructional, managerial and systemic (DIMS) aspects of learning were developed and employed. The first objective was to choose and apply a normed procedure for the screening of entry characteristics of four year-olds. Additionally, pre-school teachers participated in the design and use of some first instructional lines for mainstream, SEN, and HA pupils.
Design, Development and Implementation of Inclusive Education

In this new pre-school practice we noticed that four year old children were receiving more systemic – and more immediate – diagnostic attention: A total of 357 screening questionnaires was completed by either an infant day care teacher, parent, or pre-school teacher (see Table II). As a consequence of the screening, the pupils got more immediate instructional support than they would have received prior to this educational development (cf. also Walker et al, 1998; Knight, 1999; Tymms et al, 2000). According to the pre-school teachers, collaboration with infant day care centres, parents, and Youth Care Advisory Teams increased. The SENCO received more timely and more appropriate information, while communication and collaboration with other pre-schools and primary schools increased. Pre-school teachers were very interested in the design and use of instructional lines for mainstream, SEN and HA pupils. However, at this stage of development, the use of such lines by teachers and pupils occurred without actual support of DIMS.

Given this state of affairs after three years, a first conclusion is that despite the lack of time and facilities available to the project, a good deal of work in developing inclusive education has been completed. In accordance with the theoretically based guidelines, a prototype of a PDKS and a prototype of integrative software DIMS were developed and implemented partly with the aid of pre-school teachers. In line with results from other research, teachers often had difficulties in preparing and applying correct diagnostic and evaluation approaches to problems of SEN pupils (cf. Edelenbos & Meijer, 2002; Koster et al, 2004). Although the empirical results of the changes in pre-school practice of the three pilot schools are necessarily somewhat qualitative at this stage, they strongly confirm that we are heading in the right direction to create aspects of inclusive education as desired. This conclusion is supported also by results from related or comparable development projects (cf. Avramidis & Norwich, 2002; Geijsel & Krüger, 2005; Nap-Kolhoff & van Steensel, 2005; van den Akker, 2005).

A second conclusion is that the pre-school teachers experienced many difficulties in adapting the learning environment to the individual pupil’s specific needs and abilities, indicating that they needed real support in transforming education. This experience is rather common in such school innovation projects (see the Dutch Inspectorate of Schools, 2004; Koster et al, 2004; Smets, in preparation). Catering for pupils’ special educational needs implies working with individual education plans (IEPs) for SEN or HA pupils, simultaneously if necessary. Many existing plans fall short in the description of strategies that are to be applied by the teaching staff and in the description of the evaluation that is to be carried out after the IEP has been put into practice. In our project we had to coach the pre-school teachers to analyse their daily work in other ways, to teach them to organise and use new materials and procedures, or to use old materials in new ways. This turned out to be time-consuming, but very effective in tackling the real problems of teachers, pupils and parents. The pre-school teachers’ attitudes, beliefs, knowledge and skills with respect to providing ‘effective inclusive education’ proved to be crucial to the continuation of their motivation and classroom work in the project (cf. also Collier, 1994; Evans et al, 1999; Fullan, 1999).

A third conclusion is that the systemic collaboration with researchers revealed new insights and practices for the pre-school teachers, but also that the researchers learned from the pre-school teachers and their daily practice. From improvement or transformation points of view, the principle of an integrated educational system based on a PDKS seems to be realisable in practice for different individual or small groups of learners, including SEN and HA learners. It is also possible to create ICT-based, differentiated assignment and evaluation of individual or group activities and learning progress. This may be reported as individual progress, progress relative to the small group or class, and progress relative to the age group.

The future of inclusive education requires that each (pre-)school has to build more and more expertise in designing and applying diagnostic and multilevel learning processes, and differentiated evaluation or assessment processes, across different groups. Relevant decisions are dependent mainly on the choices being made by the teachers, the school principal and the parents. However, the multilevel system transformation required to create inclusive education is also dependent on the support of local and national educational institutions with innovation, assessment, research, coaching, or policy tasks (cf. also Jones, 2005; Ministry of Education, Culture, and Science, 2005). Therefore, the fourth conclusion is that the higher level institutions should really support the development and implementation activities at the lower levels within and between schools.
The future of the innovative project activities can be summarised in three related points. First, the development and implementation processes as sketched in the above will continue as much as possible in the three (pre-)schools. Second, a group of eight (pre-)schools located in another part of the country signed a contract to participate in the (pre-)school innovation process. Third, the researchers are developing a follow-up project to integrate comparable activities of some more pre-schools, infant day care centres and youth care organisations.
Design, Development and Implementation of Inclusive Education


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Design, Development and Implementation of Inclusive Education


