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## **Assessing Differentiation in All Phases of Teaching**

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**Title of your paper:**

Development and validation of the ADAPT-instrument for Assessing Differentiation in All Phases of Teaching

### **Abstract**

Providing education that matches students' needs can be considered "a cornerstone of effective instruction" (Parsons et al., 2017), but implementing differentiation is a complex task. Based on a Cognitive Task Analysis among expert teachers, it was clear that in order to successfully adapt education to students' needs during a lesson, preparation of both a series of lessons as well as the lesson itself is essential, just like evaluation afterwards (Van Geel et al, 2019). It was therefore concluded that in order to assess the degree and quality of differentiated instruction, a classroom observation would not suffice. An instrument was developed in which 23 indicators are scored based on a classroom observation and an interview with the teacher: Assessing Differentiation in All Phases of Teaching (ADAPT) (Keuning et al., 2020).

In total, recordings of 84 primary school teachers (mathematics lesson and interview) were used. In this study, the reliability of the ADAPT instrument was investigated and the value of this instrument for practice was discussed with raters. In total, 42 raters were trained and each scored five to fifteen recordings.

An IRT model (generalized partial credit model with the 2-parameter logistic model) was estimated to transform discrete item responses to continuous latent values. Using item parameters from the GPC-2PL model, we conducted a D-study (Shavelson et al. 1989) into the reliability of the ADAPT instrument. Initial analyses reveal high agreement and reliability, both for the instrument as a whole as when analyzing clusters of items based on the application of underlying principles for differentiation (Keuning & Van Geel, 2021).

Raters highly valued the training and instrument. They indicated for example that following the training led to reflection on their own differentiation practice, and provided better insight in what successful differentiation entails.

## Extended summary

### Introduction

The aim of differentiated instruction is to adapt education to the students' diverse educational needs (e.g. Deunk et al, 2015), mostly their current level of knowledge and skills (Tomlinson et al., 2003). Roy et al. (2013, p. 1187) define differentiation as: "an approach by which teaching is varied and adapted to match students' abilities using systematic procedures for academic progress monitoring and data-based decisionmaking."

### Theoretical background

Providing education that matches students' needs can be considered "a cornerstone of effective instruction" (Parsons et al., 2017), but for successful implementation of differentiation, teachers need a broad range of skills and underlying knowledge (Van Geel et al., 2019). Based on a cognitive task analysis, Keuning and Van Geel (2021) not only distinguished four phases in which teachers prepare and perform differentiated instruction (1. prepare a lesson series, 2. prepare a lesson, 3. perform a lesson, and 4. evaluate the lesson), but also identified five underlying principles for differentiation, that should be leading teachers' instructional decisions: 1) strong goal-orientation, 2) continuously monitor students' progress and understanding, 3) challenge all students, 4) adapt instructions and exercises in order to match students' needs, and 5) stimulate students' self-regulation (Keuning & Van Geel, 2021).

Because three out of four phases take place outside the classroom, and due to the importance of the cognitive aspect of differentiated instruction (teachers need to make deliberate instructional decisions, prior to and during the lesson), Van Geel et al. (2019) concluded that in order to assess the degree and quality of differentiated instruction, a classroom observation would not suffice. The ADAPT-instrument was developed: Assessing Differentiation in All Phases of Teaching (Keuning et al., 2020) in which 23 indicators are scored based on a classroom observation, combined with an interview with the teacher.

### Methods & aims

The primary aim of the current study was to determine the quality and reliability of the ADAPT instrument. Furthermore, we were interested in the experiences and insights of the raters, based on both the training as well as the use of the ADAPT instrument.

#### *Instrumentation*

ADAPT consists of 23 indicators, divided over the four phases: preparation of lesson series (8 indicators), lesson preparation (6 indicators), lesson execution (8 indicators), evaluation (1 indicator). Each indicator is scored on a four-point scale, where a score of 1 or 2 is deemed insufficient and a score of 3 or 4 sufficient. For each indicator for each score there is an elaborate description where the difference between the current and lower score is highlighted. Also, an explanation and examples are presented next to the score description. Furthermore, for some items 'not applicable' can be selected (e.g. when a teacher indicates they have no high-performing students for a specific lesson goal) and for all items 'unable to score' can be selected in case there is insufficient information available.

#### *Recordings*

In total, 84 primary school teachers took part in the first phase of data collection. For each of those teachers, a mathematics lesson was video-recorded and the teacher was interviewed afterwards,

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which was recorded too. The two recordings per teacher (mathematics lesson and interview) were used to score ADAPT.

### *Raters & training*

The training in the use of the ADAPT instrument was provided to 42 volunteers: teachers, students in teacher training programs and academic coaches. The training consisted of: watching an introductory video, reading the manual, discussing all indicators, two rounds of watching a recording, scoring ADAPT and comparing and discussing similarities and differences in assigned scores. In total, raters spent around 12 to 15 hours on the training phase. Due to Covid-19, the entire training and rating took place online.

### *Procedure*

Each rater was required to score ADAPT for at least five teachers. Based on their indicated availability, each rater was assigned five to fifteen teacher-ID's that had to be scored in that specific order. We made sure order-effects would be ruled out by making sure each teacher-ID was present first, middle and last for different raters. Raters were instructed not to pause and certainly not to rewind videos. They were required to watch both recordings preferably in one run, but definitely on one day, in the fixed order of first lesson, then interview. Raters were required to motivate each score as well.

### **Preliminary findings**

In total, ADAPT was scored 399 times. An IRT model (e.g. Lord, 1980) was estimated to transform the discrete item responses to continuous latent values  $\theta$ . Item parameters were estimated based on a generalized partial credit model with the 2-parameter logistic model, using Lexter (Glas & Van Buren, 2021).

Using the item parameters from the GPC-2PLM, we conducted a D-study (Shavelson, Webb & Rowley, 1989) into the reliability of the ADAPT instrument. Initial analyses reveal high agreement between raters, ranging from 0.7952 with two raters to 0.9061 with five raters. Reliability with two raters was 0.8880, increasing to 0.9518 with five raters. Similar findings were found when analyzing clusters of items based on the application of underlying principles for differentiation (Keuning & Van Geel, 2021).

Raters were very positive about the training and the ADAPT-instrument, not only for use as scoring instrument but also to reflect on their own practice and the interrelatedness of all phases and aspects of differentiated instruction. Especially the elaborate performance descriptions and examples were regarded very valuable.

### **Significance**

In the current study, we show that the ADAPT-instrument, when used by trained raters, has a high internal quality and reliability. We aim to study reliability with un-trained raters in the near future. Furthermore, we aim to compare ADAPT-scores with students' ratings on the Differentiated Instruction from Students' Perspective questionnaire.

### **Relevance to the QUINT ambition**

In this study, we operationalized differentiated instruction, as part of teaching quality, based on a cognitive task analysis. We developed the ADAPT-instrument, specifically for the context of Dutch primary school mathematics and have extensively tested the use and quality of this instrument.

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We would love to discuss international value of (the operationalization of differentiated instruction in) this instrument with the QUINT network.

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