Differential ability and attainment in language and arithmetic of Dutch primary school pupils

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Background. In preschool and primary education, pupils differ in many abilities and competences (giftedness). Yet mainstream educational practice seems rather homogeneous in providing age-based or grade–class subject matter approaches.

Aims. To clarify whether pupils scoring initially at high ability level do develop and attain differently at school with respect to language and arithmetic compared with those displaying other initial ability levels. To investigate whether specific individual, family, or educational variables covary with the attainment of these different types of pupils in school.

Samples. Data from the large-scale PRIMA cohort study including a total of 8,258 Grades 2 and 4 pupils from 438 primary schools in The Netherlands.

Methods. Secondary analyses were carried out to construct gain scores for both language and arithmetic proficiency and a number of behavioural, attitudinal, family, and educational characteristics. The pupils were grouped into four different ability categories (highly able, able, above average, average or below average). Further analyses used Pearson correlations and analyses of variance both between- and within-ability categories. Cross-validation was done by introducing a cohort of younger pupils in preschool and grouping both cohorts into decile groups based on initial ability in language and arithmetic.

Results. Highly able pupils generally decreased in attainment in both language and arithmetic, whereas pupils in average and below-average groups improved their language and arithmetic scores. Only with highly able pupils were some educational characteristics correlated with the pupils’ development in achievement, behaviour, and attitudes.

Conclusions. Preschool and primary education should better match pupils’ differences in abilities and competences from their start in preschool to improve their functioning, learning processes, and outcomes. Recommendations for educational improvement strategies are presented at the end of the article.

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In many countries the structure of mainstream education is rather homogeneous, in keeping with the use of a grade–class subject matter system. Yet a marked diversity of ability exists within the pupil population in preschool and primary education (Bennathan & Boxall, 1996; Earle, 2000; Gallagher, 1975). The different abilities of pupils suggest that actualization of each pupil's potentials, or 'degree of giftedness', in concrete products in school depends on a multitude of factors (Colangelo, Assouline, & Gross, 2004; Heinbokel, 1988). First of all, individual cognitive ability or intelligence is relevant, although this characteristic may refer to various competences and is measured by diverse instruments (Brown et al., 2005). Other individual or personality traits such as resilience (Poulou, 2007) and motivation or perseverance (Heckhausen, 1980) are also shown to be of importance. In addition, different environmental factors play a role in the learning and achievement processes in school. These include the educational level and the pedagogical guidance of parents, and the social, emotional, and cognitive influences of peers, the lessons, the teachers, and the school (Collier, 1994; Kokkinos, 2007; van Eijl, Wientjes, Wolfensberger, & Pilot, 2005; Rutter, Maughan, Mortimore, & Ouston, 1980). Moreover, both innate and environmental factors interact and may come to influence the realization of various potentials via social and organizational characteristics and class or group cognitive means or distributions (Cronbach, 1983; Solberg, Olweus, & Endresen, 2007). The corresponding social comparison processes between pupils are often decisive for the cognitive and social development and motivation of the least achieving but also the most gifted pupils in particular (Davis, 1966; Marsh, Chessor, Craven, & Roche, 1995; Mooij, 1992).

Specific school or other contextual factors can thus promote or block a pupil's learning processes and school achievement, depending on whether or not the available lesson and school options meet the educational needs of the pupil. With respect to initially low-achieving pupils, usually from socio-economically disadvantaged or minority backgrounds, the importance of providing highly structured instruction with an emphasis on the core subjects, the monitoring of progress and rapid intervention when needed, has been recognized for a long time (cf. Tesser & Iedema, 2001). On the other hand, widespread attention to gifted or highly able pupils emerged in the mid-1980s and early 1990s (Campbell et al., 2005; Onderwijsraad, 2004). Here the usual educational focus is on the cognitive or intellectual achievement components of educational enrichment and the differentiated organization of learning, including the skipping of some classes (Brown et al., 2005; Colangelo et al., 2004).

For pupils with high cognitive abilities or potentials, however, educational practice may be too restrictive, which may lead to lowered motivation and problems of underachievement (Durkin, 1966; Grayson, 2001). Moreover, teachers may have low or inaccurate expectations for certain highly able pupils or groups of pupils, or they may have accurate perceptions but no didactic facilities to support them (Mooij & Smeets, 2006). Such restrictions can increase the problem behaviour on the part of the pupil, or lead to a downward motivation–achievement spiral at school. In a recent quantitative study of success conditions for highly able pupils, it was shown that, in the lower grades of Dutch primary education, hardly any educational support was given to such pupils, whereas in the higher grades some enrichment facilities were created for pupils who either showed signs of underachievement problems or were identified as gifted in some way (Mooij, Hoogeveen, Driessen, van Hell, & Verhoeven, 2007). Guldemond, Bosker, Kuyper, and van der Werf (2003) studied giftedness using large-scale cohort data in Dutch secondary education. However, the focus of this
research on secondary education meant that it was not possible to determine whether variation in previous educational options possibly led to differences in school motivation and achievement.

Then, both psychologically and pedagogically, there is every reason to further explore the actual achievement processes which occur between 'highly able' pupils and the educational setting from a young age onwards, in an attempt to identify which processes are associated with underachievement in particular (also see VanTassel-Baska, Bass, Ries, Poland, & Avery, 1998). Do initially 'highly able pupils' differ from other groups of pupils with respect to educational attainment, and are these differences related to measures of pupils' behavioural and attitudinal characteristics, and to relevant educational characteristics? Clarification of these questions with the aid of longitudinal research, and the establishment of a more solid foundation with respect to the possible influences of characteristics of primary education on the development of a pupil's school achievement, appears to be a necessity to identify and prevent the problems of underachievement.

An answer to the research question can be given by using extensive data that are available from the so-called PRIMA cohort research, which is a national longitudinal study conducted in The Netherlands. We will carry out secondary analyses of this data to shed some more light on the possibly differential attainment of Dutch primary pupils, and to find out which educational approach appears to be effective for various types of pupils. We will statistically explain the differences in pupil development both without and with control for differences in various types of pupil and educational characteristics.

Method
The PRIMA cohort study
The Dutch cohort study ‘PRIMA’ is a large-scale, longitudinal investigation into 600 schools including about 56,000 pupils in preschool and Grades 2, 4, and 6 in primary school. About 14,000 pupils per grade participated in the research. PRIMA was initiated in the academic year of 1994/1995 and has been repeated every second year since then. Information is collected from the school directorates, teachers, pupils, and parents. We will concentrate on pupils who were in Grade 2 (8-year-old) in the school year 2002/2003 and in Grade 4 (10-year-old) in the school year 2004/2005, 2 years later (cf. Driessen, van Langen, & Vierke, 2004, 2006). Personal characteristics of the pupils and information about their structural family characteristics are obtained from the teachers and parents at the start of the pupil’s school career. Every 2 years, the pupils complete some tests and the teachers score their behaviour, attitudes, and the educational approach used with the pupil.

The entire PRIMA sample has an overrepresentation of schools with minority and non-minority disadvantaged pupils. This design was opted for because it enabled the drawing of reliable conclusions with regard to subcategories of pupils who would otherwise be represented in small numbers. Such a sample also provides a better picture of the situation for minority or immigrant pupils who are typically concentrated in schools with numerous disadvantaged pupils. For the present analyses, representativeness is of less relevance because we are primarily concerned with statistical relations between characteristics. In these analyses, the focus is on data of 8,258 pupils from 438 schools.
Variables and their measurement

Given the variables measured in PRIMA, we concentrate on cognitive abilities in the school subjects of language and arithmetic. Various characteristics at the level of the pupil, the class/grade, and the school are available. The variables chosen for analysis are the following.

Pupil level characteristics

- (Initial) ability
  
  Indications of high ability or giftedness are usually based on the outcomes of intelligence tests, ability or achievement tests, teacher or parent judgments, or combinations of these (Brown et al., 2005; Colangelo et al., 2004). Different norms are used or constructed on the basis of test results or the percentage distributions for a random sample of pupils. Sometimes the top 3% is designated as highly able and sometimes the top 5% or 10% (Campbell et al., 2005; Cigman, 2006; Hewston et al., 2005; Strand, 2006). To obtain more information about the consequences of these various norms, we chose four main categories of percentages: (1) highly able, 2.5%; (2) able, 7.5%; (3) above average, 15%; and (4) average or below average, 75% (also see Cigman, 2006; Strand, 2006). This percentile distribution is the same as that used in the secondary education cohort study done by Guldemond et al. (2003). In PRIMA the initial language and arithmetic abilities are measured by validated and calibrated ‘CITO’ language and arithmetic tests (cf. van der Veen, van der Meijden, & Ledoux, 2004). We take the score of the year 2002 to represent the initial ability score for each pupil.

- Language and arithmetic proficiency
  
  The score distributions from 2002 constituted the reference point which was subsequently indexed to represent the situation of 2004 (the so-called index method). Proficiency in language and arithmetic, or the attainment in each school subject, was then made concrete by subtracting the score on each CITO test in 2002 from the pupil’s score on the comparative test in the same school subject for 2004. A pupil’s development or proficiency score was thus measured as the difference between the respective scores of the pupil on two consecutive occasions. In the past there has been some discussion regarding the reliability of difference or gain scores (e.g. Willett, 1989). Nowadays, a vast body of literature shows that difference scores can have satisfactory reliability and validity (e.g. Allison, 1990). In fact, when the question is ‘Which group increased (or decreased) more?’ the difference score approach is to be preferred over an analysis of covariance approach (Jamieson, 1999).

- Personal characteristics
  
  Gender: (1) boy and (2) girl;
  Career course: (1) delayed; (2) normal; and (3) accelerated.

- Structural family characteristics
  
  Parental education level: (1) primary school; (2) pre-vocational secondary education; (3) senior secondary vocational education; and (4) college education;
  Ethnic origin: (1) Dutch; (2) mixed Dutch minority; (3) Surinamese/Antillean; (4) Turkish; (5) Moroccan; and (6) other minority.

- Behaviour and attitude
  
  The teachers rated the behaviour and attitude of each pupil by a series of statements using response options ranging from (1) ‘definitely untrue’ to (5)
‘definitely true’. On the basis of factor and reliability analyses for each of the
grades, identical scales were constructed: study attitude (e.g. quickly thinks that
his or her work is finished); behaviour (e.g. is often cheeky); discipline (e.g.
requires extra attention for discipline); self-confidence (e.g. panics easily); well-
being (e.g. comes to school reluctantly); popularity (e.g. is popular among
classmates); and relationship with teacher (e.g. has a good relationship with me).
Scale scores were calculated as the mean of the combined items, with the scores
for negatively formulated items reversed first. A pupil’s development with regard
to behaviour or attitude was measured as the difference between the respective
scale scores in 2002 and 2004.

Grade/class level characteristics
We first constructed variables indicating the social, ethnic, and cognitive compositions
of the pupils within the class when they were in Grade 2. The measures are: percentage
of minority pupils; percentage of pupils of low-educated parents; mean level of
intelligence; spread of level of intelligence; mean level of arithmetic and language
achievement; and spread of arithmetic and language achievement. In addition,
educational approach characteristics are determined on the basis of the Teacher
Questionnaires for Grade 2. These characteristics are: class size; joint teaching
(assistance); subgroup teaching; remedial teaching; time devoted to reading; time
devoted to language; time devoted to arithmetic; infrequent assignment of homework;
assignment of homework for only weak pupils; assignment of homework for only good
pupils; assignment of homework for all pupils; progress registration; whole-class
instruction of language, reading, and arithmetic instruction; skipping of basic subject
matter; attention to study skills and strategies; use of diagnostic tests; class-based
differentiation for reading, language, and arithmetic; individual differentiation for
reading, language, and arithmetic; and emphasis on cognitive objectives.

School level characteristics
The following educational characteristics were selected from the questionnaire
administered to the school directorates: school size; constructivist approach; expertise
of teachers to handle cognitive differences and problem behaviour together with
cognitive differences; effort on behalf of the Educational Priority Policy (aiming at socio-
ethnic disadvantaged pupils); effort on behalf of the Pupils with Special Educational
Needs Policy; use of pupil monitoring system to plan objectives; determination of
learning objectives on the basis of the method used; and evaluation of educational
options offered.

Statistical analysis
Given the level differences (i.e. pupils clustered within grade/class and school), some
kind of multi-level analysis could be used. However, then one main problem is that
selection in terms of ability leaves only about zero to three highly able pupils per class,
which is not enough for multi-level analyses because it allows for very little or no within-
group variance. We therefore opt for a mono-level analysis in which grade/class and
school characteristics are considered contextual variables to the individual pupil
The first analysis step was the concentration on the development of the pupils from Grades 2 to 4. Therefore, the Grade 2 scores were subtracted from the Grade 4 scores to attain difference scores. In a second step, the difference scores were screened by relating them bivariately to pupil, class/grade, and school characteristics. When certain characteristics were found to systematically relate to the difference scores for the pupils, in a third analysis step these significant relations were examined further. The three analysis steps were first conducted for the entire group of pupils and then separately for each of the four categories of ability. The latter analyses indicate whether some particular educational approach differs across ability categories.

Results

Developments in achievement, behaviour, and attitude

In Table 1, the developments in achievement, behaviour, and attitude are presented according to categories of ability in language (left side of the table) and ability in arithmetic (right side of the table). The difference scores for those pupils in Grade 2 in 2002 and in Grade 4 in 2004 are thus presented. The means and the \( \eta \) correlation coefficients in Table 1 indicate the strength of the variation in the difference scores across the four categories of ability. An \( \eta \) of .15 is statistically significant and taken to be the minimum for a difference to be considered relevant.

On the left side of Table 1, the first characteristic is ‘Language categories’. The four categories of ability have been coded as 4 (highly able), 3 (able), 2 (above average), and 1 (average or below average). The information in the first cells of the table then shows those pupils who were initially in the category of highly able (4) with respect to language in Grade 2 to have dropped on average by almost two categories (1.9) and thus to the category of above average with respect to language in Grade 4. The initially able category and the above average category of pupils also dropped, while the initially average or below average category of pupils climbed slightly. The course of the averages provides a clear overview of the significant changes in the levels of language achievement for the different categories of pupils (\( \eta = .56; \ p < .001 \)). This phenomenon is not seen with respect to the various language and arithmetic categories (\( \eta = .05 \)). However, for ‘language proficiency’, or the difference between the language achievement score in Grades 2 and 4, a decrease of 31 points on average is apparent for the category of pupils who were highly able with respect to language in Grade 2. In the category ‘able’ the pupils increase by five points, in the category ‘above average’ the increase is 19 points, and the ‘average/below average’ pupils gain 43 points (\( \eta = .46; \ p < .001 \)). This differentiation from the language perspective does not occur with respect to arithmetic attainment.

On the right side of Table 1, the results for the categories in arithmetic largely resemble those for language. Once again, the highly able, able, and above-average groups of pupils can be seen to drop with respect to category of arithmetic ability. This reduction does not occur concerning the corresponding language categories. A striking difference from the language results, however, is that none of the pupils declined with respect to arithmetic proficiency although the increase for the highly able pupils is relatively the lowest. Furthermore, Table 1 illustrates that none of the other behavioural or attitudinal characteristics showed significant differences across the categories of language or arithmetic ability.
Table 1. Mean differences in primary pupils' achievement, behaviour, and attitude between Grades 2 and 4, according to level of language and arithmetic ability in Grade 2

<table>
<thead>
<tr>
<th>Development in:</th>
<th>Language ability in Grade 2</th>
<th>Arithmetic ability in Grade 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Highly able (2.5%)</td>
<td>Able (7.5%)</td>
</tr>
<tr>
<td>Language categories</td>
<td>1.9</td>
<td>1.1</td>
</tr>
<tr>
<td>Arithmetic categories</td>
<td>.2</td>
<td>.2</td>
</tr>
<tr>
<td>Language proficiency</td>
<td>-.31</td>
<td>.5</td>
</tr>
<tr>
<td>Arithmetic proficiency</td>
<td>24.0</td>
<td>24.0</td>
</tr>
<tr>
<td>Study attitude</td>
<td>-.1</td>
<td>-.1</td>
</tr>
<tr>
<td>Behaviour</td>
<td>-.1</td>
<td>.0</td>
</tr>
<tr>
<td>Discipline</td>
<td>-.1</td>
<td>.0</td>
</tr>
<tr>
<td>Self-confidence</td>
<td>.0</td>
<td>.0</td>
</tr>
<tr>
<td>Well-being</td>
<td>-.2</td>
<td>-.1</td>
</tr>
<tr>
<td>Popularity</td>
<td>-.2</td>
<td>-.1</td>
</tr>
<tr>
<td>Relationship with teacher</td>
<td>-.1</td>
<td>-.1</td>
</tr>
</tbody>
</table>
The difference scores presented in Table 1 can be analysed also in a different manner. For exploratory purposes, it is useful to collapse the difference scores to form three more transparent categories such as negative, zero, and positive. In such a manner, the relations of interest can be examined in terms of the percentages of changed pupils. It may, for example, be the case that the change occurs for only the categories of negative or zero (unchanged) but not for the category of positive, which would not be detected when only total change is analysed.

For the present analyses, the ability, behavioural, and attitudinal characteristics were recoded as reflecting (1) deterioration, (2) no change, or (3) improvement. The language and arithmetic proficiency differences were recoded as reflecting (1) decline, (2) progression but not more than average, or (3) greater progression than average. In Table 2, the results are presented for categories of ability with respect to language and arithmetic, respectively. We will limit our consideration of the results to only language and arithmetic development as the developments in all of the behavioural and attitudinal characteristics showed no significant relations to categories of ability.

Inspection of the upper part of Table 2 shows 88% of the initially highly able pupils to attain a lower language ability score in Grade 4 and to thus have deteriorated with respect to the level of ability in language. Inspection of the lower part of Table 2 shows 86% of the initially highly able pupils to decline with respect to language proficiency while only 15% of the entire group of pupils declined (see the column ‘Total sample’). The developments of arithmetic ability resemble those of language ability, but the results of arithmetic proficiency are relatively better for the highly able pupils than that of language proficiency for this category of pupils.

Class/grade and school characteristics and developments

The relations between the scores on language and arithmetic categories of ability, language, and arithmetic proficiency, grade/class characteristics, and school characteristics, on one hand, and the measures of development between Grades 2 and 4 on the other hand were also analysed. First, Pearson correlations were computed for the entire group of pupils. The results showed a rather sobering empirical picture: Only a very few relations were relevant ($r \approx 0.15$) between language proficiency and the development of language ability, or arithmetic proficiency and the development of arithmetic ability. None of the educational approach characteristics showed any relation whatsoever to the development of achievement, behaviour, or attitude. Given that these educational approach characteristics are situated temporally prior to the development characteristics, we can assert that - viewed causally - the educational approach characteristics do not seem to influence the development scores.

Second, the preceding Pearson correlation analyses were repeated for each of the four categories of ability separately from both language and arithmetic perspectives. The results repeatedly reveal the same picture, generally low correlations which cannot be systematically traced back to particular characteristics of the educational approach. Those relatively speaking strong relations which occurred were found predominantly within the category of highly able pupils. The correlations of 0.25 or higher for the language perspective were as follows: Efforts on the behalf of Educational Priority Policy $\times$ development of discipline: $-0.35$ (the more personnel, the less progress); efforts on the behalf of the Pupils with Special Educational Needs Policy $\times$ development of discipline $-0.27$ (the more personnel, the less progress); time devoted to language $\times$ progress with regard to relationship with teacher: $0.33$ (the more time,
<table>
<thead>
<tr>
<th>Development in:</th>
<th>Language ability in Grade 2</th>
<th>Arithmetic ability in Grade 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Highly able (2.5%)</td>
<td>Able (7.5%)</td>
</tr>
<tr>
<td>Language categories: deterioration</td>
<td>88</td>
<td>74</td>
</tr>
<tr>
<td>Language categories: no change</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>Language categories: improvement</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Arithmetic categories: deterioration</td>
<td>31</td>
<td>29</td>
</tr>
<tr>
<td>Arithmetic categories: no change</td>
<td>47</td>
<td>54</td>
</tr>
<tr>
<td>Arithmetic categories: improvement</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>Language proficiency: decline</td>
<td>86</td>
<td>45</td>
</tr>
<tr>
<td>Language proficiency: progression but not more than average</td>
<td>9</td>
<td>40</td>
</tr>
<tr>
<td>Language proficiency: greater than average progression</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Arithmetic proficiency: decline</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Arithmetic proficiency: progression but not more than average</td>
<td>46</td>
<td>50</td>
</tr>
<tr>
<td>Arithmetic proficiency: greater than average progression</td>
<td>52</td>
<td>49</td>
</tr>
</tbody>
</table>
the more progress); and use of diagnostic tests $\times$ self-confidence: $0.27$ (the more frequent testing, the more progress). From an arithmetic perspective, there were no correlations higher than $0.25$.

In these analyses, the relations are weak at best. However, it is possible that one can speak of ‘interfering’ factors and, for this reason, the present analyses were repeated but now with such pupil background characteristics as gender, school career, parental education, ethnic origin, and test performance in Grade 2 controlled for. The results of these analyses were virtually identical to the results presented above with only a few hundredths of point difference at most. In other words, even when the differences in some critical pupil characteristics are taken into consideration, the relations of grade/class and school characteristics to pupil development remain weak at best.

**Additional analyses in preschool and primary school**

To better understand and cross-validate the above results, we decided to do some extra analyses. We first included the PRIMA cohort group of pupils in preschool Grade 2 (6-year-old) in 2002 and attending Grade 2 of primary school (8-year-old) in 2004. Then we calculated $z$ scores for each year and used the data collected in 2002 to construct decile groups of pupils in both language and arithmetic abilities. In the final step, we calculated differences of the $z$ scores by subtracting scores for 2002 from those for 2004. The same procedure was applied to a second cohort group of pupils in primary school Grade 2 (8 years old) in 2002 and attending Grade 4 of primary school (10 years old) in 2004. The results for both cohort groups of pupils are presented in Table 3.

**Table 3. Developments per decile in language and arithmetic achievement (difference in scores obtained in 2004 and 2002)**

<table>
<thead>
<tr>
<th>Decile</th>
<th>Preschool Grade 2 – primary Grade 2</th>
<th>Primary school Grade 2 – primary Grade 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Language ($n = 8.105$)</td>
<td>Arithmetic ($n = 7.735$)</td>
</tr>
<tr>
<td>1</td>
<td>1.08</td>
<td>1.06</td>
</tr>
<tr>
<td>2</td>
<td>.47</td>
<td>.50</td>
</tr>
<tr>
<td>3</td>
<td>.29</td>
<td>.21</td>
</tr>
<tr>
<td>4</td>
<td>.06</td>
<td>.04</td>
</tr>
<tr>
<td>5</td>
<td>-.09</td>
<td>.03</td>
</tr>
<tr>
<td>6</td>
<td>-.19</td>
<td>-.13</td>
</tr>
<tr>
<td>7</td>
<td>-.25</td>
<td>-.25</td>
</tr>
<tr>
<td>8</td>
<td>-.37</td>
<td>-.39</td>
</tr>
<tr>
<td>9</td>
<td>-.48</td>
<td>-.53</td>
</tr>
<tr>
<td>10</td>
<td>-.62</td>
<td>-.81</td>
</tr>
<tr>
<td>Total</td>
<td>-.02</td>
<td>-.03</td>
</tr>
</tbody>
</table>

The results in Table 3 illustrate that, in both cohort groups, nearly the same patterning exists. In particular in decile 1, thus for pupils with the relatively lowest initial abilities in 2002, positive difference scores indicate a relatively strong increase in achievement in both school subjects. However, for deciles 5–10, negative difference scores indicate a relative decrease in achievement. The decreases for preschoolers are larger than those for primary pupils, whereas the decreases for preschoolers in decile
10, the ‘highly able’ and ‘able’ pupils are largest. Figure 1 presents an overview of these results.

Additional analyses for the preschool cohort group revealed that, only within the group of highly able pupils (2.5%), the following significant relations were found (cf. Driessen, Mooij, & Doesborgh, 2007):

1. The larger the class size of the pupil in preschool Grade 2, the lower the teacher’s score of the pupil’s well-being, popularity, and relation with the teacher in primary school Grade 2;
2. The more monitoring of the pupil by a traditional age-based system in preschool Grade 2, the lower the teacher’s score of the pupil’s study attitude, self-confidence, well-being, popularity, extra curriculum support, and discipline; and the more the pupil is observed to underachieve in primary school Grade 2;
3. The higher the mean preliminary arithmetic score of the pupil’s class in preschool Grade 2, the lower the teacher’s score of the pupil’s well-being, popularity, and relation with the teacher; and the more the pupil is underachieving in primary school Grade 2;
4. Acceleration or skipping classes of the pupil in preschool Grade 2 is positively related to the teacher’s score of the pupil’s self-confidence, well-being, and relation with the teacher in primary school Grade 2.

Discussion

Secondary analyses of a large-scale cohort study of Dutch pupils revealed that, when compared with other ability categories, the category of highly able pupils declined most in terms of language and arithmetic developments between preschool Grade 2 and primary school Grade 2, and between primary Grades 2 and 4. Other ability categories

![Figure 1. Difference scores (2004 - 2002) for achievement in language and arithmetic; preschool cohort, and primary school cohort; per decile.](image-url)
of pupils showed less decline, whereas pupils with initially lower abilities attained higher results during these years. Apparently, the highly able pupils, and those in preschool in particular, have an initial developmental edge in language and arithmetic which they cannot maintain.

Some arguments can be given to support the outcomes we have found. First, we can refer to the survey result presented above, about Dutch primary teachers’ reluctance to provide highly able pupils with adequate educational support in the lower primary grades in particular (Mooij et al., 2007). In the same research, empirical information was given about teachers’ practice of requiring highly able pupils to complete the ordinary schoolwork first and then allowing them to go on with enrichment or other materials or activities. Second, despite the availability of many enrichment materials and other instruments for highly able pupils, as collected in the study by van Eijl et al. (2005), their report also clarifies that teachers usually do not know at which level what types of materials should be used with which pupils. No coherent educational pattern of anchoring points seems to exist except for the age-based national pupil monitoring system. The lack of a coherent pedagogical–didactic framework to found adequate learning processes for different types of pupils is also observed in other research in primary education (Blok, Oostdam, & Peetsma, 2006). Third, another recent study investigated the Dutch skill distribution by individual test scores of three international literacy surveys in secondary education (PISA, TIMMS, and IALS): see Minne, Rensman, Vroomen, and Webbink (2007). These researchers conclude ‘there is a declining pattern in the ranking of The Netherlands along the percentiles. The Netherlands is among the best below the 5th percentile of the skill distribution. Between the 25th and 75th percentile the ranking is relatively stable in the top 10. After the 75th percentile the ranking declines more strongly. Above the 95th percentile, The Netherlands drops out of the top 10. (. . .) Our findings also hold for the subsample of Dutch first- and second-generation immigrant students. (. . .) When we focus on the top 1% individuals (99th percentile) within the OECD, we see that The Netherlands (. . .) has a moderate ranking of place 13 at the right-hand side of the skill distribution’ (p. 46–47). This empirical information can be interpreted correctly when it is acknowledged that, traditionally, much attention is given to the improvement of education for low-achieving or disadvantaged pupils, but no systematic attention is given to high-ability pupils in The Netherlands. Fourth, this same neglect of highly able pupils has been observed in many qualitative studies carried out over the years (cf. Mooij et al., 2007).

The same arguments can be used to interpret the lack of findings with respect to the class/grade and school variables. For young high-ability pupils, in particular, those educational variables are generally ‘not relevant’ or ‘not strong enough’ to have a positive impact on their motivation and learning processes (cf. Colangelo et al., 2004; Mooij, 1999). Family support then has to counterbalance the lack of school support, which evidently promotes children from parents with higher education levels. This phenomenon has been found empirically in The Netherlands (Mooij et al., 2007) and in other countries as well, for example in Germany (Arbeitsgruppe Schulforschung, 1980; Mehlhorn, 1988; Rost, 1993), Iceland (Freeman & Joseppson, 2002), and the USA (Purcell, Burns, Tomlinson, Imbeau, & Martin, 2002). As mainstream education may not sufficiently address the pupils’ starting level, these young pupils do not know any better and feel obliged to adapt or they become disruptive and demotivated for (pre)school. The present findings thus suggest that the early education period is relatively the most important in setting criteria and norms for each pupil’s development in school.
Before concluding, however, we need to make some methodological comments. First, it could be argued that our results reflect statistical regression to the mean effects. This argument can be countered by stating that, in Figure 1, the graph for the primary school cohort from Grades 2 to 4 shows no curve at the right-hand side. Here the deciles 5–10 reflect rather comparable negative attainment scores, which do not support a regression to the mean effect. Additionally, the available qualitative and quantitative information about curriculum and learning processes in Dutch preschool and primary education supports our findings (Mooij, 1999; Mooij et al., 2007; van Eijl et al., 2005).

Our empirical results therefore indicate the process of school-based transformation of 'ability' into achievement in Dutch preschool and primary education. Second, the lack of relevance of differences in behavioural and attitudinal characteristics could raise questions with regard to the quality or validity of the measurement instruments used. In this respect we can point towards several other studies (e.g. Driessen et al., 2004, 2006) in which these same instruments have been employed: The results showed significant, and expected, differences according to pupils' social and ethnic background and sex. Third, in PRIMA the class and school characteristics analysed were collected by using written questionnaires. It can be argued that this type of measurement should be accompanied by other measurements, for example, observation of each pupil's and teacher's behaviour in situ. We underline such a methodological approach, but it should be clear that this of course requires adequate facilities to carry out such measurements. In future research, such varied and refined measurement of various characteristics should be considered.

We conclude that we have found empirical indications about a systematic educational neglect of high-ability preschool and primary pupils in The Netherlands. As this phenomenon and the related underachievement problems already present themselves very early in the school careers of pupils, preventive measures appear to be called for and we suggest the following. For educational and psychological reasons, it is necessary that the initial abilities of pupils be determined. This should occur for different domains of competence, for instance the social-communicative, general cognitive, language, arithmetic, sensorimotoric/motoric and emotional–expressive domains. Estimation should be done in a reliable and valid manner, for example, via a screening procedure which utilizes the information of parents and preschool teachers (cf. Mooij, 2000). Per pupil, the results with regard to these entry characteristics can be discussed with the teacher and parents. This is necessary for the continuity of support provided by the school and the home. In cases of discrepant estimates or suspected learning or behaviour problems, it is prudent that other professionals are called in for further diagnosis. In case of giftedness in one or more domains, it is important that a pupil can go on at his or her own levels of competence in school.

Furthermore, adequate schooling for high-ability pupils requires that, from the start of preschool, the core of the play and learning materials are organized by the domain of competence in keeping with the content/skill, degree of difficulty, and degree of pupil self-regulation (Hewston et al., 2005; Marsh et al., 1995). Only with such a differentiated ordering are teachers and parents in a position to provide adequate curricular support for each pupil in (pre)school. Accordingly, play and learning activities can be applied in keeping with the results of the initial assessment of the child. The learning progress of the pupil should, for motivational reasons, be determined on the grounds of his or her own progress and not on the grounds of average grade progress. Through the proposed differentiated curriculum, ongoing continuity can be realized with respect to the transition between domains of competence, grades, and types of education. In practice,
it is helpful to have grades or classes working cooperatively or individually in small
groups of two to eight pupils per domain of competence. At the same time, it is critical
that pupils achieve a distribution of tasks within the small group in order to foster
constructive group behaviour. More important prerequisites for the realization of such
an educational system are sketched elsewhere (Mooij, 2007).

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References
Methodology, 20, 93–114.
München, Germany: Juventa.
London: David Fulton.
begripsanalyse en een verkenning van de schoolpraktijk [New learning in primary
education; Conceptual analysis and an exploration into school practice]. Amsterdam: SCOKohnstamminstituut.
Assumptions underlying the identification of gifted and talented students. Gifted Child
Quarterly, 49, 68–79.
origins of students identified as gifted and talented in England: A geo-demographic
analysis. Coventry: NAGTY, University of Warwick.
197–212.
America’s brightest students (Volumes I and II). Iowa City, IA: The University of Iowa,
International Center for Gifted Education and Talent Development.
Cronbach, L. J. (1983). Designing evaluations of educational and social programs. San
Davis, J. (1966). The campus as a frog pond: An application of the theory of relative deprivation to
Driessen, G., Mooij, T., & Doesborgh, J. (2007). Hoogbegaafdeheid van Leerlingen in het Primair
Onderwijs: ontwikkelingen en samenhangen met kenmerken van thuis, de groep en de
school [Gifted Pupils in Primary Education: Developments and correlations with
characteristics of the home, the class and school]. Nijmegen, The Netherlands: ITS.
leerlinggegevens en oudervragenlijsten. Basisrapportage PRIMA-cobortonderzoek. Vijfde
meting 2002/03 [Primary Education: Data collection, pupil data and parent
questionnaires. Technical report PRIMA cohort study: Fifth measurement round
2002/03]. Nijmegen, The Netherlands: ITS.


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