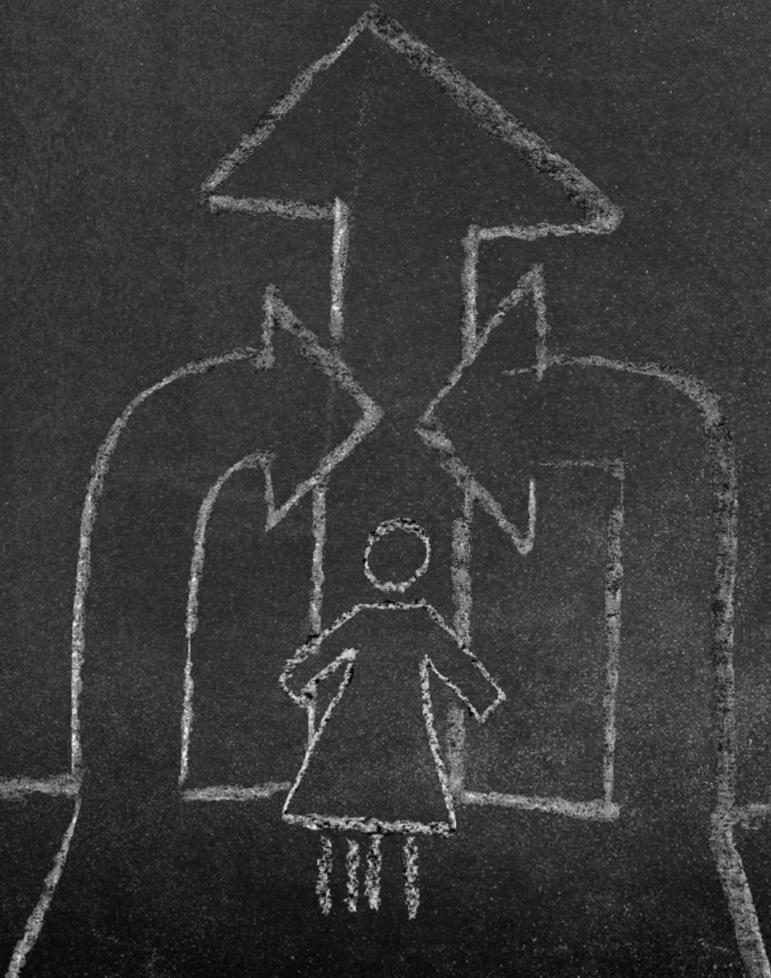


**Opening the black box
of teacher judgement:**
the interplay of rational
and intuitive processes

Kristin Vanlommel



University of Antwerp, Faculty of Social Sciences, Department of Training and Education Sciences
Supervisors: Jan Vanhoof & Peter Van Petegem
Printed by Datawyse | Universitaire Pers Maastricht
Copyright Kristin Vanlommel, Antwerp 2018
ISBN nummer: 9789057285783
EAN: 9789057285783
Depotnummer: D/2018/12.293/07



Faculteit Sociale Wetenschappen
Departement Opleidings- en Onderwijswetenschappen

Opening the black box of teacher judgement: the interplay of rational and intuitive processes

Dissertation to obtain the degree of doctor in Education Sciences

Proefschrift voorgelegd tot het behalen van de graad
van Doctor in de Onderwijswetenschappen aan de Universiteit Antwerpen
te verdedigen door Kristin Vanlommel

Prof. Dr. Jan Vanhoof (promotor)
Prof. Dr. Peter Van Petegem (promotor)

Content

Dankwoord	7
Chapter 1 General introduction and research aims	11
Chapter 2 Theoretical framework	23
Chapter 3 Data use by teachers: the impact of motivation, decision-making style, supportive relationships and reflective capacity	35
Chapter 4 Teachers' Decision Making: Data Based or Intuition Driven?	55
Chapter 5 Teachers' high-stakes decision making. How teaching approaches affect rational and intuitive data collection.	75
Chapter 6 How do teachers make sense of data in the context of high-stakes decision making?	101
Chapter 7 Examining teacher judgement from a dual-process perspective: how rational and intuitive processes mutually influence teachers' high stake decisions.	127
Chapter 8 Conclusion and discussion	155
Chapter 9 Nederlandse samenvatting en aanbevelingen (Dutch summary)	177
References	189

Dankwoord

It is not the mountain we conquer but ourselves

Kiezen voor een doctoraat, het doorlopen van een proces met veel onzekerheden en hoge verwachtingen is niet evident. Hier aan de top van de berg, nog moe van de beklimming wil ik even stilstaan, ademen en genieten van de vreugde die het uitzicht mij geeft. Neerkijkend op de vele, steile bergpaadjes maakt het dankbare besef aan alle hulp en aanmoediging tijdens de tocht dit moment zo waardevol. Het proefschrift dat hier voor u ligt, staat symbool voor een gezamenlijk traject, gesteund en gedragen door familie, vrienden en collega's.

Enkele mensen wil ik daarbij in het bijzonder bedanken. Eerst en vooral een oprecht dankjewel aan mijn promotoren die me de kans hebben gegeven om aan dit traject te starten. Jan, jouw kritische en analytische geest hebben er voor gezorgd dat ik kon groeien en dat mijn werk steeds scherper werd. Intuïtie in een proefschrift, dat heeft wat pittige discussies met zich mee gebracht. Bedankt voor de fijne, open gesprekken die daaruit volgden op exotische en minder exotische locaties. Ik ben blij met het traject dat we van bij de start samen gelopen hebben en met alle leerkansen die je me hebt gegeven.

Peter, jouw ruggensteun en uitgesproken vertrouwen van bij de start werkten voor mij erg motiverend. Binnen een context van grote vrijheid en zelfsturing had jij bewuste aandacht voor mijn proces. Een begripvolle blik, een geïnteresseerde vraag of een schouderklopje, meer dan dat was er niet nodig om bergen te verzetten. Ik waardeer jouw visie op het ruime geheel en de manier waarop je mee nadent over de toekomst.

Ik had verder ook het geluk om een ondersteunende begeleidingscommissie te hebben. Aan Kim: oprecht dankjewel voor de constructieve feedback, de fijne introductie binnen het data use netwerk en het warme onthaal in Enschede. Samen schrijven met jou was erg inspirerend. Vincent, bedankt om mij door jouw bril naar onderzoek te leren kijken, om mee na te denken en om echt tijd te nemen voor grondige feedback.

Verder wil ik het hele OOW-team bedanken om van iedere werkdag een leuke werkdag te maken. Piet, mijn academische peter, een extra dankjewel voor de goede opvang mijn eerste jaar en de verse koffie alle jaren nadien. David, mijn ceremoniemeester,

bedankt om mij met al je enthousiasme over de OOW-streep te trekken in lang vervlogen tijden. Sven, het is zo fijn hoe jij tijd kan maken voor een toffe babbel. Paul, emeritus, een leukere introductie in de academische wereld dan met jou kan ik me niet voorstellen. Laat ons gauw nog eens een visje eten in Wenen. Eric, als mentor bij mijn masterproef heb je een belangrijke basis gelegd die dit mee heeft mogelijk gemaakt. Bedankt dat je me bleef volgen en steunen vanaf de zijlijn.

Mijn collega AAP-en, partners in crime Tine en Katrien: ons kantoor was dé plek om stoom af te laten, advies te vragen en om ongenueanceerde meningen te hebben omdat we alle drie echt begrepen hoe hoog de druk soms werd. Tine: een extra dikke merci voor de lange babbels en het nalezen van mijn proefschrift in woelige tijden. Ik zal je nog belonen met de gepaste hoeveelheid chocotoffen. Maarten, mijn bureauleven was niet meer hetzelfde toen jij verdween. Mijn huidige collega's hebben minder waardering voor een streepje Andre Hazes tussendoor.

Aan alle GK10'ers: samen onderzoek doen, wandelen, surfen, lopen, pintjes pakken, ... Bedankt voor jullie inspiratie, input en voor de leuke gezelligheid. Kendra: we gaan zeker nog eens langlaufen, Marije: je bent een topmadam (vertaling volgt). Ik had graag wat meer met je samen gewerkt. Jerich - 'effe een kofteke drinken' – waarvan alleen de koffie een accurate beschrijving was van wat zou volgen, want 'effe' dat lukte ons helaas nooit. De afgelopen jaren en de congressen hadden saai en eenzaam geweest zonder jou (en veel stiller). Roos, er valt heel wat te zeggen over ons traject samen. De generatiekloof-sollicitatievraag was nog maar net verteerd of ik werd voor je moeder aanzien... We bewezen het tegendeel want we werkten graag en goed samen, zijn samen 'wezen sporten' en bouwden een vriendschap op. Ik ben blij dat we belangrijke mijlpalen binnen en buiten ons doctoraat samen hebben beleefd.

Gelukkig was er ook nog een leven buiten het werk, met fantastische vriendinnen en vrienden. Jill, alles hebben we al samen meegemaakt, een leven lang. Ik ben blij dat ik ook dit moment met jou kan delen. Bedankt Helga, voor de lieve attenties op moeilijke momenten, de grappige berichtjes, de babbels-bij-een-pintje, en om mij mee te sleuren naar de yoga. Karel en Betty, onze gesprekken zijn bijzonder waardevol geweest voor mij, bedankt voor jullie vriendschap en wijsheid. Karolien, rots in eender welke branding. Bedankt voor de saunabezoekjes, massages, glaasjes wijn, strandwandelingen, etentjes of shopmiddagen. Voor ieder stressprobleem had jij meteen de gepaste oplossing.

Langs de weg stonden er dag en nacht, jaar in jaar uit trouwe supporters met een niet aflatend enthousiasme. Dankjewel aan mijn schoonouders, voor de hulp en voor de oprechte fierheid bij iedere kleine stap onderweg. Ik waardeer jullie betrokkenheid en de welgemeende vragen over mijn werk. Mijn ouders wil ik bedanken voor het warme nest waarin ik mocht opgroeien en waarin ik vertrouwen kon krijgen in mezelf. De uitgesproken en niet uitgesproken trots in jullie dochter deden mij deugd.

Maar hoe heerlijk was het om thuis te kunnen komen... Er wordt wat afgelachen, geknuffeld en getaterd bij ons in huis. Aileen, Amy en Hanne, ik ben onwaarschijnlijk fier op de geweldige, jonge vrouwen die jullie geworden zijn. ‘Tuurlijk, moet je doen mamsie!’ – het is een slagzin die me vaak over de streep heeft getrokken. Manu, bedankt om mijn twijfel weg te nemen en me te stimuleren om te studeren, te doctoreren. De vanzelfsprekende manier waarop jij de laatste jaren alles mee draaiende hebt gehouden, daarvoor kan ik je onmogelijk genoeg bedanken.

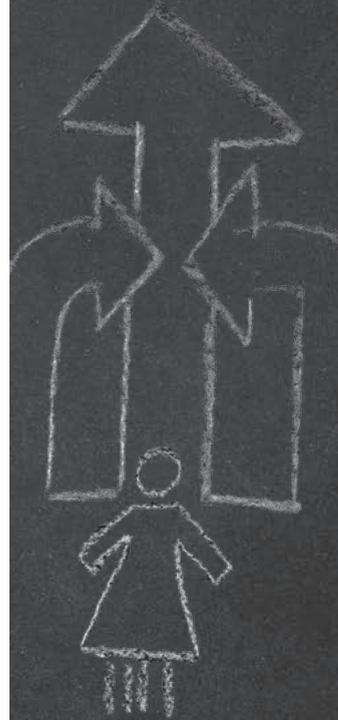
Het uitzicht is mooi, de toekomst wacht.

Kristin

Chapter

1

General introduction and
research aims



1. PROBLEM STATEMENT

The quality of teacher judgement greatly influences the extent to which education can provide equal and fair educational opportunities for all pupils (Bonvin, 2003; Eurydice, 2011; Shepard & Smith, 1989). Therefore, it is important for teachers to strive to make high-quality decisions, as these decisions will influence pupils' lives. This is especially the case when the stakes are high (e.g., passing or failing, graduating or not graduating). Although teachers enjoy considerable decision-related autonomy in areas such as decisions related to the progress of their pupils' educational trajectories, little is known about how teachers make decisions (Earl & Katz, 2006; Eurydice, 2011; Harteis, Koch, & Morgenthaler, 2008).

For a long while in education, both researchers and policymakers had great trust in teachers' intuitive judgement derived from experience within the teaching profession (Clandinin & Connelly, 1987; Elbaz, 1983; March, 1994; Shavelson & Stern, 1981; Shulman, 1986; Verloop, Van Driel, & Meijer, 2001). However, during the past decade, the trustworthiness of teachers' intuitive judgement has been questioned. An array of studies showed a lack of validity and reliability when the accuracy of teachers' intuitive judgement was compared with objective measures such as standardized tests (Brookhart, 1994, 2003, 2013; Feinberg & Shapiro, 2009; Harlen & Deakin, 2002; Hoge & Coladarci, 1989; Reeves, Boyle, & Christie, 2001). Mostly, these studies showed that intuitive teacher judgement disadvantaged specific groups such as low achievers, pupils with special educational needs or pupils from lower social classes (Briscoe, 1991; Brookhart, 2013; Kelly, 1914; Rugg, 1918; Starch & Elliott, 1912; Stiggins, 2005). However, it is difficult to define what processes underlie this intuitive teacher judgement. Although the data-use literature often mentions that teachers still rely greatly on their intuition, a transparent conceptualisation of intuition in the context of educational decision making appears to be lacking. In other professional domains, intuition is often defined as the capability to decide quickly and appropriately without deliberately processing data or balancing alternatives, without following lengthy procedures, and possibly without awareness (Harteis, Koch, & Morgenthaler, 2008; Hogarth, 2001; Klein, 2008). This broad definition of intuition can be used as a starting point, but a more narrow and specific conceptualisation needs to be found that permits empirical research on this topic in education. In this research, we aim to disentangle the confusion stemming from a lack of insight into intuition by developing a clear definition of intuition and intuitive processes in the context of teachers' high-stakes decision making. In this manner, we aim to contribute to the existing knowledge base by providing a transparent conceptualisation of a term that is often used, but seldom explained unambiguously in the educational decision-making literature.

Following upon the disappointing findings with regard to the accuracy of teacher judgement, policymakers and researchers expected educational decision making to

become more standardized and rational (Mandinach, Honey, & Light, 2006; Schildkamp, Lai, & Earl, 2012). The application of rational decision models in an educational context describes optimal teacher judgement as a sequence of data collection, analyses and interpretation to evaluate alternatives before teachers make a decision (Datnow, Park, & Wohlstetter, 2007; Schildkamp & Lai, 2012; Strayhorn, Kowalski, & Lasley, 2009). However, data use is often addressed as a broad and overarching term. In the context of teacher judgement, a fine-grained and in-depth insight into what can be understood by the processes of data use and how they differ from intuitive decision processes is greatly lacking. Too often, the use of data in a decision process is considered to lead to rational decisions. Up to now, there has been little insight into how teachers use data and their intuition in the different steps of a decision process, how they make sense of data and how this leads to a decision. Given the important impact of teacher judgement on pupils' educational trajectories, we must open this black box and shed light on the processes by which data, intuition and their interplay influence teachers' decisions. In the theoretical framework, we must also build clear definitions that allow an unambiguous understanding of rational and intuitive processes in the context of teacher judgement.

Research mostly studies teacher judgement either from a data use or from a teacher knowledge perspective. Whether we can trust intuitive judgment or whether we should adhere to rational judgement based on data is a controversial topic. However, as many researchers in the field of decision making agree, it seems appropriate to assume that both rational and intuitive processes will influence teacher judgement, and that both processes have merits and pitfalls (Epstein, 2002; Evans, 2008; Ferreira, Garcia-Marques, Garrido, & Sherman, 2006; Goldstein & Hogarth, 1997; Klein, 2008; Myers, 2002; Tversky & Kahneman, 1981). This dual-processes approach starts from the idea that human judgement is influenced by both rational processes based on deliberate data analyses and intuitive processes guided by automatic recognition. Although in empirical analyses these processes are separated for reasons of conceptual clarity, intuition is not the opposite of rationality. In practice, both processes are expected to be intertwined and mutually influence teacher judgement (Hammond, 1996; Kahneman & Frederick, 2005). In education there is little in-depth insight into the processes of teacher judgement in general (Little, 2012). To our knowledge, no research has studied teacher judgement from a dual-process perspective. *Therefore, our first research aim is to describe and disentangle how both rational and intuitive processes influence teacher judgement.*

Rational theories of decision making often start from the idea that data use can help prevent different sorts of bias associated with intuitive judgement, as, for example, confirmation bias when teachers mainly see those characteristics from pupils that they expect to see, leading to self-fulfilling prophecies or stereotyping (Jussim & Harber, 2005; Rubie-Davies, Hattie, & Hamilton, 2006). However, bias may also be present in

data-based decision making as, for one thing, all educational tests have some degree of measurement error (Gardner, 1995) and data still need to be interpreted by the teacher. The same data might have different meanings to different teachers, as they might use different (personal) criteria. The transparency of the sense-making process is an important means through which to question and investigate to what extent teachers' decisions are supported by the data. In sum, since judgemental errors may be related to both rational and intuitive processes in teacher judgement, a *second research goal aims at investigating the conditions that are necessary to prevent bias deriving from rational and intuitive processes in teacher judgement.*

There are a variety of data sources available in schools that can be used as a basis on which to make decisions, but not every teacher will pay attention to the same data, make sense of them in the same way and accept them, because teachers have different knowledge, skills and dispositions towards decision making (Mandinach & Jimerson, 2016). In the past, studies have pointed out that teacher judgment is subject to much individual teacher variation (Brookhart, 1994, 2013; Kaiser et al., 2013). For one thing, if teachers are not motivated to use data, data use is not going to happen, since the motivation of the decision maker exerts a major influence on the decision-making behaviour (Schildkamp & Lai, 2013). Research has also shown that teachers will likely make decisions in different ways in similar situations because they have a predominantly rational or intuitive decision-making style (Epstein, 2008; Nutt, 1990) and because they apply different values when they assess pupils' competences (Rubie-Davies, 2010). Because teachers have different understandings and beliefs about the purposes of their teaching, they use different teaching approaches and they will likely use cognitive and non-cognitive indicators differently in their judgement of pupils' capabilities (Brookhart, 2013; Randall & Engelhard, 2010).

Further, conditions at the school level have also been shown to influence teachers' decision making, although this has been studied almost exclusively in the context of data-based decision making (e.g. Earl & Katz, 2006; Mandinach & Jimerson, 2016). For example, supportive relationships within the school team have been put forward as an important foundation for data use. This ensures, for example, that teachers are not afraid to discuss data – including possible problems or questions and not just the positive results – because they trust each other (Bryk & Schneider, 2003). Further, the data use literature stresses the importance of the reflective capacity of a team that believes in the importance of reflection based on data (Schildkamp, Poortman, Luyten, & Ebbeler, 2016; Vanhoof, & Van Petegem, 2011; Wohlstetter, Datnow, & Park, 2008). In schools with such reflective capacity, teachers will likely use more data rationally to question their assumptions.

Since research that studies supportive and hindering conditions with regard to decision making is largely embedded in the context of data-based decision making, our *third*

research goal aims at examining what conditions at the teacher and school levels influence both the rational and intuitive processes in teacher judgement.

2. THEORETICAL PERSPECTIVES ON TEACHER JUDGEMENT

Over the last decade, there has been considerable research interest in data-based decision making in education. Studies have identified different steps of a complex, iterative circle of inquiry in which teachers define a question or problem, search for data, analyse and interpret data and deliberately evaluate alternatives before a decision is made (Datnow & Hubbard, 2016; Schildkamp & Lai, 2012; Strayhorn et al., 2009). An initial line of research broadly discussed factors that support and hinder data use with the aim of enhancing data-based decision making in education, starting from the hypothesis that rational processes lead to better judgement than intuitive processes (Young, 2006). Meanwhile, a growing body of data use literature has explored teacher judgement as a contextualized and complex practice influenced by teachers' personal knowledge and experience, which does not necessarily follow a technical-rational model (Bertrand & Marsh, 2015; Datnow & Hubbard, 2016; Sloman, 2002; Strayhorn et al., 2009). For example, authors use the terms 'wise decision making' or 'professional judgement' to describe how teachers need to combine knowledge of the content and the context in order to select and understand the best data available. Such a combination is said to enhance equitable decisions that are informed by data and grounded in context (Brown, Schildkamp, & Hubers, 2017).

Because our research aims at studying teacher judgement from a dual-process perspective, we needed theory that allowed us to study both rational and intuitive processes in this so-called professional teacher judgment. An extensive and growing body of research has studied the rational processes of data-based decision making in education, but only a few studies on intuitive decision processes are situated in professional domains and almost none in the field of education (Harteis et al., 2008; Myers, 2002; Shapiro & Spence, 1997). In this dissertation, an important challenge was to understand how we could operationalise the intuitive processes in human judgement in an educational context. Whereas frameworks for studying data use were clear from the start, the framework that was ultimately used to study the intuitive processes in teacher judgement emerged over the course of the research project.

An initial exploratory research phase helped us understand and develop conceptual distinctions between complex concepts such as intuition, data, intuitive processes and rational processes. For one thing, we defined boundary conditions that disentangled the confusion between data collected deliberately and systematically and data collected non-deliberately and non-systematically. Our conceptualisation of the main concepts will be elaborated in the theoretical framework (Chapter 2). Throughout our research

project we combined insights from data-based decision making and the recognition-primed decision model (Klein, 2008) into an integrated framework. In the second chapter, we will discuss this integrated framework of teacher judgement that was built throughout our research. For the reader, it is important to know that this theoretical framework was not readily available at the start of our research project, but was developed through evolving insights based on the different studies.

3. OBJECTIVES

Research goal 1: develop a framework that can be used to study both rational and intuitive processes in the different steps of teacher judgement.

Given the decision-related autonomy teachers have in important areas, and the lack of insight into the processes of teacher judgement, this study aims to address the above-mentioned research gaps in the current evidence base. To our knowledge, no research so far has studied teacher judgement from an integrated perspective that takes into account both rational and intuitive processes, that critically examines the conditions that prevent biased judgement and that investigates what teacher and school conditions influence both rational and intuitive processes in teacher judgement. Given the importance of teachers' high-stakes decision making and the expectation that both types of process will influence teacher judgement, the relation between rational and intuitive processes in teacher judgment clearly needs to be investigated. Given the lack of a framework that can be used to study teacher judgment from a dual-process perspective, we aim to develop a theoretical framework that can be used to explore and explain the rational and intuitive processes that underlie teacher judgement.

Research goal 2: describe and disentangle how both rational and intuitive processes influence teacher judgement.

Starting from this integrated framework, in the empirical part of this research we aim to describe and explain how both rational and intuitive processes influence the different steps of teacher judgement. Since rationality is not the opposite of intuition, but both processes are expected to be intertwined, we will also investigate the interplay between the two processes. Further, we will also explore patterns in the different steps of the decision process that can be used to understand different approaches to decision making. Therefore, the following research questions are put forward:

RQ 1: To what extent are the different steps of teachers' decision process based on rational or intuitive processes?

RQ 2: What is the interplay between rational and intuitive processes in the different steps of teachers' decision process?

RQ 3: How can we relate the rational and intuitive processes in the different steps of the decision process so as to understand different approaches to decision making?

Research goal 3: describe which conditions are necessary to prevent bias in teacher judgement.

Research has shown that the outcomes of both rational and intuitive judgement can be biased, but up to now we have little insight into what conditions need to be met in order to prevent bias in the different steps of teachers' decision process. Therefore, the following research questions are put forward:

RQ 4: What conditions can prevent bias in the different steps of teacher judgement?

RQ 5: To what extent does teacher judgement meet the conditions needed to prevent decision bias?

Research goal 4: examining which factors promote or hinder the rational and intuitive processes in teacher judgement.

Starting from the dual-process perspective, we advocate that both rational and intuitive processes are important aspects of teacher judgement. However, we know little about how we can promote an integrated approach to teachers' decision making. A growing body of research has studied factors that promote and hinder data use, but up to now little empirical evidence has described what factors enhance both rational and intuitive processes. Therefore, the following research questions are put forward:

RQ 6: Which factors at the teacher level hinder or promote the rational and intuitive processes in teacher judgement?

RQ 7: Which factors at the school level hinder or promote the rational and intuitive processes in teacher judgement?

4. RESEARCH METHODOLOGY

Our research proceeded in two phases. In an initial exploratory phase having a sequential multimethod design, a quantitative web-based survey was followed by a qualitative case study. The emphasis of the exploratory studies was to gain more insight into the different steps of teachers' decision process. In study 1 we saw that teachers

only use data to a limited extent and that an intuitive decision-making style decreased teachers' autonomous motivation to use data, whereas a rational decision-making style increased the autonomous motivation to use data. Based on these findings, study 2 aimed to gain more understanding of intuitive decision making and aimed to explore how both intuition and data were part of teachers' decisions. This study highlighted the need for more insight into the concept of intuition in the context of teacher judgment and into how it influences the decision process.

Based on the insights from our exploratory phase and an extended literature review, a refined framework was developed to describe and explain the processes of teacher judgement in the different steps of the decision process, starting from a dual-process perspective. In the second empirical phase of our research, a longitudinal case study design was undertaken with the aim of gaining in-depth insight into both rational and intuitive processes in teacher judgement. We found little empirical evidence that explained either the processes of teacher judgement in general or the intuitive processes in teacher judgement more specifically. Given the lack of a solid research base, we decided to focus the explanatory phase of this dissertation on the individual processes of teacher judgment and influential factors at the teacher level. Although the research, as well as the results from our first exploratory study, suggested that teacher judgement is also influenced by factors at the school level, we deliberately chose to narrow our research in order to gain fine-grained insight into the black box of teachers' decision processes.

Our research stance is aligned with a constructivist approach that aims to explain a phenomenon, such as teachers' decision process, within the complexity of its context (Bloland, 2005). The aim of constructivist inquiry is to study a phenomenon in the social setting in which it usually interacts, for example, using real cases of ongoing decision processes about specific pupils instead of general questionnaires (Denzin & Lincoln, 2000).

Our position is that an in-depth inquiry into the complex matter of teacher judgement, which operates under constantly changing conditions and is influenced by numerous factors, needs to be grounded in its context. Starting from a constructivist research stance, we attempt to capture variations in teachers' decision making through fine-grained descriptions of a specific decision process regarding pupils' transition. A multiple case study design was suited for the purpose because it allows us to explore teachers' decision process over time (one school year) through detailed and in-depth data collection (Yin, 1994). Multiple cases (i.e., transition decisions) were selected to describe different perspectives on the phenomenon (i.e., the decision process) (Creswell, 2005).

5. OUTLINE OF THIS DISSERTATION

The main aim of this dissertation is to disentangle teachers' decision processes when making high-stakes decisions. Four overarching research aims have been put forward and five individual studies will be discussed in the following chapters. **Table 1** provides an overview of the different studies and how they are related to the three research aims that form the empirical part of this dissertation.

Table 1: Overview of this dissertation

Study	Chapter	Title	Describing and explaining rational and intuitive processes	Conditions to prevent biased judgement	Understanding influential factors for teacher judgement
1	2	Data use by teachers: the impact of motivation, decision-making style, supportive relationships and reflective capacity.	x		x
2	3	Teachers' decision-making: Data based or intuition driven?	x	x	
3	4	Teachers' high-stakes decision making. How teaching approaches affect rational and intuitive data collection.	x		x
4	5	How do teachers make sense of data in the context of high-stakes decision making?	x	x	
5	6	Examining teacher judgement from a dual-process perspective. How rational and intuitive processes mutually influence teachers' decisions.	x	x	x

In an initial exploratory part of this dissertation, a broad view of decision-making and judgement was used to explore rationality and intuition in teacher judgement.

Study 1 describes the extent to which teachers use data for decisions at the classroom level. Based on large-scale survey data, it provides insight as to why teachers differ in the extent to which they use data. The study discusses the impact on teachers' data use of their motivation to use data, decision-making style, supportive relationships and reflective capacity.

Study 2 explores how data and intuition influence teachers' decision process. Results of semi-structured interviews are used to refine our view of data as well as of the intuitive processes in teacher judgement.

In the second phase we studied the different steps of teachers' decision process from a dual-process perspective.

Study 3 describes what data teachers collect rationally or intuitively when making high-stakes decisions. It also provides insight into how teachers' approaches influence their data collection. The focus of **study 4** is on the sense-making process, investigating to what extent teachers use pre-defined or personal criteria, search for alternative explanations and triangulate data when they interpret data.

Study 5 provides a general overview of the different steps in teacher judgement and how they are related. We offer a more in-depth discussion of what data are taken into account when teachers evaluate alternatives and what data are decisive for the final decision.

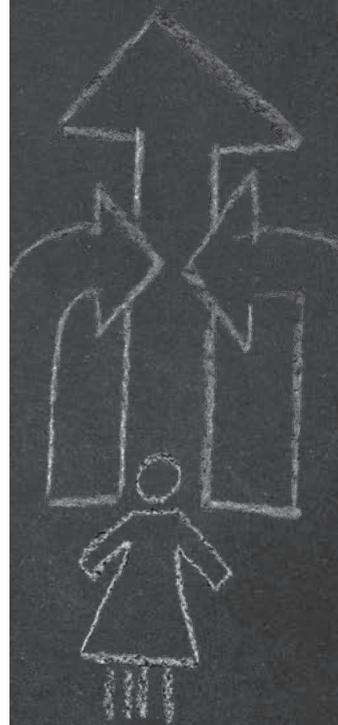
This dissertation has an article-based structure: three of its chapters have been published in academic journals and three of its chapters have been submitted for publication.

Chapter 2

Theoretical framework

This chapter is partly based on

Vanlommel, K., Van Gasse, R., Vanhoof, J., Van Petegem, P.
(submitted) A conceptual proposal for an integrated framework on
teacher judgment that combines theories on data use and intuition
as expertise. Article submitted for publication in
Educational Research



1. TEACHER JUDGEMENT FROM A DUAL-PROCESS PERSPECTIVE

In the field of decision making, recently developed theories on dual-process approaches to decision making indicate that rational and intuitive processes both influence human judgment (Hogarth, 2001; Klein, 2008). Up till now, there has been a lack of insight into how a mutual interplay of these processes can contribute to teacher judgement. In this dissertation, the investigation of rational processes in teacher judgement is based upon theories off data-based decision making that are commonly used within education (Datnow & Hubbard, 2016; Mandinach & Jimerson, 2016; Schildkamp, Poortman, & Handelzalts, 2016). The intuitive processes of teacher judgment will be studied through the lenses of naturalistic decision making. These theories have contributed to our understanding of intuitive judgement in other professional fields, but so far this has not been a common approach to studying decision making in an educational context. The recognition-primed decision model describes how experts can use their professional knowledge of subject and context to make accurate decisions, based on their expertise (Klein, 2008). Experts are usually defined as those professionals (e.g., teachers) who are recognized within their profession as having gained, through learning and experience, the necessary competences to perform proficiently. In this regard, intuitive decision processes are approached from a learning perspective, explaining how teachers develop individual knowledge structures during explicit and implicit learning within their specific school context (Harteis et al., 2008).

2. WHAT IS DATA-BASED DECISION MAKING AND HOW CAN IT CONTRIBUTE TO TEACHER JUDGEMENT?

2.1 Clarifying the concepts of 'data' and 'data-based decision making'

As a counter-movement to the era in which teachers' intuitive knowledge strongly influenced the outcomes of teacher judgement, the initial body of data use research mainly conceptualised data as quantitative indicators of pupils' cognitive output (Hubbard, Datnow, & Pruyne, 2014). This was based on the assumption that the quality of educational decisions would increase to the extent that they were based on objective measures, such as standardized tests.

More recently, scholars have critiqued this narrow view because it inhibits a full understanding of pupils' competences and it has led to undesirable practices such as 'teaching to the test' (Brown, 2017; Ehren & Swanborn, 2012). Therefore, broadening the concept of data to include all indicators that inform some aspect of schooling has been advocated (Schildkamp & Lai, 2012). These definitions include quantitative measures, such as results from (standardized) tests or attendance rates, but also

qualitative indicators, such as observations in the classroom or conversations with colleagues, pupils or parents.

Although this recent shift towards broad and encompassing definitions of data acknowledge that there is more to learning than the results of standardized tests, the downfall is that the concept of data has become entangled, leading to conceptual confusion. For this reason, we need to delimit the concept of data in the context of teacher judgement. Further, to understand the concept of data as it is intended in theories of data-based decision making, we need to fully understand the boundary conditions that separate rational processes of data use from intuitive processes that also inform teacher judgement. For example, can we define teachers' informal observations of pupils' behaviour as 'data' since they provide teachers with cognitive or non-cognitive information directly related to the pupil? According to rational decision theories, data collection needs to be initiated by a clear goal or question and follows a cyclic circle of inquiry (Earl & Louis, 2013; Schildkamp & Lai, 2012). In the recognition-primed decision model, indicators are collected through an automatic recognition of cues that is guided by patterns stored in memory instead of fixed procedures. In this dissertation, we came to following conceptualisation of data:

Data refers to all cognitive and non-cognitive indicators (both quantitative and qualitative) directly related to the pupil. Data can be collected rationally (deliberate and systematic) or intuitively (non-deliberate, non-systematic).

Data-based decision making can then be defined as a complex and iterative process in which a problem or question is diagnosed, data are collected deliberately and systematically, analysed and interpreted and alternatives are tested against pre-defined criteria before a decision is made (Coburn, Toure, & Yamashita, 2009; Coburn & Turner, 2012). The research keeps showing that data-based decision making is still limited in practice (Datnow & Hubbard, 2016; Verhaeghe, Vanhoof, Van Petegem, Verhaeghe, & Van Damme, 2010). This may be due to the principle of bounded rationality or because data as such have no meaning unless the teacher makes sense of them. We will elaborate on these limitations to rational data use in the next section.

2.2. Limitations of rational data use: the principles of bounded rationality and sense making

Where pure rational theories assume that teachers can easily access all data that they need, that they have knowledge of all alternatives and that the consequences of a decision are known and consistent, this does not coincide with teacher judgement in practice. In practice, not all data are available, not all alternatives can be considered and the consequences of a decision are often hard to predict (Kahneman, 2003; March, 1978; Simon, 1987). Decision makers focus on some data and they ignore others, because they do not have the time or the cognitive ability to process all data that are

available. The core idea of bounded rationality is that teachers (as with all decision makers) may intend to make rational decisions, but they cannot because they are constrained by limited time, incomplete information or limited cognitive capabilities to process all of the data. Decision makers face limitations in attention, memory and comprehension with regard to their information-processing capacities (Kahneman, 2003).

A second limitation to full rationality of teacher judgement is related to the process of sense making. Data have no meaning in the form in which they are presented. They need to be interpreted; meaning is constructed in the mind of the teacher, where new information is linked to existing information and transformed into knowledge that is meaningful for the teacher (Bertrand & Marsh, 2015). Phrased differently, the process of sense making is not merely a technical process in which objective, external standards translate data into conclusions in a mechanical way. Rather, it is a normative process enacted through the teacher who uses his or her personal knowledge and beliefs about teaching to understand what the data mean in the specific context (Bertrand & Marsh, 2015).

In summary, rational data use can contribute to teacher judgement, since it provides teachers with information on pupils' competences and it is considered to be a valuable touchstone to test intuitive judgement. However, theories of bounded rationality suggest that teachers' decision making cannot be fully rational since teachers' time and cognitive capabilities are too limited to process all available data. Therefore, it is suggested that intuitive processes are needed to help teachers focus attention on relevant data and help them understand what the data mean (Klein, 2008; March, 1994).

3. WHAT IS INTUITION AND HOW CAN IT CONTRIBUTE TO PROFESSIONAL TEACHER JUDGEMENT?

Theories of intuition often start from differing viewpoints. They either consider intuition as a valuable complement of professional expertise, as we will discuss in the recognition-primed decision model (Klein, 2008; Simon, 1987), or they study intuition as heuristics and bias (e.g., Kahneman & Frederick, 2005; Klayman, 1995; Slovic, Finucane, Peters, & MacGregor, 2002). In order to gain insight into the role of intuitive processes in teacher judgement, it is important to understand both when intuitive processes can contribute to teacher judgement and when they may lead to bias.

3.1 Intuition as expertise

From the first point of view, theories of naturalistic decision making focus on the value of expert intuition, originating from early research on master chess players who were able to make accurate decisions because they recognized cues and complex patterns (Chase & Simon, 1973; De Groot, 1978). This led to the definition of intuition as recognition, and was elaborated further in the recognition-primed decision model (Klein, 1997, 2008). Klein (2008) described how subject-matter experts are able to make good decisions in complex contexts because they recognize cues and patterns based on the expert knowledge stored in their memory, without a deliberate and systematic search. Applied to teacher judgment, this means that teachers who have gained the necessary competences through learning and experience should be able to recognize cues and patterns in complex decision situations. This recognition allows teachers to respond spontaneously and to develop a course of action without a deliberate and systematic collection and analysis of data (Kahneman, 2003; Klein, 2008). Studies from the field of intuitive expertise have shown that experts can make accurate decisions based on a narrow choice of indicators (De Groot, 1978; Klein, Calderwood, & Clinton-Cirocco, 1986). Starting from these theories, we came to following conceptualisation of intuition in the context of teacher judgement:

Intuition is a personal knowledge base that consists of patterns and mental models teachers have acquired through learning and experience, enabling teachers to recognize cues spontaneously without deliberate attention or a systematic approach.

However, two boundary conditions separate intuitive expertise from overconfident and biased intuitive judgement (Kahneman & Klein, 2009). First, skilled intuitive judgment will only develop in an environment of sufficient regularity to provide valid cues. For example, Klein et al. (1986) studied how firefighters learn to understand familiar cues when fighting fires with recurring causes in regular houses. By seeing the same cues over and over again and learning what they mean in those circumstances, firefighters develop patterns and mental models that make them experts. However, when the firefighter is confronted with a highly unusual situation, for example, a fire in a chemical laboratory, his or her intuitive judgement will likely fail as far as recognizing cues and making decisions based only on these cues. Overconfidence in one's intuition often causes experts to rely on the same strategies when faced with different situations, leading to poor judgement.

A second boundary condition for the accuracy of intuitive judgment is the availability of direct feedback. Using the example of firefighters, when they make a poor judgment the flames will immediately rise, for example, informing them instantly that they made a wrong decision. Firefighting is also teamwork, so that when one person is on the point of making a poor judgement, colleagues will immediately warn him or her not to do so. Because this environment provides direct and immediate feedback on judgements

made, firefighters are able to develop accurate patterns that can be stored in memory and that can help them make accurate decisions based on a limited amount of cues.

However, we can wonder to what extent teacher judgement meets these requirements. Multiple factors interfere with and mediate the consequences of teacher judgement. The context of the classroom and the context of each pupil change constantly. For example, how a pupil's educational trajectory evolves is influenced not only by his or her level of achievement, but also by events occurring at home or with friends, socio-emotional growth, and so on. Further, teachers do not receive immediate and direct feedback on their actions as in the example of firefighters. Mostly, teaching is an individual job between the walls of the classroom, and collaboration about pupils' learning outcomes has been shown to be limited (Van Gasse, Vanlommel, Vanhoof, & Van Petegem, 2016). Kahneman and Frederick (2005) suggest that when these two conditions are not (completely) satisfied, people cannot trust in only a limited amount of intuitive cues; instead, these cues need to be complemented and tested by data collected rationally. Data triangulation and testing alternative hypotheses are considered to be important preconditions to prevent intuition from leading to over-reliance on heuristics and bias.

3.2 Intuition as heuristics and bias

In contrast to theories of naturalistic decision making, the heuristics and bias approach starts from the assumption that intuition decreases the accuracy of teacher judgment. In this regard, Kahneman (2003) used the term 'illusion of validity' for the unjustified sense of confidence that often comes with intuitive judgment. Kahneman and Tversky (1972) first described the heuristics and bias of intuitive judgment, and many studies since have confirmed the persistence of different errors in the intuitive judgement of professionals. For example, teachers may only see data that confirm their assumptions and ignore data that point to the contrary when data are collected non-deliberately and non-systematically.

The idea of confirmation bias raises critical questions with regard to the accuracy of teacher judgement, as it may lead to such outcomes as stereotyping and self-fulfilling prophecies (Agirdag, Van Avermaet, & Van Houtte, 2013; Jussim & Harber, 2005; Kahneman & Frederick, 2005; McCarty, 2002; Rubie-Davies et al., 2006; Sharma & Sharma, 2015; Smith, Jussim, & Eccles, 1999). Stereotypes comprise evaluative judgements of a given group, such as a social class, ethnic group or gender, that enable teachers to come to a quick judgment based on a limited amount of cues. Tversky and Kahneman (1981) describe a similar bias as the representative heuristic. Both stereotyping and the representative heuristic imply that teachers base their judgment on partial information (about often irrelevant features) that is insufficient for coming to a good judgment. When teachers collect little data rationally to challenge intuitive processes of judgement, the pitfall is that this teachers' initial problem definition is

merely strengthened, rather than being challenged by data. In this way, teachers' initial judgement proves to be right at the end of the decision process.

In summary, intuitive processes can contribute to professional teacher judgment because expert teachers are able to recognize important cues and make sense of data in a specific context. However, intuitive judgement can also lead to biased decisions (Kahneman & Klein, 2009). Since both rational and intuitive processes have merits and pitfalls, we need to understand how these processes and the interplay between them can contribute to teacher judgement. In the subsequent section, theories on both rational and intuitive decision making will be integrated in relation to the steps of problem definition, data collection and processing, evaluation of alternatives and decision, which are commonly identified in decision theories (e.g., Blackwell, Miniard, & Engel, 2006; Mintzberg & Westley, 2001; Schildkamp & Lai, 2012).

4. RATIONAL AND INTUITIVE PROCESSES INTEGRATED IN THE DIFFERENT STEPS OF THE DECISION PROCESS

Step 1: Problem definition

A problem or goal is defined when the actual state of affairs is weighed against personal or shared standards (Mintzberg & Westley, 2001; Schildkamp, Poortman, & Handelzalts, 2016). Starting from a naturalistic approach to decision making, a decision process may be initiated when a teacher recognizes a cue spontaneously. This recognition-primed problem definition is acknowledged to be an important aspect of expertise, since it helps teachers to be aware of possible problems at an early stage, even when little relevant data may be available at that point in time. However, decision theory stresses the need for further problem diagnosis, using data to test teachers' hypotheses (Schildkamp, Poortman, & Handelzalts, 2016). Since the entire decision process might be inaccurate when it is guided by a false problem definition (Mintzberg, Raisinghani, & Theoret, 1976; Mintzberg & Westley, 2001), we will critically investigate to what extent teachers recognize and/or diagnose a problem.

Step 2: Data collection

Subsequently, problem definition is expected to trigger the search for more data (Evans, 2008; Schildkamp et al., 2012). Data search may be guided by rational processes when initiated based on a pre-set goal and collected systematically, as described in data-based decision making (e.g., Mandinach et al., 2006). Teachers might also gather data intuitively without a clear goal or plan for data collection. Both rational and intuitive data collection are considered to be valuable parts of professional teacher judgement. However, research has shown that both rational and intuitive processes of data

collection may be vulnerable to different sources of bias (Burgess, Greaves, Vignoles, & Wilson, 2009; Kahneman & Frederick, 2005; Klayman, 1995). According to decision theory, teachers may mainly pay attention to indicators that confirm what they already believe and often ignore data that point to the contrary (Goldstein & Hogarth, 1997; Harteis et al., 2008; G. Klein, 2008; Tversky & Kahneman, 1981). In order to prevent the pitfall of confirmation bias, using multiple data sources (triangulation) can help raise questions and complement information deriving from one source with information from another (Earl & Katz, 2006; Kahneman & Klein, 2009). The complexity of conclusions related to pupils' competences also requires a detailed and balanced view from more than one data source (Cohen, Manion, & Morriison, 2008; Creswell, 2005). Therefore, we will critically examine to what extent teachers use multiple sources of data to question the assumptions deriving from intuitive data collection and also to cross-check data collected rationally.

Step 3: Making sense of data

Independent of the rational or intuitive nature of teachers' data collection, data need to be analysed and interpreted before they can inform teachers' decision making (Bertrand & Marsh, 2015). It is suggested that, although rational models prescribe optimal procedures for coming to valid conclusions (Bosker, Branderhorst, & Visscher, 2007; Leonard, Scholl, & Kowalski, 1999), in practice people are more likely to take mental shortcuts (heuristics) to come to quicker and easier conclusions (Evans, 2006; Kahneman, 2003; Klein, 2008). Heuristics can be defined as simple procedures for reaching satisfying, but possibly invalid conclusions. False inferences (fallacies) may be drawn when teachers' conclusions are not supported by the data, because of a biased interpretation (Evans, 2006; Kahneman & Frederick, 2005). As stated above, false inferences are often explained in terms of confirmation bias, when teachers frame the data to fit their existing beliefs (Harteis et al., 2008; Kahneman & Frederick, 2005). The focus is often on confirming hypotheses, not challenging them. An important way to tackle an invalid interpretation of data because of confirmation bias is to search for contrasting explanations that question pre-held beliefs and assumptions (Kahneman & Frederick, 2005). Therefore, teachers need to consider plausible rival explanations in order to question their assumptions. Looking at the criteria used when teachers make inferences is also important. Heuristics may lead to quick conclusions that are mainly based on personal criteria instead of rational, pre-defined criteria (Kahneman & Frederick, 2005).

Sense making is a critical aspect of teacher judgement to consider in the light of educational decisions, but in-depth insight into how teachers make sense of data is still lacking (Coburn & Turner, 2012; Datnow & Hubbard, 2016)

Step 4: Evaluation of alternatives

In the fourth step, after teachers have collected and processed all data, an important question concerns what data teachers take into account when they evaluate alternatives and make a decision. Even decision processes that are predominantly rational may result in intuitive judgement when information deriving from one intuitive cue overrules all information deriving from rational data collection. Teachers may have collected different sources of data in a deliberate and systematic manner during the year, for example, test results. When there is a decision to be made, the alternatives based on these test results are compared with evaluations based on teachers' intuitive data collection. Research has shown that the evaluative criteria applied by teachers are often based on subjective beliefs about good teaching (Allal, 2013; Rubie-Davies, 2010; Zanting, Verloop, & Vermunt, 2001). Information deriving from both rational and intuitive evidence may coincide and thus strengthen teacher judgement, or may provide contrasting viewpoints. In that case, an important question lies in investigating how teachers evaluate the alternatives and what type of evidence (rational, intuitive) is decisive for the final decision.

In summary, rational and intuitive processes need to be understood in relation to the different steps of the decision process.

In the first step of the decision process, rational processes refer to problem diagnosis when teachers use at least one process or output indicator to define a problem or to challenge intuitive problem recognition. In the subsequent steps, rational processes refer to a deliberate and systematic collection of data, interpreted by pre-defined criteria and an evaluation of alternatives that starts from a rational evidence base.

Intuitive processes on the other hand refer to problem recognition without further diagnosis, to a non-deliberate, non-systematic data collection guided by spontaneous recognition, an interpretation based on personal criteria and an evaluation of alternatives that starts from an intuitive evidence base.

Teachers' decisions may be based on rational or intuitive processes in the different steps of the decision process, or on a combination of both. Figure 1 provides a static visual overview of what is, in practice, a complex, iterative process.

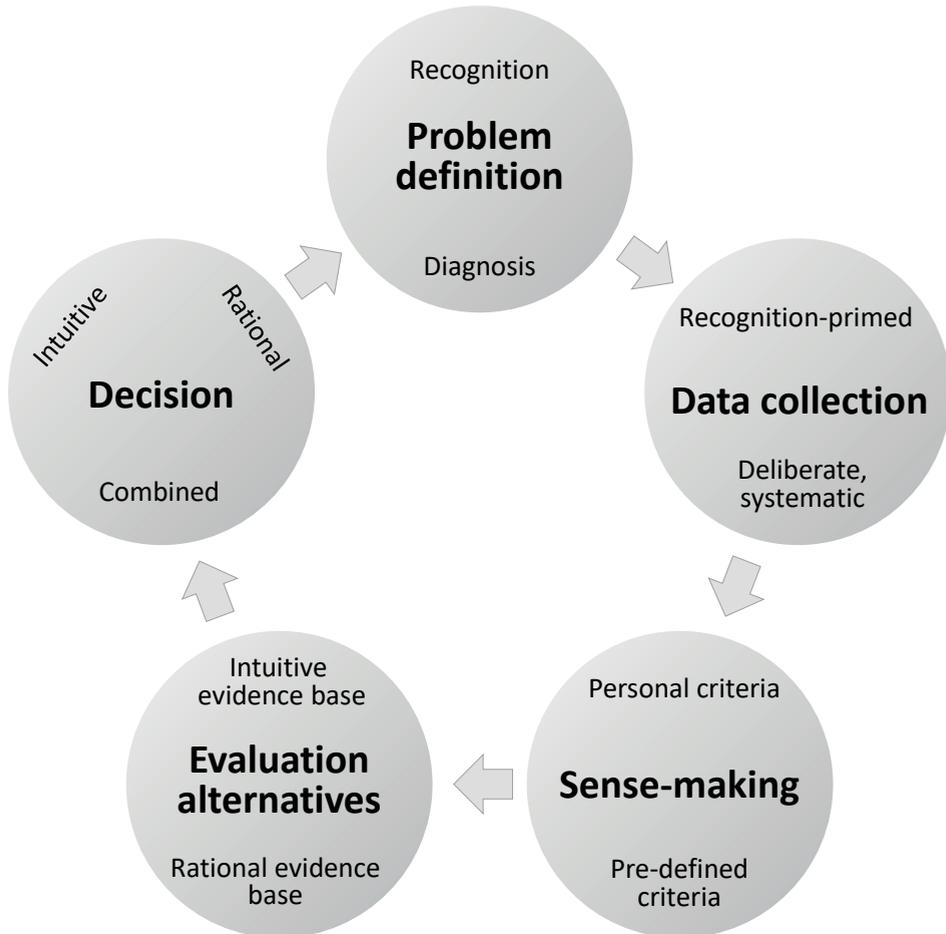


Figure 1: Overview of rational and intuitive aspects of the different steps of the decision process

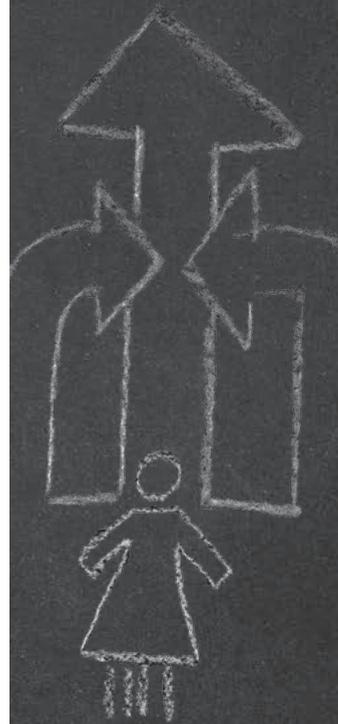
3

Chapter

Data use by teachers: the impact of motivation, decision-making style, supportive relationships and reflective capacity

This chapter is based on

Vanlommel, K., Vanhoof, J., & Van Petegem, P. (2016). Data use by teachers: the impact of motivation, decision-making style, supportive relationships and reflective capacity. *Educational Studies*, 42(1), 36-53.



1. INTRODUCTION

Teachers enjoy considerable autonomy in important areas, such as the choice of teaching methods or how they assess their pupils (Eurydice 2011). The quality of their decisions is therefore of crucial importance. Empirical research demonstrates that sound and effective use of data can make a major contribution to good decision-making in schools (Rossi, Lipsey, & Freeman 2004, Schildkamp & Ehren, 2013, Earl & Katz, 2006). If teachers predominantly base their decisions on individual perceptions, opinions or limited observations, there is a risk that the teaching provided may not fully meet pupils' needs (Earl & Katz, 2006). When teachers become active users of data, they have access to a broader spectrum of information on which to base their decisions. Data thus constitute a source of information as part of a cycle of reflection in which teachers continually monitor the impact of their teaching practices on pupil performances. In this way teachers can modify their approach when they see that it is not sufficiently effective (Timperley et al., 2007).

For example, by using assessment data such as the results of standardized tests teachers can monitor and check whether their pupils are achieving the objectives that have been set, which in turn can be used as a basis on which teachers can decide whether they need to modify materials, instructions or support. Research indicates that pupils' education suffers when teachers fail to make use of the results of standardized tests, or do so only to a limited extent, given that this is a rich source of information about their pupils (Lai & Schildkamp, 2013; Timperley & Phillips 2003). However, it also appears that the majority of teachers worldwide scarcely make any use of the data available to them when they make decisions (Ledoux et al., 2009; Schildkamp & Kuiper 2010; Robinson, Phillips, and Timperley, 2002). Teachers appear to base most of their decisions on what they see happening in the classroom or on their experience (Ledoux et al., 2009; Schildkamp & Kuiper 2010).

The introduction of new approaches to decision-making involving the use of data means that teachers can no longer cling to their traditional way of working. However, changing this is no easy matter. Teachers bring in to a decision task certain dispositions and cognitive styles (Hunt, Krystofiak, & Meindl, 1989). We should remember that the implicit knowledge base of teachers has long been recognized as the principal source of information (Darling-Hammond & Sykes 1999). Changing habits of mind requires the right dispositions to data-based decision making, such as the motivation to use data. If teachers are not motivated to use data, data use is not going to happen since the motivation of the decision maker exerts a major influence on the decision making behaviour (Schildkamp & Lai, 2013; Taylor, 1984). Although scholars have stressed the need for research that focuses on the interplay between psychological antecedents as teachers' motivation and change, systematic research is scarce (Thoonen, Slegers, Oort, Peetsma, & Geijssel, 2011). The results of the few studies available show that the impact

of different structural and cultural dimensions of the school organization on teaching practices are mediated by psychological factors (Geijsel, Slegers, Stoel, & Krüger, 2009; Kwakman, 2003; Smylie, 1992). So, if we want to deepen and broaden our understanding of data use in schools, it is important to investigate teachers' motivation for data use and conditions that might influence teachers' motivation.

Self-determination theory (SDT) (Deci & Ryan 2002) allows us to examine the reasons that teachers give for using data (regulation) and the extent to which they feel themselves to be autonomously motivated to use data or see themselves as subject to a controlled motivation. Motivation is of crucial importance in change processes: if teachers are not prepared to familiarize themselves with a new way of working and are not willing to apply it, nothing will change (Earl et al., 2003). Research shows, however, that teachers, more than other professionals, are often resistant to change (Jesus & Lens 2005; Prick, 1989; Esteve, 1992). SDT assumes that people have a natural desire to continue to develop and to take on new responsibilities (Deci & Vansteenkiste, 2004). However, SDT recognizes that this innate disposition towards growth does not arise unconditionally: it only manifests itself when people find themselves in a stimulating environment (Van den Broeck et al., 2009). This makes it especially important that the school team has a positive attitude with regard to collective reflection based on data. A positive attitude influences the quality of the individual's motivation, which in turn results in changes in behaviour (Naquin & Holton, 2002). Moreover, teachers must be prepared to expose their vulnerabilities. Analysis of data can reveal information that is incompatible with the teacher's own views and conceptions, which might call his or her judgement into question and which, in turn, might lead to feelings of insecurity, anxiety and frustration. Trusting the other members of the school team, supportive relationships and collaboration are important preconditions for this (Hoy & Tschannen-Moran, 2003; Bryk & Schneider 2003; Schildkamp, Karbautzki, & Vanhoof, 2013). Motivation is also influenced by the personal characteristics of the individual (Deci & Ryan, 2002; Bandura 1997). Hence, different individuals will take decisions in different ways in similar situations because they have different cognitive styles (Nutt, 1990). Through investigating the decision-making style of teachers, we have a way to understand why a teacher in an identical situation uses different information in the decision-making process. People predominantly exhibit either a rational or an intuitive style (Epstein, 2008). In some teachers a rational decision-making style predominates. They prefer to analyse facts first before they make a decision, so the expectation is that they will feel autonomously motivated to search for data to underpin their decisions. Teachers with an intuitive decision-making style heavily rely on their intuition. Therefore one might assume that teachers with an intuitive style will feel less motivated to use data for decision making. In our study we are interested in to what extent teachers' decision-making style influences teachers' motivation to use data for decision-making.

Given the importance of data use as a source of information for pedagogical decisions, the impact of teachers' motivation on their data use is a relationship which clearly needs to be researched further. We also need to take account of the possible impact of teachers' decision-making styles, supportive relationships within the school and the reflective capacity of the school team on teachers' motivation for data use. To this end we posed the following research questions:

1. To what extent do teachers use data as a source of information for decisions at classroom level?
2. What motivates teachers to use data as a source of information for decisions at classroom level?
3. Which decision-making style do teachers use when making decisions at classroom level?
4. To what extent do schools exhibit supportive relationships and reflective capacity with regard to data use?
5. What impact does teachers' motivation for using data have on their data use?
6. What is the impact of teachers' decision-making style on their motivation for data use?
7. What is the impact of supportive relationships in schools and the reflective capacity of the school team on teachers' motivation for using data?

2. CONCEPTUAL FRAMEWORK

In this section we will explore the concepts introduced in introduction in more detail. We will discuss the following concepts in turn: (1) 'data use', (2) 'motivation for data use', (3) 'decision-making style', (4) 'supportive relationships' and (5) 'reflective capacity'. The conceptual model (Figure 1) provides a visual representation of the relationships between the various concepts.

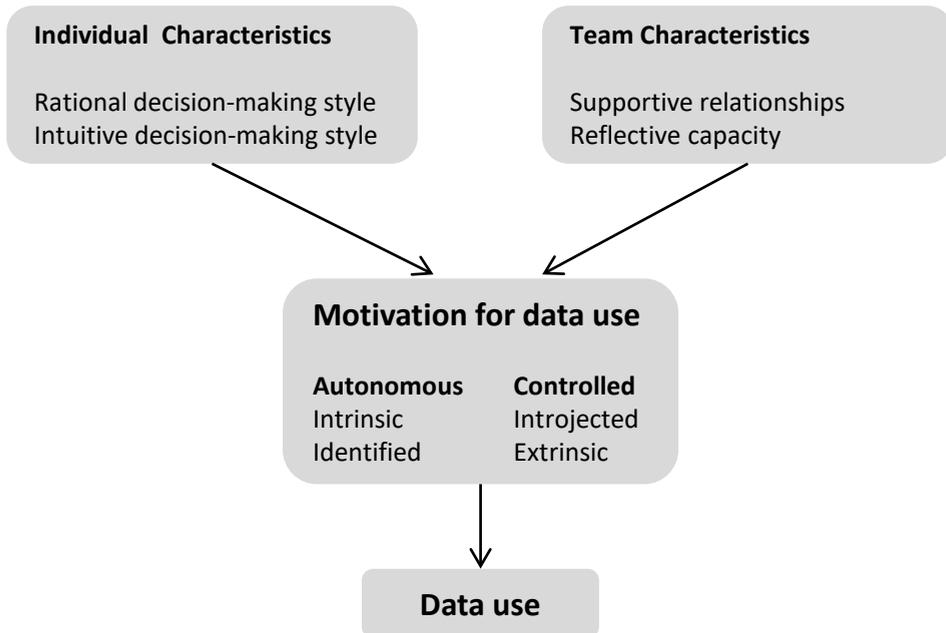


Figure 1. The conceptual model

2.1. Data use

Schools collect a wealth of data, such as the results of tests, pupil attendance data, written reports about parental consultation etc. In literature, ‘data’ and ‘data use’ are often intentionally conceptualized very broadly so that they encompass all relevant quantitative and qualitative information about pupils, teachers, parents and schools. One of the definitions that is used delineates data as all the information that is collected and organized in order to examine particular aspects of the school (Robinson & Lai, 2006). Although a wide spectrum of data plays an important role in gaining insight in teaching and learning, in this research we focused on one specific kind of data to gain more in-depth insight in teachers’ decision-making processes. The feedback reports based on the results of standardized tests provide us a valuable case. First, because they are standardized and therefore they can be studied and compared in a larger group of schools. Second, because the use of these feedback reports is a matter of school and teachers’ autonomy, it provides us a valuable case to study teachers’ motivation to use data. Thus, for the purposes of the present study, ‘data’ and ‘data use’ specifically refer to the data from and use of feedback reports provided to the Flemish primary schools involved in the study. These feedback reports are developed by the School Advisory Services which are tasked to support Flemish schools in their self-monitoring process. The feedback reports are based on the results of standardized tests and are intended to provide schools with a reliable resource that they can use to assess

their teaching practice (Duerloo, 2012). This enables both the individual teacher and the school team as a whole to draw up improvement initiatives with a view to improving the quality of the education they provide and if necessary to modify the teaching offered to pupils. In other words, the aim of these feedback reports is development-oriented (Vanhoof et al., 2012). In this context, therefore, the use of data is not an end in itself, but part of a process aimed at providing an optimal education for every pupil (Kowalski & Lasley II, 2009; Levin & Datnow 2012; Wayman & Stringfield 2006; Barrezeele, 2012; Schildkamp, Rekers-Mombarg, & Harms, 2012). Even though a lot of time is spent collecting and analysing the data, in practice it appears that in many schools there are a lot of assessment data collected that are rarely used for decision-making. This is a waste of time and resources (Robinson et al., 2012). The aim of his study is to explore to what extent Flemish teachers make use of these feedback reports to monitor and adjust their teaching practices.

2.2. Motivation for data use

From a development perspective, the starting point for data use is that it grows from the bottom up, without pressure or obligation from above (Hall & Hord, 2006). Consequently, data use in development-oriented systems is heavily dependent on teachers being self-motivated (Sutherland, 2004). Why are some teachers prepared to use data as an information source for their decisions and why are others not prepared to do so? Their motivation to use these data can be very different. Self-determination theory (SDT) differs from other theories in that it emphasizes the quality of the individual's motivation rather than the quantity of motivation (Vansteenkiste, Lens, & Deci, 2006). Traditionally, motivation psychology makes a distinction between intrinsic and extrinsic motivation (Deci, 1971). Differences in the quality of motivation are related to the extent to which extrinsically motivated behaviour is autonomously regulated or regulated in a controlled manner. Behaviour regulation indicates *why* people do things (Figure 2). SDT states that autonomous motivation is always of a better quality than controlled motivation. Autonomous motivation encourages optimal functioning, whereas controlled motivation causes people to perform less well (Vansteenkiste, Lens, & Deci, 2006).

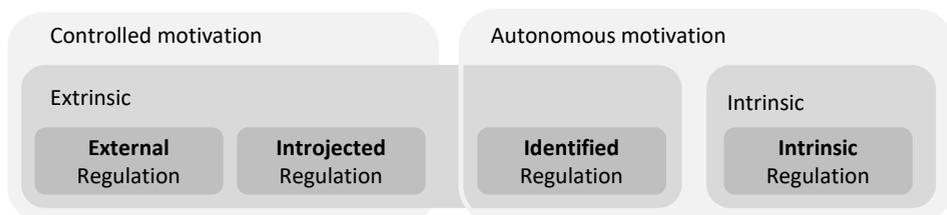


Figure 2. The self-determination continuum (Ryan & Connel, 1989).

2.2.1. *Controlled motivation for data use*

Self-determination theory (SDT) refers to ‘controlled motivation’ when the behaviour in question, in this case, data use, is regulated by pressure, obligation and control (Deci & Ryan, 2000). SDT further distinguishes between *introjected regulation* and *external regulation*. The latter form of controlled motivation is a form of extrinsic motivation in which teachers use data to obtain bonuses or to avoid penalties or criticism. In this case, teachers perceive pressure from others (e.g. the school management, school inspectorate, colleagues, etc.) to use the feedback reports. There is, therefore, no internalization, which is why this can be regarded as the most controlled form of motivation.

In the case of *introjected regulation*, teachers perceive control and pressure from the inside outwards, from within themselves, so that the teacher associates his/her self-worth with the use or not of data as a point of departure for decisions. It is possible that teachers use the feedback reports because they want to demonstrate that they are valuable team members or because they want to avoid negative feelings, such as guilt or shame. In the case of external regulation, therefore, behaviour is stimulated by external factors, while internal controlling factors are the motivation in the case of introjected regulation.

2.2.2. *Autonomous motivation for data use*

Autonomous motivation suggests that the individual has the feeling that *he or she wants to carry out a certain action*, rather than that he or she is being put under pressure to do so (Deci & Ryan, 2000), and explains why people primarily act of their own volition. *Identified regulation* is the third type of extrinsic motivation on the continuum (Ryan & Connell, 1989). Teachers who identify personally with the reason why they use data as a source of information for decisions, do so because they themselves believe it to be important or worthwhile. Identification is still an extrinsic form of motivation: the feedback reports are not used because teachers find it interesting to do so, but in order to achieve an objective. However, teachers identify personally with this objective and act without perceiving any coercion or pressure. Identified regulation can therefore be regarded as a form of autonomous motivation (Deci & Ryan, 2000). In contrast, *intrinsically motivated* teachers spontaneously use data because they think that data use is interesting. The fourth type of motivation on the continuum, intrinsic motivation, is thus the most autonomous form of motivation. Autonomous motivation involves satisfying a need and, for that reason, it is a high quality motivation that contributes to optimal functioning (Deci & Ryan, 2000). In the context of this specific form of data use, this means that teachers will work with the feedback reports because they find it enjoyable and interesting to see what information this will give them.

This motivation can be stimulated or inhibited by both individual and contextual factors (Levin & Datnow, 2012; Spillane, 2012; (Schildkamp, Ehren, & Lai, 2012, Deci & Ryan 2002). We will look at each of these in turn.

2.3. Individual characteristics: decision-making style

There are a variety of data sources available in schools that can be used as a basis on which to make decisions, but not every teacher will pay attention to these data, understand them and accept them, because individuals differ from each other (Blackwell, Miniard, & Engel, 2006). People will make decisions in different ways in similar situations because they have different decision-making styles (Nutt, 1990). In other words, a teacher's decision-making style influences the way he or she makes decisions. This decision-making style can be seen as a set pattern, based on habit, which describes how a teacher responds when asked to make a decision. The literature identifies two types of decision-making style: an intuitive and a rational style (Epstein, 2008). An intuitive style is instinctive, closely related to feelings, quick and set in motion automatically. A rational style, in contrast, is slow, deliberate, driven by rules and can be expressed explicitly (Epstein, 2008). Teachers use both decision-making styles in interaction with each other, but research shows that individuals predominantly use one or other decision-making style (Langan-Fox & Shirley, 2003). In some teachers a rational decision-making style predominates. They think things over carefully before they make a decision and analyse the facts first. Other teachers, however, predominantly exhibit an intuitive decision-making style, relying initially on their instincts when making a decision. In this study we will look at the extent to which teachers' decision-making style has an impact on their motivation for using data as a point of departure for decisions.

2.4. Characteristics of the school team: supportive relationships and reflective capacity

Schools that successfully use data have the necessary support base. This can only be developed if there is a sufficiently broad support across the school team (Vanhoof & Van Petegem, 2011, Bryk & Schneider, 2003). *Supportive relationships* are an important foundation for data use. This ensures, for example, that teachers are not afraid to present their own classroom practice to colleagues or the school management – including possible problems or questions and not just the positive results – because they trust each other (Bryk & Schneider, 2003). In schools where there are supportive relationships with regard to data use, teachers make appropriate use of their colleagues' expertise and take advantage of each other's skills to analyse the feedback reports. Staff also work together as a close-knit team in order to use the feedback reports, and colleagues help each other to interpret them. As a result of this, working

with the feedback reports is not the responsibility of the individual teacher, but of the entire school team.

In order to implement data use successfully, it is also important that there is a readiness in the school to carry out systematic reflection and that a critical attitude is adopted with respect to the existing approach (Vanhoof & Van Petegem, 2011; Earl & Katz, 2002). In schools with a *reflective capacity* teachers firmly believe in the importance of reflection based on data and they are willing both to question their own functioning and to improve their performance on the basis of data. A reflective attitude of this kind in relation to data use is a precondition for effective data use (Wohlstetter, Datnow, & Park 2008, Kerr et al. 2006).

3. RESEARCH CONTEXT AND METHODOLOGY

3.1. Data use in Flanders: policy and practice

This research was conducted in Flanders, the Flemish speaking community of Belgium. Flemish schools dislike the idea of central examinations and the idea of systematic data collection on the performance of pupils (Van Petegem, 2005). However, schools are required by law to monitor and improve their own quality in a systematic manner. How they do that is a matter for the individual school. Some school networks develop and organize standardized tests for the schools within their network. A lot of time and energy is put in the development, collection and analyses of these data. Afterwards, feedback reports are provided to the schools. Teachers can, for example, use the results of standardized tests for instructional purposes or to create intervention strategies for individuals. These data may also be used by teachers as well as school leaders to reflect on their own teaching or management practice. Since the results of these standardized tests are not published and since there is no official obligation to work with these results, if and how teachers and schools use them is a matter of free choice. Therefore it is expected that the use of these data differs a lot between schools and between teachers.

3.2. Data collection and instruments used

This article reports the results of an online survey into teachers' perceptions with regard to (1) the use of feedback reports as a source of information for decisions at classroom level and (2) the extent to which they see themselves as being motivated to use these feedback reports. We used a structural equation modelling to test for the existence and the strength of the relationships represented in the conceptual model. The target population consisted of teachers from 1,411 primary schools from a single school network within the Flemish educational system which participated in the same

standardized tests. These standardized tests are only taken in years 4 and 6 of primary education (when pupils are aged 10 and 12, respectively). As the purpose of the feedback reports is to give the entire school team a reliable resource with which teachers can assess their teaching practice, all the teachers in the schools were involved in the study. Our intention was to survey at least 20 teachers in each school or 75% of the teachers in the smaller primary schools. In total, 408 teachers in 52 primary schools were surveyed, of whom 85.3% were women and 14.7% were men. At the start of the study we assumed that all teachers from the primary schools in question would be familiar with the content of the feedback reports and would use that content to a greater or lesser degree. Our research revealed, however, that it was largely only those teachers who had taken part in the standardized tests with their pupils who were familiar with the feedback reports. This meant that many respondents failed to reply to questions that directly related to the feedback reports. In order to be able to form a reliable picture of a teacher's use of feedback reports, we decided that our explanatory analysis would only include results from teachers who gave answers to all of the items. The explanatory analyses were therefore carried out on the basis of data from 176 teachers.

The measurement instruments used in the survey were based on validated scales for the concepts 'motivation' (Ryan and Connell 1989), 'decision-making style' (Betsch, 2004), 'reflective capacity' and 'supportive relationships' (Vanhoof & Van Petegem, 2006). We developed the items with regard to 'data use' ourselves (by means of a pilot study). All the scales shown were measured using a 5-point Likert scale, ranging from (1) entirely disagree to (5) entirely agree, supplemented by the response option 'Don't know/Not applicable'. The construct validity of the scales was tested by means of exploratory factor analyses (with oblique rotation). For the internal consistency of the scales we used Cronbach's alpha. Our preparatory analyses showed that the scales used have a 'good' to 'very good' internal consistency. Table 1 presents the psychometric characteristics of the scales used and gives an example item to show how each scale was operationalized.

Chapter 3

Table 2. Overview of the survey instrument – Note: the text in italic is an example item for the scale in question

Scale	No. of items	Cronbach's alpha	N
Data use <i>The feedback reports have contributed to the introduction of other teaching methods in the classroom.</i>	8	0.93	306
Autonomous Motivation: Intrinsic <i>We work with the feedback reports because we find them very interesting.</i>	3	0.89	287
Autonomous Motivation: Identified <i>We work with the feedback reports because we want to understand our pupils better.</i>	6	0.95	287
Controlled Motivation: External <i>We work with the feedback reports because the school management/inspectorate forces us to do so.</i>	3	0.86	285
Controlled Motivation: Introjected <i>We work with the feedback reports because we would feel guilty if we didn't.</i>	3	0.84	282
Decision-making Style: Rational <i>I think carefully before I make a decision.</i>	3	0.95	398
Decision-making Style: Intuitive <i>For most decisions it is a good idea to trust your instincts.</i>	4	0.89	392
Reflective Capacity <i>In our school we firmly believe in the importance of reflection based on the feedback reports</i>	5	0.90	272
Supportive Relationships <i>In our school we work together as a close-knit team to use the feedback reports</i>	5	0.92	255

4. RESULTS

We will start with a brief presentation of the descriptive results for the different variables, with particular emphasis on the extent to which there is evidence of data use by teachers in the primary schools involved in the study and the quality of teachers' motivation for data use. We will then go on to discuss teachers' decision-making styles, supportive relationships in schools and the reflective capacity of the school team. In this way we hope to answer research questions 1-4. Subsequently, we will test the impact of the quality of teachers' motivation on their data use (research question 5) and the impact of their decision-making style (research question 6), supportive relationships and reflective capacity (research question 7) on the quality of their motivation for data use.

4.1. Descriptive Results

Table 3: Descriptive Statistics – Answer categories: 1 = entirely disagree; 2 = disagree; 3 = neither disagree/nor agree; 4 = agree; 5 = entirely agree

Scale	<i>ave.</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
Data use	3.18	0.81	1.00	5.00
Autonomous Motivation				
- <i>Intrinsic</i>	2.97	0.70	1.00	5.00
- <i>Identified</i>	3.72	0.73	1.00	5.00
Controlled Motivation				
- <i>External</i>	3.03	1.09	1.00	5.00
- <i>Introjected</i>	2.09	0.80	1.00	4.33
Rational Decision-making Style:	4.25	0.53	2.00	5.00
Intuitive Decision-making Style	3.53	0.64	1.50	5.00
Reflective capacity	3.26	0.77	1.00	5.00
Supportive Relationships and Collaboration	2.88	0.94	1.00	5.00

On the basis of the findings set out in Table 3 we can conclude, firstly, that based on self-report the teachers make only limited use of the feedback reports as a point of departure for their decisions (average 3.18). Teachers mainly perceive an identified regulation with respect to working with the feedback reports (average 3.72). External regulation scored lower (average 3.03). Teachers evaluate their intrinsic motivation to use the feedback reports at just below the neutral midpoint of the answer scale (average 2.97). Teachers give the lowest score for their perception of an introjected regulation (average 2.09). This means that teachers primarily work with the feedback reports because they recognize that doing so can provide valuable information about their pupils, or because they perceive an expectation or obligation from others (e.g. the school management or the school inspectorate). Teachers are less positive about the extent to which they find the analysis and interpretation of the feedback reports interesting.

Secondly, we looked at the decision-making style of the respondents. Teachers self-report that they mainly use a rational decision-making style (average 4.25) and to a certain extent an intuitive decision-making style (average 3.53). The teachers involved in the study are of the opinion that they first think carefully and analyse the facts before they make a decision. However, when making decisions, they also rely on their instincts and intuition to a certain degree.

Finally, when we look at the characteristics of the school team, we find that, according to the teachers, schools only exhibit a limited reflective capacity with regard to the feedback reports (average 3.26). Teachers are the least positive about supportive relationships with regard to the use of the feedback reports (average 2.88), with the average below the neutral midpoint of the answer scale (3). According to teachers' perceptions, in the primary schools involved in the study, there is only a limited belief in the importance of reflection based on the feedback reports and it is only to a limited extent that schools exhibit a positive attitude and willingness with regard to collective

reflection on the basis of the feedback reports. Teachers disagree that there is support and collaboration with regard to the analysis and interpretation of the feedback reports in their school.

4.2. Explanatory Results

In order to examine the impact of teachers' motivation on data use (research question 5), of decision-making style on motivation (research question 6), and of supportive relationships and reflective capacity on the motivation for data use (research question 7) we used structural equation modelling to determine whether the relationships we expected, based on the theory, exhibit a good fit with the empirical data (Muthén & Muthén, 2003). Figure 3 shows the results of this path model in terms of standardized path coefficients. The model was tested by means of the 'Lavaan' R package (Rosseels 2011). When testing the model we used the following fit indices: Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA). The CFI compares the proposed model with a model in which no relationships are assumed (the 'null model'). The guidelines in the literature state that a model is a good fit when CFI is equal to or greater than 0.95 (Hu & Bentler, 1999). Finally, the Root Mean Square Error of Approximation (RMSEA) indicates how well the model fits with the actual situation in the population, if this is known (Byrne, 2001). The deviation is shown per degree of freedom, and therefore should be as small as possible. A value of less than 0.05 indicates a good fit, while values between 0.08 and 0.10 are acceptable. When we created the path model, the modification indices suggested a direct regression line from 'supportive relationships' to 'data use'. In order to research this relationship further, we decided to include the direct regression line from 'supportive relationships' to 'data use' in the model. The fit indices for the final path model as presented in Figure 3 indicate that the model is a good fit (RMSEA: 0.078; CFI: 0.965). For the sake of clarity and to avoid clutter, those correlations which the model revealed not to be statistically significant are not included.

The path model shows that we can conceptualize a latent variable 'autonomous motivation for data use', which explains the variance in 'intrinsic motivation' and 'identified regulation'; and a latent variable 'controlled motivation for data use', which explains the variance in 'extrinsic regulation' and 'introjected regulation'. The loadings of the different regression lines which start with these latent variables show that the concrete variables can be reduced to the underlying concepts. We can conclude that there are medium to large effects (Cohen, 1988) (autonomous motivation 0.81 and 0.89; controlled motivation 0.90 and 0.45). Modification indices also indicate a correlation between the endogenous latent variables Autonomous Motivation and Controlled Motivation (correlation coefficient = 0.51).

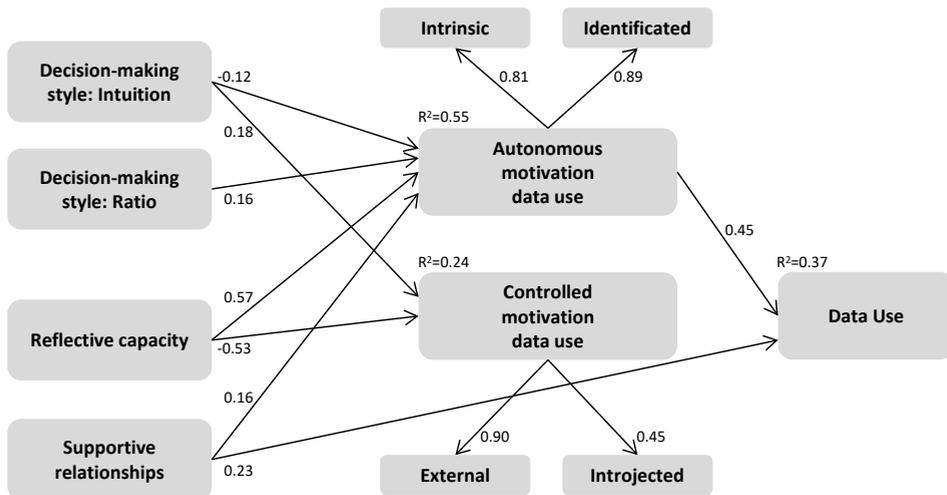


Figure 2: The SEM-model

In the explanatory research questions, we wanted to look first at what impact the quality of motivation has on teachers' data use (research question 5). The path model shows that teachers' autonomous motivation with respect to data use has a direct effect on their actual data use ($\beta = 0.45$). In contrast, there appears to be no statistically significant direct effect of controlled motivation on teachers' data use. The expectation that the quality of the motivation with respect to using data would correlate with actual data use is therefore confirmed by the path model.

Research question 6 was intended to help us understand the possible impact of teachers' decision-making styles on their data use. In this case we made a further distinction between teachers who predominantly exhibit an intuitive decision-making style and teachers who predominantly exhibit a rational decision-making style. Our first finding in this regard is that teachers' decision-making style does indeed have a statistically significant effect on the quality of their motivation for data use. The path model demonstrates that rational decision-making style has a positive, direct effect on teachers' autonomous motivation to use data ($\beta = 0.16$). Equally, there appears to be a negative direct effect of intuitive decision-making style on autonomous motivation for data use ($\beta = -0.12$). Based on the path model we also see that there is a significant direct effect of intuitive decision-making style on controlled motivation for data use ($\beta = 0.18$). It is apparent, therefore, that teachers' decision-making style does indeed have an effect on their motivation for using data as an information source for decisions. However, the corresponding regression coefficients reveal that this effect is limited.

Finally, research question 7 examined the effect of supportive relationships in the school and the reflective capacity of the school team on teachers' motivation for data use. Based on the path model we find that both characteristics have a statistically

significant effect on teachers' motivation for data use. The standardized regression coefficients demonstrate that the reflective capacity of the school team with regard to data use has the greatest impact on teachers' motivation. There appears to be a significant direct effect of reflective capacity of the school team with regard to data use on the autonomous motivation of teachers for data use ($\beta = 0.57$). At the same time, the path model shows a negative direct effect of reflective capacity of the school team on the controlled motivation of teachers with regard to data use ($\beta = -0.53$). The path model also reveals a significant direct effect of supportive relationships within the school team on the autonomous motivation of teachers to use data ($\beta = 0.16$).

Modification indices suggested a direct regression line from supportive relationships to data use. The path model shows that the independent variable 'supportive relationships' has a statistically significant effect on both autonomous motivation for data use ($\beta = 0.16$) and on actual data use ($\beta = 0.23$) after controlling for the other predictors. In other words, the effect of supportive relationships is partly mediated by autonomous motivation for data use, where the direct effect is 0.16 and the indirect effect is 0.07 (0.16×0.45).

So, teachers' data use is directly affected by teachers' autonomous motivation ($\beta = 0.45$) and by supportive relationships within the school team ($\beta = 0.23$). Further, the model suggests indirect effects (through Autonomous Motivation) from supportive relationships ($\beta = 0.07$), Rational Decision-Making Style ($\beta = 0.07$) and Reflective Capacity ($\beta = 0.26$).

5. CONCLUSION AND DISCUSSION

There is a firm conviction among a variety of educational stakeholders that the quality of decisions in schools increases the more these decisions are based on data (Johnson, 1997; Marsh et al., 2006). For this reason, the present study wanted to look at: (1) to what extent teachers use data as a source of information for their decisions at classroom level, (2) what motivates teachers to use data, (3) which decision-making styles teachers use and (4) to what extent the school team exhibits supportive relationships and reflective capacity with regard to data use. In addition to describing data use by Flemish teachers, we also wanted to explain differences in data use with a view to encouraging data use in schools and to contribute to the further development of theories of data use. For that reason we also set out to explain the impact of (5) teachers' motivation, (6) teachers' decision-making style and (7) supportive relationships and reflective capacity within the school team on data use.

Our first important finding is that the teachers surveyed make only limited use of the data put at their disposal as a source of information for their decisions at classroom

level. The quality of teachers' motivation plays a crucial role in explaining the differences in data use between teachers. In our study controlled motivation had no effect on teachers' data use, whereas autonomous motivation appeared to have a significant positive effect on teachers' data use. The descriptive results indicate that teachers exhibit a certain degree of identified motivation, but that intrinsic motivation is present only to a limited extent. On the self-determination continuum of Ryan and Connell (1989) (Figure 2), this means that teachers already perceive a certain degree of autonomous motivation for using data as a point of departure for their decisions at classroom level, but that this motivation is still largely externally regulated. If we want to promote data use in schools, the motivation for working with data needs to come more from the teachers themselves. Previous research has already demonstrated the importance of teachers having an interest in data use and being enthusiastic about it (Schildkamp & Lai, 2013, Vanhoof et al., 2014). Future research might shed more light on the possible preconditions required to generate enthusiasm and interest among teachers for working with data. In this regard, we need to be very careful that the use of data resulting from the systematic monitoring of pupil performance is not only focused on accountability (O'Day, 2002; Wößmann, 2002). When the results of standardized tests are only used to demonstrate or evaluate the quality of the education provided, teachers might feel pressure to use these data. In that case, there would be no intrinsic motivation.

We also looked at the impact of teachers' decision-making style on their motivation to use data as a source of information for decisions at classroom level. We found a significant direct effect of rational decision-making style on teachers' autonomous motivation to use data. At the same time, our research revealed a negative direct effect of intuitive decision-making style on teachers' autonomous motivation to use data, while an intuitive decision-making style showed to have a positive direct effect on teachers' controlled motivation to use data. In other words, teachers who predominantly exhibit a rational decision-making style regard themselves as more autonomously motivated to use data. Teachers report to use a rational decision-making style more than an intuitive decision-making style when making decisions at classroom level. However, we also found that data use in the schools involved in the study was limited. Nevertheless, our explanatory results indicate that there is a positive direct effect of a rational decision-making style on autonomous motivation, on the one hand, and of autonomous motivation on data use, on the other. A possible explanation for this is that teachers with a rational decision-making style realize that working with data can provide valuable information (identified), but because they do not find the use of data interesting or appealing in itself (intrinsic), they make less actual use of data. More in depth questions rise on the impact of teachers' behavioural regulations on their data use. In this research, we conducted a quantitative approach. It allowed us to explore our research questions on a larger scale. A qualitative approach might gain more insight

in the impact of teachers' behavioural regulations on their decision-making behaviour. Future research can make valuable contributions in this regard.

Further, our study points out the important role of school characteristics on teachers' data use. It is clear that the reflective capacity of the school team with regard to data use has the greatest impact on teachers' autonomous motivation to use data. Autonomous motivation increases the more the members of the school team are convinced of the importance of reflection that is based on the data and are willing to look critically at their own performance on the basis of data. However, the primary schools involved in the study exhibit this kind of reflective capacity only to a limited degree. The second precondition (supportive relationships with regard to data use) is likewise found only to a limited extent in the primary schools involved in the study. Nevertheless, our research indicates that support from colleagues, collaboration and trust in each other all have a positive impact on the autonomous motivation of teachers and also on data use. Teachers' autonomous motivation increases if they can analyse and interpret data with other teachers and if they can call on the help and expertise of colleagues when they encounter difficulties. There appears to be a positive direct effect of supportive relationships with regard to data use on autonomous motivation for data use. However, our research also revealed that there is a direct, positive effect of supportive relationships on data use after controlling for other predictors. In other words, the effect of supportive relationships is partly mediated by autonomous motivation for data use. This finding is consistent with the findings of previous research, which has demonstrated that motivational factors can mediate the effect of school characteristics (Thoonen et al., 2011).

This study has shown that teachers' motivation should be at center when promoting teachers' data-based decision making. When stakeholders from policy and practice want to enhance data use in schools, there is a need to build on supportive relationships with regard to data use and on reflective capacity since they have a positive impact on teachers' autonomous motivation to use data. Accountability is not the right driver for data use since it increases teachers' controlled motivation, which has shown not to lead to the desired data use. It is more important to show teachers the value of data use and in investing time and effort in making them enthusiastic about working with data. However, research literature shows that habits of mind and motivational variables are hard to change in schools (Keating, 1996). Therefore, measures to develop an inquiry habit of mind need to be implemented in an early stage in teachers' professional development, as in teacher education.

The findings of the present study may also serve as a valuable starting point for further research. In order to gain more insight in the preconditions that are necessary for enhancing data use in schools, future research should broaden these findings by taking into account other individual and organizational conditions that might impact teachers'

data use. In this research, we studied the use of feedback reports that were provided to schools with the aim of improving teaching and learning. However, in our study it appeared that not all teachers in schools were aware of the existence of these feedback reports and only a minority of teachers used the feedback reports for data based decision making. Future research might provide more insight in the way educators communicate about data that are available and to what extent a shared vision on data use is apparent in schools.

In essence, we can say that the quality of teachers' motivation for using data has an important impact on their data use. At present, teachers appear to perceive only a limited intrinsic motivation to use data as a point of departure for their decisions. If we want to encourage data use in schools, a key element will be generating intrinsic motivation among teachers. Working on the reflective capacity of the school team and fostering supportive relationships within the school are important preconditions in this respect.

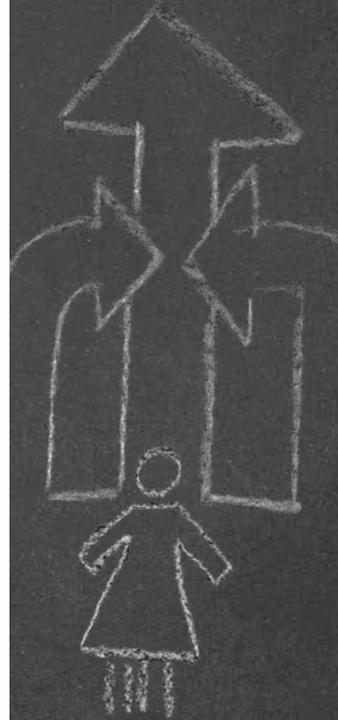
4

Chapter

Teachers' Decision Making: Data Based or Intuition Driven?

This chapter is based on:

Vanlommel, K., Van Gasse, R., Vanhoof, J., & Van Petegem, P. (2017).
Teachers' decision-making: Data based or intuition driven?
International Journal of Educational Research, 83, 75-83.



1. INTRODUCTION

Pupils' lives are affected profoundly by decisions that teachers make, yet little is known about the way teachers make decisions (Earl & Katz, 2006; Harteis et al., 2008). Internationally, the body of research on data-based decision making in schools is expanding. The assumption is that collecting and analyzing data and adding it to the decision process before the decision is made, will have a positive impact on the quality of educational decisions (Earl & Louis, 2013; Marsh, 2012; Rossi, Lipsey, & Freeman, 2004; Schildkamp & Ehren, 2013). In practice, data use in schools still appears to be limited (Schildkamp & Ehren, 2013). The mixed results about teachers' use of data in decision-making are largely explained by factors concerning the level of the school. For example support and leadership are expected to predict the extent of teachers' data-based decision-making (Earl & Louis, 2013; Schildkamp & Lai, 2013; Wayman, Spring, Lemke, & Lehr, 2012). Furthermore, authors point out teacher-related and data-related factors, such as teachers' self-efficacy and attitude or availability and reliability of data to explain teachers' limited use of data (Kerr, Marsh, Ikemoio, Darilek, & Barney, 2006; Levin & Datnow, 2012; Schildkamp & Teddlie, 2008; Strayhorn et al., 2009; Vanhoof, Vanlommel, Thijs, & Vanderlocht, 2014). Programs and materials have been designed to improve teachers' access to and work with data, assuming that resolving these barriers by providing training and support will lead to an enhanced level of data-based decision making in schools. This viewpoint mainly implies that teachers use a rational straightforward approach to decision-making. Theories of rational choice that have been developed for decades identified optimal ways of making decisions. Kahneman and Frederick (2005) demonstrated that people do not always adhere to the principles of rational choice, instead they tend to rely on intuitive strategies, even when these strategies may generate systematic deviations from optimal decisions. Although decision makers may try to make rational decisions based on the analysis of data, they are constrained by limited cognitive capability to process all data available, incomplete information or lack of time (Kahneman & Frederick, 2005). Studies of decision making in real-world settings suggest that teachers may not consider all data or consequences of their alternatives (Kahneman & Frederick, 2005; Klein, 2008; March, 1994). Relevant information about problems is not always sought and available data is often not used. These findings need to be taken into account when studying teachers' decision making. Theories of data-based decision making need to be expanded with a more in-depth insight into how the intuitive and rational bases of teachers' decision-making intervene with the decision process.

Different decision theories can be used to study teachers' decision process. These theories vary in degree in which the different steps of the decision process rely on intuitive or analytical processes, but similar steps in the decision-making process can be identified (Blackwell et al., 2006; Cohen, 1988; Klein, 2008; Schildkamp & Lai, 2013). The

starting point of a decision process is when teachers *define a problem*. Problem definition occurs when the teacher senses a difference between what he or she perceives to be the standard and the actual state of affairs (Blackwell et al., 2006). Once problem definition occurs, teachers will probably start *searching for information*. This information search may be internal, as they might retrieve knowledge from their intuition, or may be external when they collect data. The next stage in teachers' decision process is *evaluating alternative options* identified during the search process before the decision is made (Blackwell et al., 2006). Research has shown that for many years, decisions of teachers were primarily based on intuition with little or no use of systematic data analysis (Creighton, 2007; Earl and Katz, 2006). In the last decade however, a strong belief has grown among a wide variety of stakeholders that the quality of decisions increases in proportion to the extent to which these decisions are based on data (Johnson, 1997; Marsh, Pane, & Hamilton, 2006; Schildkamp & Ehren, 2013). In practice, the intuitive and data-based grounds of teachers' decisions are assumed to be interrelated (Spencer, Detrich, & Slocum, 2012). According to Whitehurst (2002) data-based decision making needs to integrate the best available data with the intuition of the teacher in making decisions. Intuition can help by weighting the best available data in relation to values and contextual factors and it refines the source of information by retaining relevant and valuable data and discarding the rest (Spencer et al., 2012). However, this may bring possible pitfalls. Teachers often suffer from information overload or lack of time. Therefore they might use heuristics – cognitive short cuts – which allow easier procedures to reach a decision (Kahneman & Frederick, 2005; Tversky & Kahneman, 1981). If the teacher considers too little information, he/she risks simplifying too much and the decision may be based upon individual perceptions, opinions or limited observations (Earl & Katz, 2006). According to Kahneman and Frederick (2005) errors of intuitive decision making can be detected and corrected by the rational part of decision making. Data-based decision making can challenge and complement intuitive judgments by collecting and analyzing data to add additional information to the process, before the decision is made (Earl & Louis, 2013).

Since teachers' decision-making is important, the potential boundaries of data-based decision making and the lack of a solid research base that takes into account the intuitive and rational bases in teachers' decision making, this study sets out to explore the role of intuition and data in the decision-making process of teachers.

The following research questions will be set forward:

1. What is the role of data and intuition in defining the problem?
2. What is the role of data and intuition in the search for information?
3. What is the role of data and intuition in the evaluation of alternatives?

2. THEORETICAL FRAMEWORK

Since little is known about the way teachers make decisions, this study sets out to explore the role of data and intuition in the decision process of teachers. Therefore, we needed a model that takes into account rational as well as the intuitive bases in teachers' decision-making. Decision theories with an overall rational bases focus on the collection, analyses, interpretation and evaluation of data (Earl & Louis, 2013; Schildkamp & Ehren, 2013; Timperley & Parr, 2010). Decision theories that start off from the idea that rationality is bounded by limitations (e.g. Klein, 2008) stress the importance of recognition of situations, based on experience. Recognition then brings expectancies, relevant cues, plausible goals and typical action. In this research we needed a decision-making model that combined the bases of rational and intuitive decision-making. We were able to find such a model in research on consumer decision-making. Although this model has not been tested in educational decision-making before, it provided us with a valuable starting point to explore teachers' decision process. Based on the model of Blackwell et al. (2006) we defined three consecutive steps that were relevant for teachers' decision-making. First of all, we will discuss the step of **'Defining the Problem'**. Secondly, the concepts Data and Intuition in the **'Search for Information'** will be elaborated. Finally, we will take a closer look at the **'Evaluation of Alternatives'** by discussing the evaluative criteria and decision rules that are used by teachers when they have to make a decision. An overview of the theoretical framework is presented in Figure 1.

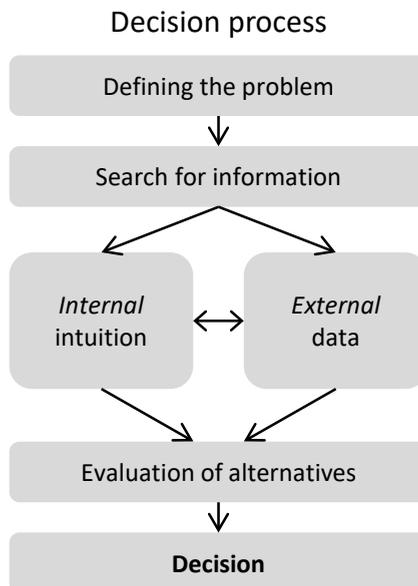


Figure 1: The decision process (Based on Blackwell et al., 2006)

2.1 Defining the Problem

The starting point of a decision process is when teachers define a problem. Problem recognition occurs when *'an individual senses a difference between what he or she perceives to be the ideal versus the actual state of affairs'* (Blackwell et al., 2006, p. 71). Sometimes teachers have to define complex problems requiring a substantial amount of time and energy. More commonly, however, decisions are based on rather simplistic processes with limited impact in which relatively little time and effort are devoted to the decision (Blackwell et al., 2006; Earl & Katz, 2002). The complexity of the problem that initiates the decision-making process has an impact on the extent to which the subsequent stages of the decision process are expected to be elaborated.

2.2 The Search for Information: Data or Intuition?

Once teachers have defined the problem, they will search for information. This information search may be external: consulting data or may be internal, retrieving information from their intuition. Psychologists argue that people differ in the cognitive processes they use to make decisions (Epstein, 2002, 2008; Kahneman & Frederick, 2005; Klein, 2008; Tversky & Kahneman, 1981). The idea that cognitive processes can vary in the degree to which they rely on intuitive or analytical processes have been given different names like *'Dual Processing'* (Evans, 2008), *'System 1 and System 2 Thinking'* (Kahneman & Frederick, 2005; Tversky & Kahneman, 1981) or Hammond's *'Cognitive Continuum Theory'* (Hammond, Hamm, Grassia, & Pearson, 1987). These authors state that the rational system enables individuals to process information deliberately and to engage in analyses in an attentive manner while the intuitive system involves the automatic and relatively effortless processing of information and permits individuals to reach perceptions of knowing without conscious attention (Dane & Pratt, 2007; Hogarth, 2001).

2.2.1. The Concept Data

Broadly speaking, data-based decision-making is the process by which teachers collect and analyze data to guide educational decisions (Dane & Pratt, 2007; Ikemoto & Marsh, 2007). For the aim of this study, we deliberately chose not to reduce our definition by adding prevailing conditions such as the need for data to be collected in a deliberate and systematic manner, or the need for a written reporting. Since we aim to explore the role of data in the decision process of teachers, we started off from a broad definition with as few restrictions as possible concerning the way data is collected and stored. Quantitative (i.e. test results, socio-economic indicators) as well as qualitative data (i.e. observations, collegial consultation) will be taken into account. We delimited the concept data by only focusing on data that is directly related to the pupil. Data in schools can be related to different levels, like the macro-level (national/international

policy and influences), the meso-level (school policy) and micro-level (related to pupils and teachers) (Mahieu & Vanhoof, 2010). Thirdly, we stress the importance of taking into account context, input, process as well as output data to understand what is happening in schools (Hulpia, 2004). On the micro-level context data may for example be related to expectations from parents, input data may be related to socio economic indicators, process data may be related to pupils' work ethic during lessons and output data may be related to test results.

In literature on data use the conceptual distinction between 'data' and 'information' sometimes lacks clarity. In this study we chose to make a clear conceptualization based on Vanhoof, Mahieu, and Van Petegem (2009) who define data as facts, numbers or measures that are easy to store and exchange. We would like to add that data may be captured on paper or digitally, but data may also be found in audio or visual observations. Data as such is no valuable contribution to the decision process since it embodies no meaning without a code, legend or framework that facilitates interpretation. When a code, legend or framework is added to data, this data becomes information and may serve as a valuable information source in the decision process.

Summarized, in this study we will define data as: 'all cognitive, social and emotional context, input, process and output indicators that are directly related to the pupil.' This data becomes information when a code or legend is added.

2.2.2. The Concept Intuition

Intuition is not the opposite of rationality, nor a random process of guessing. Intuitive processes evolve from experience and learning and consists of a mass of patterns and abstractions, which are impressed in our minds (Simon, 1987). Intuition can be conceptualized as information that is unconscious, involving associations that are produced rapidly (Dane & Pratt, 2007). One of the defining characteristics of intuition is that it occurs outside of the conscious thought (Dane & Pratt, 2007; Epstein, 2002, 2008). While the outcomes of intuition, the intuitive decisions, are clearly accessible to conscious thinking, how a person arrives at them is not (Dane & Pratt, 2007). The second characteristic of intuition refers to the recognition of recurring patterns (Dane & Pratt, 2007). The linking together of new elements from pupils with existing (non-conscious) patterns is why it is being referred to as associative (Epstein, 2002; Kahneman & Frederick, 2005). Intuition can therefore help teachers to integrate wide-ranging data that is available into usable categories of information about their pupils. Thirdly, affect is associated both with the process and outcome of intuition: teachers' emotions may play a role in decision-making process related to their pupils, thus, results in affect-laden decisions (Dane & Pratt, 2007).

Possible Pitfalls

Because intuition refers to recognizing a solution, it is likely that teachers will have more confidence in their intuition than in the alternatives suggested by data (Downey & Kelly, 2011). Kahneman and Frederick (2005) among others have argued that people use heuristics – mental shortcuts – that reduce the complex tasks of assessing probabilities to simpler decision tasks. When confronted with a complicated problem which in education is often influenced by an innumerable number of factors, intuition allows teachers to focus on critical information. While heuristics are often useful for making decisions in complicated situations, they may also lead to severe and systematic errors (Kahneman & Frederick, 2005; Tversky & Kahneman, 1981). Kahneman and Frederick (2005) suggested that the rational processing (System 2) can monitor the quality of intuitive judgment (System 1), which it may endorse, correct or override. In the context of teachers' decision making, the possible pitfalls of intuition stress the importance of analyzing data that is carefully considered and provides a basis for thoughtful and defensible decisions (Schildkamp & Ehren, 2013).

2.3 Evaluation of Alternatives

The next stage in teachers' decision processes is evaluating alternative options identified during the search process. In this stage, teachers compare what their intuition tells them about their pupils with the information they might have gathered from data. Teachers may use preexisting evaluations stored in memory to select the alternative that will most likely result in their satisfaction. Different teachers are likely to use different evaluative criteria -the standards they use to compare different alternatives (Blackwell et al., 2006). Finally, there is also the question of the decision rule: how is a choice to be made among the alternatives in terms of the value of its consequences (March, 1994)?

For the sake of completeness we have to elaborate that we separated the search for information and the evaluation of alternatives in this theoretical framework for reasons of conceptual clarity. We have to recognize however, that in practice these two stages are expected to be intertwined during the decision process (Blackwell et al., 2006; March, 1994).

Case

The complexity of the problem that initiates the decision-making process has an impact on the extent to which each of the stages ascribed above are likely to be followed because of the importance of making the right decision (Blackwell et al., 2006). Since our aim is to study teachers' decision process, it is important to start off from a decision with a high degree of complexity and with high stakes for the people involved. Therefore, this study started off from the specific case of grade retention. The decision whether a student can progress to the next year or not is an important decision in

schools since it has an impact on students' academic career and socio-emotional adjustment (Hall & Hord, 2006). In the majority of European countries, teachers remain the prime arbiters in the decision for grade retention (Eurydice, 2011) yet little is known about the way teachers make these decisions (Hall & Hord, 2006; Harteis et al., 2008). Given the controversy of research examining the efficacy of grade retention and the high stakes involved, it is utterly important that teachers make informed decisions (Kelchtermans, 2009). However, it appears that in most schools the decision to retain is a subjective one, primarily based on teacher appraisal (Beijaard & Verloop, 1996; Hall & Hord, 2006; Verloop et al., 2001).

Research Context

This study was set out in first grade of primary education in Flanders (Dutch speaking part of Belgium). In 1998 the study of (OECD) suggested that repetition rates in Flanders would substantially decrease when they were also based on data instead of merely on teachers' intuition. In 2011 the Eurydice study showed that there were still high repetition rates for Belgium in comparison to other European countries and lack of insight in how these decisions are made.

In Flanders, the official decision for grade retention is expected to be made at the end of the academic year in a class counsel. The teacher then formulates his or her advice concerning the transition of the child using cognitive or socio-emotional arguments to underpin this decision to the other members of the pupils counsel (principal, care-coordinator and in exceptional cases a representative of the Pupils Counsel Services). Although officially the decision to retain is a team decision, in practice it appears that in most cases the counsel mainly confirms the decision suggested by the individual teacher. This stresses the importance of questioning the way the individual teacher makes his or her decision concerning grade retention. Therefore, this study sets out to explore the role of data and intuition in defining the problem of possible grade retention, in teachers' search for information and in the evaluation of alternatives.

Therewithal, it is important to know that in Belgium there is no general obligation to use standardized tests, teachers can develop and use their own tests or use existing tests that are related to a certain teaching method.

3. METHOD

3.1 Context and Participants

The study was conducted in Flanders (Dutch speaking part of Belgium) with 17 teachers, in 17 different schools, all teaching in first year of primary education (teaching 6 year olds). Participating teachers registered voluntarily after a web-based call or were

directly contacted by the researcher. We deliberately did not ask principals to select teachers to avoid feelings of pressure or obligation, but all principals agreed with the research being undertaken in their schools before the interviews took place. All participants (2 male, 15 female) were teachers in first year of primary education that recently had a case of grade retention.

3.2 Interviews and Procedure

With the aim of exploring the decision processes of teachers and providing in depth answers to the present research questions, we used a qualitative research design including semi-structured in-depth interviews. Teachers were asked to describe retrospectively a decision concerning grade retention they found hard to make. This critical incidents method focuses attention on the key elements that were important during the process being described (Klein, 2008). According to Klein, (2008) if you can get teachers to tell you about tough cases, then you have a pathway into their perspective. The in-depth interviews had an average duration of one hour and were conducted by a single researcher. The same interview protocol was used in all 17 interviews to assure methodological consistency and control for reliability (Cohen et al., 2008). All interviews were audio-recorded digitally and the files were saved for reasons of reliability (Cohen et al., 2008). Peer-debriefing sessions were conducted in which the different methodological choices, data analysis procedures and interpretations were critically examined (Creswell & Miller, 2000).

3.3 Analysis

The interviews were transcribed ad verbatim and coded using NVivo 10. Before starting the analyses, the verbatim transcribed interviews were comprehensively read from the beginning to the end to obtain an overall impression (Miles, Huberman, & Saldaña, 2014). In the subsequent coding process, the theoretical framework was used as a guideline and utilized in analyzing the data (Schilling, 2006). General codes, such as 'Information Search' were distracted from the theoretical framework and were specified through several subcodes, such as 'Internal Search' and 'External Search'. To test the construct validity of the coding, the first two authors coded two interviews independently. The inter-rater reliability (Cohen's Kappa) is 0.95 (Miles & Huberman, 1994). From theory as well as from the input of participants was searched for similarities and differences in the interviews to deduce cross-case interview results (Miles & Huberman, 1994). Thereby, we followed the principles of framework analysis (Maso & Smaling, 1998).

4. RESULTS

4.1 *The Role of Data and Intuition in Defining the Problem (RQ 1)*

In answer to research question 1 we explored the role of data and intuition in defining the problem. All interviews show that teachers rely a great deal on their intuition to understand what they see happening in the classroom. In the interviews, teachers stress the importance of observing pupils during daily practice. It allows them to see how they respond to them, to the curriculum and to other pupils. According to teachers, looking at pupils' verbal and non-verbal responses gives them the most important information they need to define the problem that led to grade retention. So, observations are said to be the most important data source in defining the problem, but it appears that intuition serves as a framework to interpret these observations and to make sense of signals. In summary, it appears that daily classroom observations are the main data source to define the problem that leads to grade retention. Teachers stress the importance of intuition to make sense of and interpret these classroom observations.

'How shall I put it? It's an intuition, a gut feeling. If they experience difficulties with certain issues, then you can already tell: this will be a problem. I know it sounds strange, but during the first two weeks, I have a pretty clear picture of who is going to make it and who is not.' (teacher 15)

'During the first weeks I can tell who might have to retain a grade, I don't necessarily need test results.' (teacher 11)

According to the teachers, test results play a less important role in defining the problem. Teachers state that their intuition enables them to define problems at an early stage, even before they have test results. Although teachers stress that every child is different; in the interviews there appeared to be certain cues that triggered the search for information. When teachers look at pupils, apparently certain features draw their attention since they deviate from the perceived average. During the interviews, teachers found it hard to explicate these features. When teachers were asked to describe why a problem might arise, they tried to explain how they could feel that something was wrong. Teachers often used the words 'intuition' or 'gut feeling' and it took them some effort to externalize on what characteristics this judgment was based. Analyzing the interviews, there appeared to be certain cues that implicitly told teachers to pay special attention to pupils. The most important cues that derived from the interviews appeared to be related to (a) a slow work pace (b) a low level of concentration (c) lack of maturity (d) inadequate retention of the curriculum and (e) lack of basic cognitive skills. These cues were predominantly based on the interpretation of observations through teachers' intuition than trigger the search for information.

'Defining maturity is predominantly based on intuition. There are no standardized tests to measure whether a pupil is mature enough. (teacher 10)

'My intuition told me: this isn't right. It's my intuition that tells me when I have to search for information. It is possible that test results make me realize that something is wrong, but in most cases, it is the other way around. I have never been surprised by test results.'(teacher 1)

4.2 The Role of Data and Intuition in the Search for Information (RQ 2)

4.2.1 Collecting Data

Qualitative Data

When describing their search for external information, it appeared that teachers mainly rely on qualitative data sources. Again, classroom observations are set forward as the main source of information. In the interviews all teachers describe how they learn a lot by observing pupils during daily practice. Observing pupils in relation to their cognitive abilities and socio-emotional behavior is said to provide teachers with valuable information on pupils' strengths and weaknesses.

The interviews showed that these observations predominantly happen in an unconscious manner while teachers instruct and work with their pupils. Teachers explained how they find it hard to search for information in a deliberate and systematic manner as in most cases their attention is drawn to things that deviate from their expectations like disturbing behavior for example. Teachers explain how they try to focus their observations to gain more insight after they defined a problem, but most teachers nuance their answer by adding that most of their resources are absorbed by coping with everything that is happening around them.

Secondly, teachers indicate that conversations with the care coordinator are another important source of information since the care coordinator often worked with pupils who had the same problems in the past. During this consultation, teachers describe how they express their concerns and how the care coordinator will provide them with some tips and tricks on how to handle concrete problems. Afterwards, in most cases, the care coordinator will have a private session with the pupil to observe him/her while doing exercises or doing a test to explore a specific problem. Afterwards, teachers receive the feedback of this private session orally during set meetings or teachers can find the results and comments documented in the pupils' files. According to teachers, these files are not consulted that often because they already discussed the results with the care coordinator orally. Teachers indicate that they prefer to receive information orally than having to read reports themselves.

Conversations with parents are also set forward by teachers as a valuable source of information to get an overall picture of the child. Teachers state that they find it important to gain insight into the way parents see their child and to determine the amount of parental support children get. In the interviews the perceived value of this external information source is said to depend on the involvement of the parents and on the home environment. Information that is provided by parents and that teachers categorize as important, will be documented in pupils' files. Most information deriving from parental consultation however, will be stored in teachers' memory.

Finally, informal conversations with colleagues are also mentioned as a source of information, mostly to ask for practical tips or tricks. In some cases conversations with specialists, like people from the Pupil Counseling Center or therapist, are seen by the teachers as a valuable information source since they possess concrete information concerning specific problems or learning disabilities.

Quantitative Data

The interviews showed that teachers put less weight on quantitative data sources in their search for information. The results of non-standardized tests are put forward as the most important quantitative data source. Although batteries of standardized tests are available to schools, generally speaking non-standardized tests are perceived to be a more reliable data source since they allow teachers to adjust the testing to the needs of their pupils. For instance, pupils may be given extra time or an adjusted instruction. According to teachers the content of non-standardized tests will take into account the vocabulary that is used during lessons or that fits the vocabulary level of the pupils. Teachers describe pupils' reports as a summary and overview of their test results. According to teachers a report is the written reproduction of what they see happening in the classroom, so most teachers do not feel that pupils' reports add information to their decision process. Rather, it provides an overview of the individual scores in relation to the average and is mainly said to serve as a tool for communication and accountability towards the parents.

'Test results may of course provide valuable information, but you have to combine this information with you own experiences. What impression did I get when I observed this pupil?' (teacher 11)

Teachers seem to have less faith in the results of standardized tests. According to teachers, language skills have an impact on the results of standardized tests, since standardized tests use other vocabulary than teachers do during lessons. On top of that, the vocabulary is rather difficult, therefore teachers feel like the results can partly be explained by pupils' competencies of the Dutch language, rather than the competencies they seek to measure. Additionally, the standardized instruction that comes with the

standardized tests, does not allow teachers to be responsive to the special needs of their pupils, in the interviews most teachers see this as a shortcoming.

‘These are standardized tests, so we have to take them. In a way, I will take them into account. In most cases, they don’t differ that much from our judgment, but sometimes they do. The most important consequence is that you have to explain this to the parents, like: she had a bad day, she didn’t understand the vocabulary. (teacher 15)

Reports of external specialists, i.e. the Pupil Counseling Center or therapists, may be used as an information source, although teachers state that most of the time, they get this information orally during set meetings, so they do not feel the need to read the report afterwards.

Teachers’ prevalent argument to search for data was related to accountability. Teachers elaborated that they will need to collect data to underpin their intuition because according to teachers, intuition is not solid proof in their conversations with parents. Therefore, they feel the need to collect data that serves as evidence to underpin their intuition.

‘Off course, I want to be able to underpin my intuition with facts. Pure instinctively, that’s not possible. In these days you have to make sure that you’re covered. (teacher 1)

Summarized, it appears that teachers – in their search for external information - mainly rely on qualitative data, such as their own observations during daily practice and conversations with colleagues and parents or an oral explanation of special interventions. According to teachers the most important quantitative data source are the results of non-standardized tests. Results of standardized tests are perceived as less valuable, since teachers feel that these tests disable them to adapt the content and instruction to the specific needs of their pupils. The main reason why teachers collect quantitative data appeared to arise from an accountability perspective.

4.2.2 Intuition as source of information

Teachers state that intuition is the most important information source in defining the competences, attitudes and special needs of their pupils. Most teachers indicate that they highly value getting to know their pupils as well as possible in order to adjust their teaching practices to their specific needs. According to teachers, it is their intuition that gives them the ability ‘to read their pupils’. Secondly, teachers’ intuition appears to give direction to the search for data. According to teachers, intuition indicates possible causes of the defined problem. Based on this information teachers decide on the sort and the amount of data they need. Thirdly, teachers’ intuition seems to serve as a lens through which data is perceived. Concrete examples from the interviews are the

alternative explanations given by teachers when a pupil scores lower on a test than the teacher had expected. Teachers state that, by working with their pupils, day in day out, they are able to see the bigger picture while test results are only a snapshot. So, they will use their intuition to interpret unexpected results and to decide whether they will accept the information provided by these test results or whether this information will be put aside.

'I rely on my gut feeling: that's sufficient to know when I have to worry and when I do not have to worry.' (teacher 11)

Most teachers share the opinion that pupils will only function well when they feel understood and when they feel emotionally supported in the classroom. According to teachers, it is because they care about their pupils that they are able to fully understand pupils' potential and special needs. Both verbal as well as non-verbal elements may trigger these 'feelings of knowing'. The reverse side is that several teachers mentioned a feeling of personal failure when they had made the decision for grade retention because, according to teachers, it means they were not able to give the pupil what he or she needed.

'I believe my intuition is reliable because I highly value knowing my pupils. The strong feelings of mutual trust enable me to identify problems very quick.' (teacher 1)

'The child is not only the brains, it's the entire package. Yes, you have to be rational, but you have to be emotional as well.' (teacher 7)

Our research shows that intuition plays a pivotal role in teachers' search for information that precedes the decision for grade retention as it (1) is seen as the most important source of information to determine the competencies and needs of pupils (2) gives direction to the search for data (3) serves as a lens through which teachers look at data and (4) is used as a framework to interpret data so this data becomes information that is relevant for the decision process. Teachers, however found it difficult to explain the bases of this intuition. Most teachers describe intuition as a part of their personality, because they can easily put themselves in the situation of a child. According to teachers, experience elaborates the use of intuition in two ways. Firstly, because of experience teachers feel they are less focused on the curriculum, which allows them to spend more time observing pupils. Secondly, experiences from the past are said to serve as a reference point. After practicing their job for some years, teachers state that they know what a pupil should be able to do at a certain point in time, they experienced familiar cases and teachers are said to recognize patterns in mistakes and behavior.

'So many years of teaching in first grade gives me a pretty good idea of the average pupil in first grade and how a child is situated in relation to this average.' (teacher 2)

'There are always things that come back, you start to recognize them. The look on his face, an attitude or a reaction can recall a pupil you had in the past. Then you think: he went along this road. Thus, you can connect your gut feeling with facts.' (teacher 15)

Starting from the evaluations they make throughout the year, based on written and oral testing, teachers develop an image of pupils' capacities. In teachers' opinions, pupils who are underachieving in a general sense, in mathematics as well as in their mother tongue are not ready for a subsequent grade. Whether the decision for grade retention will be made, apparently that is where intuition comes in. The next paragraph will elaborate on how teachers evaluate the two alternative options: will a pupil be allowed to pass to a subsequent grade or will he/she have to retain a grade?

4.3 The Role of Data and Intuition in the Evaluation of Alternatives. (RQ3)

The third research question aims to explore how teachers evaluate alternatives before they make the decision for grade retention. When teachers were asked which criteria they used to evaluate whether a pupil could proceed to the subsequent grade or had to retain a grade, most teachers state that there are no universal criteria since every child is different. Analyzing the interviews, however, we were able to define criteria that appeared to be salient in the decision for grade retention. Firstly, we will discuss how a choice is made among the alternatives in terms of the value of its consequences. Therefore four decision rules will be elaborated on. Secondly, starting from these decision rules we will take a look at the standards used to compare different alternatives. These evaluative criteria are summarized at the end of this paragraph.

Lack of maturity is mentioned by teachers as one of the most important reasons they see for grade retention in first grade of primary education. Teachers feel that repeating the year will provide the pupil with extra time to develop and to (literally) grow. In their opinion, in this case pupils will benefit from repeating the year. Teachers indicate that there is no clear definition of maturity and there is no valid test to measure maturity. Therefore, teachers state, they mainly have to base their judgment on intuition, deriving it from relevant cues.

'Maturity is an important issue in first grade. Often, you notice that a child is not ready to learn. When you decide to give the pupil the chance to repeat the same year, you will see that the pupil progressed and that things go much better.' (teacher 11)

Teachers feel that the *wellbeing* of the child is always a priority. Based on observations in the classroom, sometimes complemented with information from parents about changing behavior at home, teachers state that they notice when the pressure is getting too high and when a child feels unhappy. The interviews point out that, when this is the

case, immediate action is undertaken by developing an alternative program which lowers the pressure on the pupil. In most cases it means that this particular child will not reach the learning objectives by the end of the year, so grade retention will be the only alternative. This measure is only possible with parental consent. When evaluating alternatives, another argument made by the teachers is the degree to which they expect a child to fit in a certain class group. For example, although the cognitive abilities of a child appear to be low, teachers may not decide to retain a grade because they feel the child is too mature to spend another year with younger children. In this case, teachers fear that the child will become unhappy and that his/her motivation will decrease.

'You will notice that children start to suffer from a headache or stomach pain. They don't like coming to school anymore. This is what happens when you raise the pressure too much. In that case, the wellbeing is always a priority.' (teacher 2)

In the interviews, all teachers felt that the decision for grade retention is meaningful when there is a *lack of basic academic skills needed for the next year*. In the interviews teachers state that the curriculum of first grade is not that difficult, but it is an important basis that needs to be built upon throughout the years to come. So, there have to be solid basic skills and competencies. Teachers perceive it as a necessary precondition for future success. Teachers also indicate that grade retention is only meaningful if it solves the underlying problem. According to teachers, when there is the presumption of a possible learning disability, grade retention is not the right decision because repeating the year will not solve the problem. Teachers have to base this assumption mainly on their intuition since, in practice, pupils in first grade are said to be too young for an official diagnosis.

'A decisive argument in the decision for grade retention was that the child performed weak on all of his basic academic skills. During all the year, we had given him extra care, but that didn't lead to the desired results.' (teacher 14)

Finally, according to teachers the decision has to *feel right*. Teachers state that the decision for grade retention is a very difficult one and since they *'don't have a crystal ball'* (teacher 11) it is important that the decision feels right. If they believe in the decision they make, they feel like they have acted to the best of their ability.

'My intuition is very important when I have to make the decision for grade retention. If the decision does not feel right, I will not make the decision. I wouldn't be able to forgive myself if it turned out wrong.' (teacher 1)

Deriving from the decision rules that have been set forward by teachers, the predominant evaluative criteria to compare alternatives appeared to be (1) the perceived added value of grade retention in the development of the child (mainly gaining maturity) and (2) the perceived benefit for the wellbeing of the child. Since

teachers mentioned that there are no valid tests to measure maturity or wellbeing and children from first grade are too young for official diagnosis of disorders, these evaluative criteria seem to heavily depend upon the intuitive judgment of the individual teacher. It is also said to be important that the decision feels right to protect teachers from feelings of uncertainty because there is no guarantee that teachers made the right choice. Although teachers state that information retrieving from data as well as intuition plays an important role when evaluating alternatives, arguments based on the intuition of the individual teacher appear to weigh heavily on the decision for grade retention.

'When all the data seems to be negative, I put this next to my intuition, then we decide: what is in the best interest of the child?' (teacher 15)

5. CONCLUSION AND DISCUSSION

Theories of data-based decision making in education are merely based on theories of rational choice. However, research shows that people do not always follow the principles of rational choice, instead they tend to rely on intuitive strategies (Kahneman & Frederick, 2005; Klein, 2008). Therefore, this study used teachers' decision process concerning grade retention as a case to explore the role of data and intuition when teachers define the problem (RQ1), search for information (RQ2) and evaluate alternatives (RQ3).

Firstly, we can conclude that intuition plays a leading role when teachers define a problem. The results show that teachers use their intuition to interpret what they see happening in the classroom. Based on observations and on intuition, teachers are able to define a problem at an early stage, even before test results come in.

Secondly, when teachers search for information to elaborate the problem, intuition also appeared to play a pivotal role in deciding which data will be consulted and which information retrieved from data will be taken into account in the decision process. Intuition is used as a guiding framework to make sense of data. In this manner teachers transform data into meaningful information that can be used in the decision process.

Finally, when evaluating alternatives, information provided by data is taken into account, but is weighted and evaluated by the touchstone of intuition. In the case of grade retention, an important decision rule appeared to be that the decision for grade retention had to feel right for the teacher. In the case of the decision for grade retention there are no guarantees of making the right choice. Therefore, above all, the decision has to feel right in order for teachers to believe they have acted to the best of their ability. These findings confirm that 'feelings of knowing' lead to an enhanced sense of confidence in one's own decision (Langan-Fox & Shirley, 2003).

These conclusions draw attention to the possibility of systematic errors (Kahneman & Frederick, 2005). Research has shown that people tend to focus on confirming their hypotheses, not challenging them (Evans, 2008; Evans & Feeney, 2004; Kahneman & Frederick, 2005; Shafir, 1994). Theory on this so called confirmation bias shows that people have the tendency to look at data that confirms what they think, believe or know and work hard to avoid evidence to the contrary (Kahneman & Frederick, 2005). So, if teachers look at their pupils through the lens of their intuition, through what they currently think, believe and know, they might only look for data that supports this predisposition. Given the possible pitfalls of confirmation bias, the content of teachers' intuition may be inquired and complemented using data. However, in this study we found that teachers use data in decision processes only to a limited extent since teachers have a strong belief in the value of their own intuition.

Furthermore, it appeared that teachers prefer to use results of non-standardized tests and often reject the results of standardized tests when they don't correspond with their own judgment. As we have explained when we elaborated the research context, in Belgium we have no central exams and there is no general obligation to use standardized tests. By rejecting the results of standardized tests, teachers may ignore a valuable source of information. Timperley and Phillips (2003) found that when teachers relied on their own assessments of pupils' knowledge rather than on standardized tests, they underestimated what pupils could do and were targeting their instruction at lower levels than what students were capable of achieving.

These findings highlight the value of carefully collecting, analyzing and adding data to the decision process, at the same time this study draws attention to the prevailing dominant role of intuition in teachers' decision making. If we want to gain more insight in the role and impact of data in teachers' decision making, first we will have to gain a more in-depth insight in the bases of teachers' intuition and in its impact on teachers' use and sense making of data. Further research is needed to elaborate our understanding of teachers' decision process. The prevalent models on data-based decision making will need to be broadened by acknowledging and refining the role of intuition in teachers' decision making. The findings in this study may serve as a valuable starting point in regard to this.

We need to mention some limitations of this study. Firstly, we used the decision for grade retention in first grade of primary education (teaching 6 year olds) to explore teachers' decision process. This provided us with a valuable case, but it brings limitations as well. Other decision strategies may be applied or other data sources may be used when teachers make other decisions or even the same decision in another grade. Future research can make valuable contributions to the body of research when they use the findings of this study as a starting point to explore other decisions teachers have to make.

Chapter 4

Furthermore, starting from theoretical insights, we divided information into two categories: data and intuition. This study showed that in practice these information sources are intertwined and that there is an exchange and mutual influence of internal and external information sources. Teachers' information use is not dichotomous. A valuable addition to further research may start from a grounded theory perspective to explore the broad spectrum of information that is used by teachers during decision making, ranging from internal on the one side of the continuum to external on the other side and exploring all the gradations in between.

Also, we deliberately started off from a very broad definition of data, without restrictions often made in data-use literature, saying that data needs to be collected in a deliberate and systematic manner. There are strong arguments to be made to include these restrictions in order to separate data from casual and unintentional information-gathering that is no part of a cycle of reflective inquiry. In this strict definition data can be placed on the one hand of the continuum, whereas data in our definition can be placed in a stage before the end of the continuum. A critical remark with regard to this is that the share of data in teachers' decision process would be minimal if we had applied these limitations in our research. The data use mentioned by teachers in our study seldom happens in a deliberate and systematic manner, but we need to stress that our conceptualization of data use appeared to play an important role in explaining teachers' decision-making.

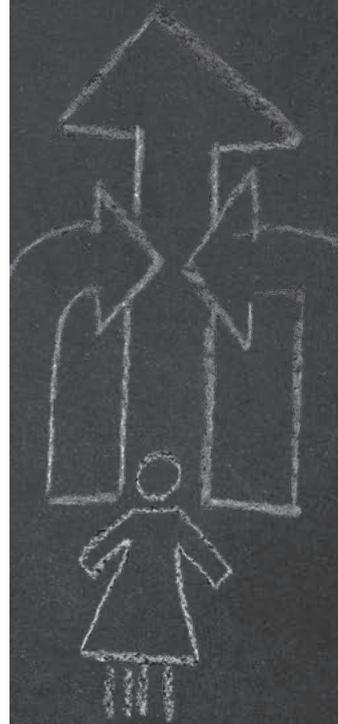
5

Chapter

Teachers' high-stakes decision making. How teaching approaches affect rational and intuitive data collection.

This chapter is based on:

Vanlommel, K., Van Gasse, R., Vanhoof, J., & Van Petegem, P. (2018). Teachers' high-stakes decision making. How teaching approaches affect rational and intuitive data collection. *Teaching and Teacher Education*, 71, 108-119.



1. INTRODUCTION

Teacher judgement has a significant impact on pupils' educational trajectories, especially transition decisions that sort pupils in educational tracks. Understanding how teachers judge the competencies of pupils, and why they judge them the way they do, is therefore of crucial importance. Human judgement is believed to be based on rational as well as intuitive processes (Harteis et al., 2008; Kahneman & Frederick, 2005). For many years in the education field, so-called informed intuition was accepted as the primary basis of teacher judgement (Creighton, 2007). According to theories on intuitive expertise, experienced teachers are able to recognise the most important data without needing to search for it (Harteis et al., 2008; Klein, 2008). This intuitive type of data collection is considered to be an important aspect of expertise and a valuable basis of teacher judgement (Harteis et al., 2008; Klein, 2008).

However, the disadvantage of intuitive data collection is that it can lead to confirmation bias when teachers focus their attention on what they expect to see and consequently they may miss important data that questions their assumptions.

In the past, numerous studies of teacher judgement have emphasised the lack of reliability when the outcome of teacher judgment was compared with the results of objective measures such as standardized test (Bennett et al., 1993; Harlen & Deakin, 2002). More recently, Kaiser, Retelsdorf, Südkamp, and Möller (2013) came to similar conclusions as they found teacher judgment of students' achievement level and progress to be far from reliable. The low accuracy of teacher judgement was mostly explained by the conclusion that teacher judgement included many non-achievement factors collected spontaneously during practice (e.g. motivation, interest) (Allal, 2013; Bennett et al., 1993). These findings have led to an increased expectation that teachers will collect data rationally to enhance their quality of judgement (Carlson, Borman, & Robinson, 2011; Earl & Louis, 2013; Schildkamp & Lai, 2012; Wohlstetter et al., 2008).

Many studies have therefore investigated factors that might promote or hinder data collection within schools, such as school context and data characteristics (see e.g. Coburn & Turner, 2011; Ikemoto & Marsh, 2007; Levin & Datnow, 2012; Mandinach et al., 2006; Schildkamp, Poortman, Luyten, et al., 2016; Vanlommel, Vanhoof, & Van Petegem, 2016; Wayman et al., 2012; Wohlstetter et al., 2008).

On the individual level, scholars initially focused on technical factors relating to teachers' data literacy - the ability to transform information into actionable instructional knowledge and practices by collecting, analysing, and interpreting all types of data (Mandinach & Gummer, 2013). To a lesser extent, psychological or motivational factors were also considered, for example teachers' attitude with regard to data use, teachers' confidence in their ability to use data or the quality of teachers' motivation to use data (see e.g. Pajares, 2003; Rubie-Davies, 2010; Tschannen-Moran & Hoy, 2001; Vanhoof et

al., 2014; Woolfolk & Hoy, 1990). In their review study with regard to teacher beliefs about data-driven decision making, Datnow and Hubbard (2016) concluded that teacher belief systems are frequently underexposed in data use research as well as educational reforms. Nevertheless, examining teachers' beliefs would provide a better understanding of their capacity and willingness to use data to inform their judgement (Coburn & Turner, 2012). While rational models of data use are supported by researchers and policy-makers, these new approaches to teaching may not coincide with how teachers believe good teaching and judgement should be exercised (Kelchtermans, 2009; Thomas & Beauchamp, 2011). When it comes to data use, teachers do not adopt new expectations as passive executors, instead they actively use their conceptions of good teaching to interpret, evaluate and adapt new approaches to the practice of teaching (Buchanan, 2015; Drake, Spillane, & Hufferd-Ackles, 2001). Teachers' approaches to teaching influence their teaching and assessment practices (Postareff & Lindblom-Ylänne, 2008).

How teachers approach the practice of teaching and why they believe in the approach they adopt has been the focus of many studies in recent years (Calderhead, 1996; Lindblom-Ylänne, Trigwell, Nevgi, & Ashwin, 2006; Postareff & Lindblom-Ylänne, 2008). However, these insights are often used to explain the relationship between teaching and learning approaches. Although research has demonstrated that teachers hold an array of conceptions and approaches to teaching that might inhibit or support new approaches towards data use, these are largely ignored in research as well as in reform strategies focusing on data use (Day, 2002; Van Veen, Slegers, & Van de Ven, 2005). A greater degree of in-depth insight is therefore needed into why individual teachers still predominantly use data intuitively rather than rationally, despite initiatives to support data use at school level (Schildkamp & Lai, 2013; Vanlommel et al., 2016). Teachers' approaches to teaching may therefore be a valuable lens through which to view and explore this issue.

In this study, we will describe how teachers collect different categories of data when they judge pupils' competencies. Thus, we will investigate how different approaches to teaching influence the way teachers collect data to inform their judgement.

2. THEORETICAL FRAMEWORK

2.1 Teacher judgement: a dual process approach

Studying teacher judgement, different viewpoints can be found stressing the importance of either rational or intuitive processes. The last decade, there has been increased attention for data-based decision making in education, starting from the idea that data use enhances the quality of educational decisions (Mandinach & Jimerson,

2016; Schildkamp et al., 2012). This application of rational decision models in an educational context describe optimal teacher judgement as a sequence of deliberate and systematic data collection, analyses and interpretation to evaluate alternatives before teachers make a decision (e.g. Datnow, Park, & Kennedy-Lewis, 2012; Schildkamp & Ehren, 2013; Strayhorn et al., 2009).

Meanwhile, a growing body of literature has explored teacher judgement as a contextualized and complex practice influenced by teachers' knowledge and experience, which does not necessarily follow a technical-rational model (Bertrand & Marsh, 2015; Coburn & Turner, 2011; Datnow et al., 2012). In practice, it appears that teacher judgement is still greatly based on intuitive processes. For example, Vanlommel, Van Gasse, Vanhoof, and Van Petegem (2017) found that intuition played a prevalent role when primary teachers make the decision for grade retention.

As many researchers in the field of decision making agree, it seems appropriate to assume that both rational and intuitive processes act as two parallel and concurrent systems that influence teacher judgement (Epstein, 2002; Evans, 2008; Ferreira et al., 2006; Goldstein & Hogarth, 1997; Klein, 2008; Myers, 2002; Tversky & Kahneman, 1981). This dual process approach to teacher judgement (Evans, 2008), also described as 'System 1 and System 2 Thinking' (Kahneman & Frederick, 2005; Tversky & Kahneman, 1981) or 'Cognitive Continuum Theory' (Hammond, Hamm, Grassia, & Pearson, 1987) starts from the idea that the rational system enables teachers to collect and process data deliberately while the intuitive system involves a more spontaneous data gathering and processing. Although in empirical analyses these processes are separated for reasons of conceptual clarity, intuition is not the opposite of rationality. In practice rational and intuitive processes are expected to be intertwined and mutually influence each other (Hammond et al., 1987; Kahneman & Frederick, 2005).

In one point of view, evidence shows how rational data analyses can be used to detect and correct bias deriving from intuitive judgement (Earl & Louis, 2013; Kahneman & Frederick, 2005). On the other hand, studies in the field of naturalistic decision making show how experts are able to overcome the limitations of bounded rationality because they are able to recognize relevant data in all the information that surrounds them (Kahneman, 2003; Klein, 2008; March, 1994). Data collection has shown to be of decisive importance in the final decision since only data that are brought into the decision process can be taken into account (Schildkamp & Lai, 2012). Because teachers, as all decision makers, have limited time and cognitive capabilities to process all data available, data collection is guided by the expected value of the information for the decision maker. How teachers believe good teaching should be and their approaches to teaching is expected to influence how they collect data to a great extent. (March, 1994).

Starting from a dual process approach that takes into account both rational and intuitive processes in teacher judgement, following paragraphs will elaborate the role of

data and intuition in the important phase of data collection and how data collection may be influenced by teachers' approaches to teaching.

2.2 How do teachers collect data?

2.2.1 Rational data collection versus Intuitive data collection

Data use broadly refers to collecting, analysing and interpreting data before a decision is made (Mandinach & Gummer, 2013). Although all steps are important in this cyclic and systematic process of data use, how teachers collect data has shown to have an important impact on the final decision (Kahneman & Frederick, 2005). Since teachers, as all decision makers, have limited time and cognitive capabilities with regard to information processing, they will not consider all data, instead they filter data through existing knowledge and beliefs, paying attention to some data, and ignoring other (Spillane, Reiser, & Reimer, 2002; Weick, 1995). Therefore, the step of data collection is said to be of decisive importance in teacher judgement. Only the data that are brought into the decision process can be analysed, interpreted and used to evaluate alternatives in the final decision (Schildkamp, Poortman, & Handelzalts, 2016). The process in which teachers collect data can incorporate both rationality and intuition (Epstein, 2010; Kahneman & Frederick, 2005). Therefore, it is important to define the distinguishing characteristics that separate rational data collection from intuitive data collection.

In education, teacher judgement has been based predominantly on intuitive strategies for many years. Teachers collected data spontaneously during their daily practice (Creighton, 2007). Allal (1988), for example, used the term 'spontaneous performance assessment' to describe the intuitive judgement of effort or perseverance based on pupils' daily assignments, along with unrecorded and occasional observations of attitudes and work habits. At elementary-school level, teachers' spontaneous observations and overall impressions used to provide the main basis for official decisions (Airasian, 1994). Intuitive data collection refers to spontaneous, recognition-primed collection of data without any deliberate, systematic search. Throughout their careers, teachers develop a framework of personal knowledge based on learning and experience (Kelchtermans, 2009; Klein, 2008). This personal expertise enables teachers to recognise patterns in the data that surrounds them and guides their attention when searching for data (Dane & Pratt, 2007; Klein, 2008). The recognition of data will create expectancies about future outcomes and enables teachers to identify a plausible conclusion without deliberate analyses (Klein, 2008).

Although these intuitive strategies are an important aspect of expertise, judgement that is solely based on data collected intuitively may not be objective and fair as judgemental heuristics may produce a form of bias that jeopardises intuitive judgement (Kahneman & Frederick, 2005). For instance, confirmation bias may apply when teachers only

observe what they expect to see and ignore any data that questions their assumptions (Harteis et al., 2008; Kahneman & Frederick, 2005). Thus, the nature and quality of data collection has an important impact on the quality of teacher judgement (Earl & Louis, 2013). Hence, rational data collection is considered to be a valuable alternative that prevents intuitive heuristics from leading to confirmation bias (Kahneman & Frederick, 2005).

Rational models of teacher judgement are embedded in theories on 'data use' and describe a cyclic process that is initiated by a pre-set goal or question. Subsequently, teachers decide what data they need to answer that question and will think about a plan or method to collect the data. They will then engage in a deliberate search for data, analysing and interpreting it before making any decision. If the data collected do not provide a sufficient answer to the question, a new cyclic process will then be initiated (Earl & Louis, 2013; Schildkamp & Ehren, 2013).

In contrast to a spontaneous recognition-primed collection of data, rational theories on data use describe a purposeful and cyclic process that follows a series of steps initiated by a pre-defined goal. At one end of the cognitive continuum are deliberate, systematic strategies of data collection as described in theories of data use (Hammond et al., 1987). At the other end are non-deliberate, non-systematic recognition-primed strategies as described in theories of intuitive expertise (Klein, 2008).

In this study, a conceptual distinction will be made between rational and intuitive modes of data collection that will be based on the extent to which data are collected in a deliberate and systematic manner.

Deliberate data collection means that teachers will intentionally collect data when initiated by a pre-defined problem or goal (Schildkamp & Lai, 2012). For example, teachers may analyse pupils' writing exercises because they want to find out if the same mistakes are recurring.

Systematic data collection refers to the collection of data according to a pre-defined plan or using a specific method (Earl & Louis, 2013). For example, classroom observations may be conducted using an observation protocol that denotes a form of systematic data collection. On the other hand, classroom observations cannot be deemed systematic if they are conducted without a thoughtful, explicit method such as a protocol or a checklist. Given the likelihood of confirmation bias teachers may only see what they expect to see.

2.2.2 Data: the need for a clear definition

Literature on data-use often encompasses broad definitions of data, varying from cognitive to socio-emotional factors, and includes quantitative as well as qualitative indicators (e.g. Coburn & Turner, 2012; Earl & Katz, 2006; Schildkamp & Lai, 2013). In

this study, we acknowledge the importance of different kinds of data that can be found in schools, however we will organise and categorise the data for reasons of conceptual clarity. The CIPO-framework provides a useful lens through which to view the cognitive and socio-emotional Context, Input, Process and Output data used by teachers (Kellaghan & Stufflebeam, 2003; Scheerens, 1990). *Context* data refer to all peripheral and external data relating to a specific pupil, for example parental expectations regarding pupils' future educational trajectories. *Input* data refer to the characteristics of a specific pupil, such as a certificate denoting a learning disability. *Process* data are related to processes of learning and instruction in relation to a specific pupil, for example, the work ethic a pupil demonstrates during lessons. *Output* data comprise cognitive and non-cognitive output indicators such as test results. Arranging the broad definition of data in this framework leads to the following definition of data being adopted in this study: *data are all cognitive and socio-emotional context, input, process and output indicators, both quantitative and qualitative.*

2.3 Approaches to teaching

As described above, decision making is not a technical-rational process free of values and beliefs (March, 1994; Pajares, 1992; Rubie-Davies, 2010). Teachers engage in a decision-process with a set of cognitions that operates as a lens through which they look at teaching and give meaning to it. Teachers tend to fit the decision making process into a frame that is familiar (Kelchtermans, 2009). Teachers' approaches to teaching influence their behavior with regard to instruction and assessment (Postareff & Lindblom-Ylänne, 2008).

Studies examining the accuracy of teacher judgement when compared with objective measures point out that teacher judgment is subject to much individual teacher variation (Brookhart, 1994, 2013; Kaiser et al., 2013). Teachers use different standards and hold different values when they assess pupils' competences (Kelly, 1914; Rubie-Davies, 2010). Because teachers have different understanding and beliefs about the purposes of their teaching, they use achievement and non-achievement factors differently in their judgement of pupils' competences (Brookhart, 2013; Randall & Engelhard, 2010). For example, teachers who believed that fair decisions needed to take into account socio-emotional factors such as effort and persistence, used more non-achievement factors in their judgement (Briscoe, 1991; Brookhart, 1994; Stiggins, 2005). This raises the expectation that teachers with a certain approach to teaching will collect different kind of data. In literature on teachers approaches to teaching (eg. Lindblom-Ylänne et al., 2006; Trigwell et al., 1999; Williams & Coles, 2007) teachers have shown to differ into the extent in which they focus on the curriculum. While some teachers focus their teaching on curricular goals, other teachers focus more on the socio-emotional aspects of teaching (Pratt, 2002). That is why we assume that teachers' approaches to teaching will influence their mode of data collection. More specific, we

assume that teachers who focus more on the socio-emotional aspects of teaching will use more non-achievement data to inform decision making. Further, our assumption is that teachers who focus more on curricular goals will use more achievement data to inform decision making. As previous research has shown that the use of non-achievement factors negatively influenced the accuracy of teacher judgement when compared with objective measures, it is important to explore this relation.

A teaching approach can be defined as a strategy teachers adopt when teaching, based on their beliefs of good teaching (Louws, Meirink, van Veen, & van Driel, 2017; Meirink, Meijer, Verloop, & Bergen, 2009; Trigwell, Prosser, & Taylor, 1994). These approaches often vary from a teacher-centred strategy, where the intention is to transmit knowledge to pupils, to a pupil-centred strategy aimed at facilitating learning (Trigwell et al., 1994). Teachers' approaches to teaching are frequently studied in relation to their conceptions of teaching, as conceptions of good teaching influence how teachers teach (Allal, 1988; Beijaard & Verloop, 1996; Beijaard, Verloop, & Vermunt, 2000; James Calderhead & Robson, 1991; Kelchtermans, 2009; Postareff & Lindblom-Ylänne, 2008). Given this, Kember and Gow (1994) identified two conceptions of good teaching possessed by teachers. Firstly, teachers with a knowledge transmission conception believe that good teaching focuses on transferring content to pupils and preparing them to achieve adequate grades. Teachers with a learning facilitation conception view good teaching as an approach that motivates pupils and guides learning processes. In subsequent research, Prosser and Trigwell (1999) combined conceptions of good teaching with their earlier findings regarding the teacher-centred/pupil-centred approach, postulating an information transmission/teacher-focused approach and a conceptual change/student-focused approach. The same dimensions were combined by Pratt (2002) into a clear, descriptive framework where three different teaching approaches were based on a combination of a high/low focus on transmitting the curriculum on the one hand, and a pupil-centred/teacher-centred approach on the other. Although, in practice, teachers may use elements from all the approaches, most tend to follow one particular approach (Pratt, 2002).

(1) Teachers with a *transmission* teaching approach believe that good teaching requires a focus on the curriculum and a systematic and structured approach. Pupils are seen as passive recipients of information transmitted to them by the teacher. Teaching is therefore founded on a teacher-centred approach.

(2) Teachers with a *developmental* teaching approach believe that effective teaching must be planned and conducted from the pupils' point of view. Good teachers must understand how pupils think and reason about the content and must therefore provide them with tasks that are meaningful. They consider each pupil's individual needs whilst teaching them as much of the curriculum as possible. Teachers are clear and structured

in their delivery of the content because they believe this will create a supportive environment within which pupils will master increasingly complex curricular goals.

(3) Teachers with a *nurturing* approach believe that good teaching comes from the heart and that enhancing pupils’ motivation is the key to learning. These teachers believe that pupils are motivated learners when they feel happy during class and enjoy coming to school. Therefore, nurturing teachers predominantly focus on the socio-emotional aspects of teaching rather than curricular goals. In order to be responsive to students’ socio-emotional needs, these teachers place pupils at the centre of teaching (pupil-centred approach) and do not adhere to a structured teaching approach (Pratt, 2002).

These teaching approaches therefore reflect teachers’ differing conceptions of good teaching. Given this, we will therefore investigate whether and how these approaches explain differences in the way teachers collect data to inform their judgement. An overview of the theoretical framework is provided in figure 1.

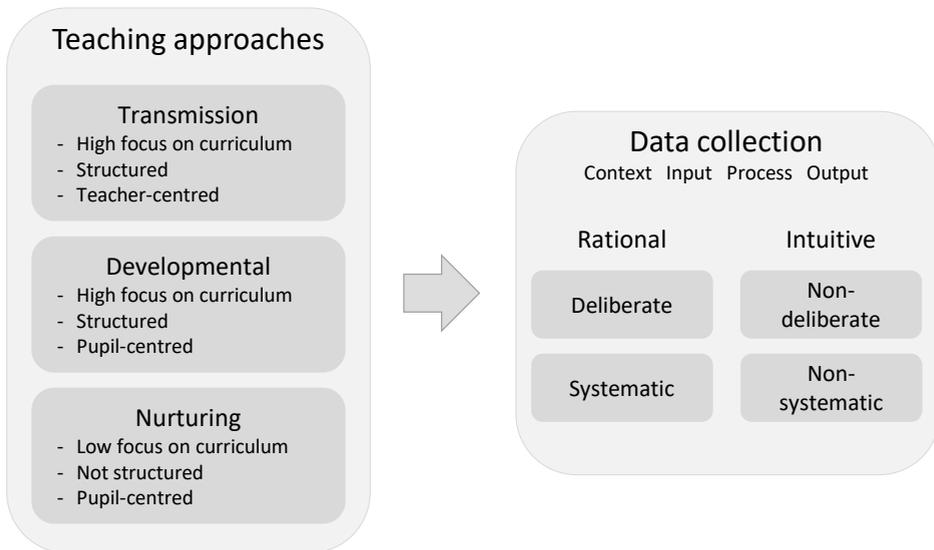


Figure 1: Overview of the theoretical framework

3. THE APPROACH OF THIS STUDY

In this study, we selected the transition from primary to secondary education as an appropriate case to show because this transition involves complicated decisions that are influenced by many factors, and will have a decisive impact on pupils’ future position in society. Moreover, it is one in which the judgement of the individual teacher still plays a significant role.

In Flanders (Belgium), pupils typically make the transition to secondary education by the age of 12. Teachers therefore need to make the transition decision at the end of a pupil's primary education. Although, officially, the transition decision is made by a team, in practice it appears that the judgement of the teacher is still of decisive importance (Bonvin, 2003; Goos, Van Damme, Onghena, Petry, & de Bilde, 2013). This highlights the importance of questioning how the individual teacher makes the transition decision. As stated in the theoretical framework, rational data collection is viewed as a valuable approach that prevents intuitive heuristics from leading to judgement bias. Therefore, we will study how rational or intuitive teachers use data to inform their judgements about pupils' competencies in relation to the transition to secondary education.

Research Question 1 is therefore:

RQ 1: What kind of data do teachers collect rational or intuitive to inform their judgement?

This question derives from an increasing expectation that teachers will collect data rationally to inform decision making. However, research has shown that teachers' conceptions of good teaching significantly influence their approach to teaching (Drake et al., 2001; Van Veen et al., 2005). These, in turn, will influence how teachers assimilate new models of teaching and evaluation as teachers will try to assimilate new norms into their existing conceptions of good teaching (Kelchtermans, 2009; Van Veen et al., 2005; Zembylas, 2003). Therefore, we will also investigate how teachers' approaches to teaching influence how they collect data to inform their judgement. This leads to the second research question, which is:

RQ 2: How do teaching approaches influence teachers' collection of data when judging pupils' competencies regarding the transition from primary to secondary education?

4. METHOD

4.1 *Design*

In our study we used a qualitative research design based on semi-structured interviews, because our focus is on understanding how teachers collect data to inform their judgement and how their teaching approaches influence data collection. This requires an in-depth description of the underlying processes and beliefs in a contextualised way (Yin, 1994). This qualitative research design allows us to gain a rich understanding of the complexity of the phenomenon in a real-life context, trying to understand the viewpoint of the teachers.

4.2 Participants

The focus of this study was on 6th grade (pupils aged 11 – 12) primary education in Flanders (Belgium). In this research paper, we want to investigate how teachers collect data rationally or intuitively. Theories of naturalistic decision making suggest that only experts in a domain are able to recognize relevant cues spontaneously because they have developed mental models based on experience (Klein, 2008). Therefore, we wanted to include only expert teachers in our research. In previous research five years of teaching experience is often mentioned as the minimum criteria to identify expert teachers (Palmer, Stough, Burdinski & Gonzales, 2005).

A purposive sampling strategy was adopted as the participants needed to be teachers in 6th grade with at least five years' experience as a teacher (Miles, Huberman & Saldana, 2014). Sixteen 6th grade teachers participated on a voluntary basis.

31% of the teachers were male (N=5) and 69% were female (N=11). 44% had between 5 and 10 years of teaching experience whilst 56% of the teachers had more than 10 years of experience (see table 1). All teachers signed an informed consent form stating that they were informed about the goals of the research, that they understood their anonymity was guaranteed and that they could end their cooperation at any time.

Table 1: Descriptive Overview of the participants

Teacher	Gender	Years of Teaching Experience
1 Emma	female	11
2 Frank	male	32
3 Bart	male	15
4 Roy	male	32
5 Amy	female	13
6 Ann	female	8
7 Joyce	female	5
8 Peter	male	4
9 Sophie	female	8
10 Bob	male	19
11 Julie	female	29
12 Lisa	female	7
13 Mary	female	25
14 Pamela	female	30
15 Liz	female	7
16 Katy	female	8

4.3 Interviews and Procedure

Participants answered open-ended questions that explored their initial judgements about pupils' competencies at the start of the year, in relation to the transition decision

they will need to make at the end of the year. Example questions include: "You indicated that there might be a problem with the transition from primary to secondary education with 'pupil X'. "; "What data did you use to inform this judgement?"; "How did you collect these data?" Questions related to their teaching approach were also included. For example, they were asked: "How do you see yourself as a teacher?", and "How would you describe your teaching approach?" All teachers discussed a transition problem involving 2 specific pupils, which meant that a total of 32 cases were discussed.

The in-depth interviews lasted for an average of one hour and were conducted by a single researcher. The same interview protocol was used in all 16 interviews to ensure methodological consistency (Cohen, Manion & Morrisson, 2008). All the interviews were audio-recorded and the files securely saved for reasons of reliability (Cohen et al., 2008). Peer-debriefing sessions were then conducted in which the different methodological choices, data analysis procedures and interpretations were critically examined (Creswell & Miller, 2000).

4.4 Analysis

The interviews were transcribed ad verbatim and analysed using the qualitative software package, NVivo 10. The aim was to capture variations in both data collection (rational versus and in approaches to teaching. In step one, all references to data collection and teaching approaches from half of the transcripts were listed, and any variation in these descriptions was then explored inductively. Researcher A (the first author) annotated interview fragments with an open code, staying as close as possible to the original text (Miles et al., 2014). Subsequently, researcher A and B (second author) discussed these open codes to ascertain whether the codes were valid in terms of the text fragments surrounding them. In step three, researchers A and B discussed the extent to which these codes could fit into the theoretical framework. After both researchers had come to an agreement a deductive approach was then used. Two randomly selected interviews were analysed by both researchers and inter-rater reliability (Cohen's Kappa) was found to be 0.90 (Miles & Huberman, 1994). Based on the coding schema researcher A analysed all interviews in the last step of the coding process.

Table 2: Overview of the codes

Code	Conceptual characteristics	Example
Data	Quantitative and qualitative cognitive and social-emotional context, input, process and output indicators	Test results, conversations with pupils, observations, pupil files.
Deliberate	Collection starts from a pre-defined goal or question	A test taken to measure a specific curricular goal
Systematic	Collection is carried out according to a pre-defined plan or method	Observations using an observation protocol
Context	Indicators that delineate influencing factors in the surroundings of a pupil	Expectations from parents regarding further educational trajectories in secondary education
Input	Indicators referring to specific characteristics of a pupil	Certificate of a learning disorder
Process	Indicators that describe how a pupil relates to processes of learning and instruction	The work ethic a pupil displays during the lesson
Output	(Non) cognitive output indicators	Test results
Teaching approach		
Focus on curriculum	The teacher considers transmitting the curriculum to be the main goal of teaching	'Above all, pupils need to score at least 60% on all parts of the curriculum.'
Structured	Teaching follows a daily and weekly routine that is planned beforehand and strictly adhered to by the teacher.	'Every day, we start the day by discussing our routine so that every pupil knows what is going to happen.'
Teacher-centred	Teaching starts from how the teacher believes the content should be delivered. Pupils are viewed as passive receivers of information.	'I put a lot of energy in transmitting the knowledge the best way I can, so I expect pupils to be quiet and concentrated.'
Pupil-centred	Teaching starts from the needs and perceived levels of the pupils.	'I try to find out how what interests them, so I can use this as a starting point.'

To answer research question 1 we binarised the qualitative data according to the level of headcodes for each participant. Score 1 was allocated to a participant if a headcode was present in one of the cases, score 0 if this was not the case. Each of the 16 teachers discussed 2 cases, so 32 cases were discussed in total. Binarisation provides a clear overview into the appearance of phenomena across participants, removing individual differences between participants (e.g., talkative versus introverted participants) (Onwuegbuzie, 2003). This technique was suitable for the present dataset because all the conceptual topics were questioned in all semi-structured interviews. Starting from our theoretical framework, we calculated the use of context, input, process and output data for both cognitive and socio-emotional indicators (Kellaghan & Stufflebeam, 2003; Scheerens, 1990). We used binarisation, as a quantitative method for data reduction, merely as a starting point for further qualitative in-depth analysis.

To answer the second research question – the influence of approaches to teaching on teachers' data collection - we studied the text fragments that described teachers'

approaches to teaching. Based on insights derived from the theoretical framework, we used a deductive approach to cluster teachers into three different categories (transmission/developmental/nurturing) based on (1) high or low focus on the curriculum, (2) high or low structured teaching approach and (3) teacher centred versus pupil centred approach.

5. RESULTS

5.1 Teachers' data collection when judging pupils' competencies.

Table 3 provides an overview of the data teachers used to make their judgement. As explained in the methodology, the results were binarised. Each of the 16 teachers described 2 individual cases, 32 in total. For each case, we scored a (1) in that category if teachers used at least one data source of that sort or (0) when teachers did not use that kind of data. No teacher mentioned the use of context data, therefore we did not include this category in the table.

Table 3: Overview of teachers' data collection

Data collected	Rational data collection		Intuitive data collection	
	Cognitive	Socio-emotional	Cognitive	Socio-emotional
Input	8	2	0	0
Process	2	1	19	24
Output	13	0	1	0

The first issue to focus upon is what kind of data do teachers use rationally, and how do they use it to inform their judgements regarding transition decisions? The interviews showed that teachers predominantly use cognitive output indicators rationally, mainly by referring to the results of non-standardised tests. For example, Pamela describes how the test results for French show her that Ruby has not mastered the curricular goals. Like most teachers, Pamela's tests are based on a teaching method and are part of the teachers' manual that comes with pupils' schoolbooks. In many cases, teachers adapt these tests according to their own needs. This often means that teachers will only use the parts of the test they find relevant, or that corresponds with what they have taught. Furthermore, in many of the interviews teachers reported the use of tests they developed themselves to quickly test a small part of the curriculum. In exceptional cases, rational cognitive output data referred to homework or assignments pupils completed in the classroom. Just two teachers referred to the results of standardised tests. For example, Emma mentions a very low score on a standardised reading test taken by Jake. Because Jake is new in school, she found these results highly informative in judging his competencies.

Teachers also reported collecting test results to establish the extent to which a pupil has reached specific curricular goals, or to what extent they have progressed in certain subject areas. Given that teachers describe a deliberate and systematic collection of cognitive output data, this can be defined as rational data collection.

Teachers also collected cognitive input data to inform their judgement. Rational input data are related to information about pupils' (learning) disorders, SES-indicators and the situation at home. According to some teachers, they search for information in the pupils' files or will consult colleagues from previous years to determine the right approach for pupils with (learning) disorders or with problems at home. For example, Bob goes to see the care coordinator to find out which compensation strategies work best for Jake, a boy with dyslexia. However, in the interviews, many teachers did not mention a deliberate search for cognitive input data as they are presented with them passively at the start of the year in pupils' files or during a meeting where the transition from one grade to the other is prepared.

In general, the interviews show that the predominant use of rational data refers to cognitive indicators that were collected deliberately and systematically. Teachers seldom collect socio-emotional data rationally to inform their judgement regarding the transition decision. In the interviews, intuitive data collection exclusively referred to observations made during daily practice when teachers' attention was drawn by certain cues. According to the teachers, they had not deliberately planned to investigate certain aspects of pupils' competencies beforehand. No teacher mentioned the use of an observation protocol, a check list, or any other kind of method or system to guide their observations. Because the observations discussed by the teachers were neither carried out deliberately nor systematically, these observations are believed to be collected intuitively.

'I noticed him slouching in his chair, he showed no interest in what so ever. You can recognize that kind of pupil, their attitude is different from the average 11-year old. We sometimes say that their eyes don't twinkle. I noticed that when I looked at him immediately. I knew this passive attitude would be a problem.'
(Frank)

According to the teachers, their expertise as a teacher, as well as the personal connection they have with their pupils, allows them to recognise the most important indicators relating to pupils cognitive and socio-emotional progress as well as any problems they may have. Teachers often mention the word 'intuition' when they describe how they spontaneously recognise the most important data that proved to be decisive in their judgements regarding transition decisions.

'At the end, there is no pupil in my classroom of whom I thought: I hadn't noticed that myself, I hadn't seen that. Apparently, I observe a lot unconsciously. It is impossible to teach and to observe pupils deliberately at the same time. But I

know I get the essence implicitly. The trouble is that it is hard to formulate, because it's mostly an intuitive way of information gathering. For me, it is an important aspect of my teaching'. (Peter)

In the interviews, only Frank mentioned a deliberate and systematic search for information on interactions, this was between one pupil and a group of others when he observed them in the playground one week. Frank suspected that Tom, a boy in his class, was unfairly blamed by a group of other pupils for things happening in the classroom. This case is the only example we found in the interviews on the rational collection of process data related to socio-emotional indicators. In this study, intuitive data collection almost exclusively refers to a spontaneous, recognition-primed collection of process data. Only Lisa refers to the spontaneous recognition of a specific mistake in a writing task that might indicate a learning disorder. In this case, her intuitive recognition triggered a deliberate search for more data. In summary, a large amount of the data that informs teachers' judgements in relation to transition decisions is collected intuitively through observations during daily practice. Intuitive data collection is complemented by rational data collection to a certain extent, mainly regarding output indicators such as the results of non-standardised tests and, to a certain extent, input indicators such as reports on (learning) disorders.

5.2 Teachers' approaches to teaching and their influence on data collection.

To answer RQ 2 we will first describe differences in teachers' approaches to teaching. Following this, we will then explore how differences in such approaches influence data collection.

Five out of 16 teachers can be defined as teachers with a transmission approach to teaching. According to these teachers, good teaching requires a clear structure, for example, a fixed daily and weekly schedule. In this way, they make efficient use of class time, enabling pupils to master the content. The teachers describe how they try to prepare their pupils for secondary education and how they see it as their duty to assist them as far as possible in achieving the goals of the curriculum. In the interviews, most of these teachers believed that good teachers were experts in the subject matter who can teach their pupils in a competent way. Pupils are mainly seen as passive recipients of information.

Chapter 5

Table 4: Elements of teaching approach, gender and years of teaching experience (N=16)

Teacher	Sex	Years of Experience	High focus on Curriculum	High on Teacher Centred	High on Structured approach
Transmission Approach					
5	Amy	F	13	+	+
6	Ann	F	8	+	+
9	Sophie	F	8	+	+
15	Liz	F	7	+	+
16	Katy	F	8	+	+
Developmental Approach					
1	Emma	F	11	+	-
7	Joyce	F	5	+	-
11	Julie	F	29	+	-
12	Lisa	F	7	+	-
Nurturing Approach					
2	Frank	M	32	-	-
3	Bart	M	15	-	-
4	Roy	M	32	-	-
8	Peter	M	5	-	-
10	Bob	M	19	-	-
14	Pam	F	30	-	-
No Fit					
13	Mary	F	25	-	-

'I'm a strict teacher, I'm aware of that. But I have learned that pupils need structure in order to learn. I experienced the transition to secondary education as a gigantic step myself. In secondary education, I was confronted with so much at the same time, organisation,... self-dependence. (...) It (the approach) doesn't make me the most popular teacher, but afterwards, parents often come to me and thank me because their children were well-prepared. That, I find more important. I am a teacher, not their best friend, I have to teach them as much as possible.' (Emma)

Four out of 16 teachers can be identified as teachers with a developmental approach to teaching. These teachers believe it is important that pupils learn as much as possible, and they try to be responsive to pupils' individual needs. They claim that good teachers try to understand what is happening with pupils, not only in school, but also at home. In the interviews, the teachers described how they tried to set high standards that were then adapted to the capabilities and life context of each pupil. Therefore, according to these teachers, good teaching is based on the needs and potential of each pupil. Furthermore, these teachers believe that all pupils benefit from a structured and comprehensive approach, as this creates a safe learning environment.

'Wellbeing, I think it is very important, but there needs to be hard working too. We are in 6th grade, they need to work more independently. Each day, they know what their assignments are, it is the same method every week, and they know they will have to finish all their tasks by the end of the week. I can see that Tim's motivation has grown, he has opened up. Sometimes I notice that he did not make his homework. I know the situation at home, I know it's not easy for him. I will talk with him about it, be understanding, try to find a solution, but he knows he will still have to do his homework.' (Joyce)

Six out of 16 teachers can be defined as teachers with a nurturing approach as they generally believe that good teaching involves caring, listening to, and motivating pupils. These teachers describe how they believe good teaching involves loving your pupils as a parent, and making them feel safe and happy when they come to school. Thus, they do not see the curriculum as the focal point of teaching. According to these teachers, the socio-emotional aspects of teaching are very important as they will enhance pupils' motivation to learn, which in turn will be a lever for better achievement in the curriculum. In their daily routine, these teachers try to be responsive to the needs of their pupils and to what is happening in the group; they do not believe in, and do not like, a rigid structure or routine. For example Roy describes how he approaches George.

'I believe you can solve most issues using humour. If something happens in the class, I have to be responsive. I try to make a little joke,... Do not seek direct confrontations, or use punishment,... Otherwise, you create a stressful situation and that has the reverse effect. (...) I know it is related to who I am, people say that humour is part of my personality. I don't like to punish, it gives me a bad feeling. Getting a connection with my pupils, it is one of the most important elements for me as a teacher. When I succeed in getting through to Georges personal wall, I hope that he will make some efforts because he finds it important to do it for me, and... maybe I can still get him there (transition general secondary education).'

For Mary, we were not able to determine a dominant perspective. On the one hand, Mary describes herself as a teacher with a structured and consistent teaching approach. On the other, Mary believes that good teaching comprises open and warm interactions with pupils, rather than delivering the curriculum and addressing pupils' needs. Therefore, Mary could not be assigned to any one of the three categories.

Subsequently, to answer research question 2, we will explore how the three teaching approaches described above influence the way teachers use data to inform their judgement. Regarding research question 1, the results showed that teachers mainly use input and output data that were collected rationally, and process data that were collected intuitively. Based on these findings, and to provide a clear overview, only these categories will be listed in Table 5. The extent to which teacher judgement was

Chapter 5

based on at least one output or process indicator (1) or was not used by the teacher (0) for each case is documented in the table below. Because each teacher described two cases, scores can vary from 0 to 2.

Table 5: Use of rational and intuitive data in relation to teaching approaches (N=15)

Teacher identity	Rational data collection		Intuitive data collection
	Input	Output	Process
Transmission approach			
Amy	1	1	1
Ann	2	2	1
Sophie	2	0	2
Liz	0	1	2
Katy	1	2	1
	6/10	6/10	7/10
Developmental approach			
Emma	2	2	2
Joyce	0	1	2
Julie	1	1	2
Lisa	0	2	2
	3/8	6/8	8/8
Nurturing approach			
Frank	1	0	2
Bart	1	0	2
Roy	0	0	2
Peter	0	0	2
Bob	1	1	2
Pamela	1	1	2
	4/12	2/12	12/12

Table 5 suggests that data collection differs according to the teaching approach used.

Firstly, teachers with a transmission approach use data that were collected both rationally and intuitively. In at least half the cases, these teachers use input and output data collected rationally as well as process data collected intuitively. We see similar results for developmental teachers. All these teachers referred to the use of process data that was collected intuitively. Moreover, these teachers rationally collected output data in 6 out of 8 cases and input data in 3 out of 8 cases. Joyce's story can be used as an example. She describes how she judges the competencies of Roman:

'I am afraid he lacks cognitive capacities as well as motivation to make it in secondary education. He scores below average on Dutch language and mathematics. When I compare test results, especially when he needs to study big parts of the curriculum, he fails. He regularly does not make his homework. On

the other hand, when he is attentive and active during the lessons, he is often able to give the right answer. I believe he is not motivated to work and to study at home. Partly, I understand, his parents are divorced and I sometimes notice that he did less for school when he was with his mother. So, for now, he does not meet the curricular goals, but I think he might be smarter. (...) I think that because occasionally, he gives smart answers during class. I will do the best I can to get him motivated, I noticed that my approach made him feel safe enough to be involved, but in the end, he will still need to do it himself.'

However, Table 5 offers a different view of teachers with a nurturing approach to teaching. All nurturing teachers use process data that was collected intuitively. However, data collected rationally was used in less than half of the cases. In the interviews, teachers collect output data rationally in 2 out of 12 cases and input data in 4 out of 12 cases. Moreover, 2 out of 6 nurturing teachers made no mention of the use of data that was collected rationally in their judgement of pupils' competencies related to transition decisions. Nurturing teachers preferred to focus on socio-emotional elements and wanted to care for their pupils. However, as the example of Bob shows, when nurturing teachers do not experience a personal connection with a pupil, they feel they are not able to help them properly.

'Tim, he lacks motivation to make it in general secondary education if you ask me. For example, they had this recitation and he gave me his preparation on this sloppy piece of paper... Not even printed, handwritten without a margin. Then I think: do I need to keep investing all this extra effort in supporting him, when he can't even make an effort to do his assignment properly? I tried to have a conversation with him about his assignment, but he didn't seem to care. (...) I feel like a father for my pupils, really, I feel the responsibility to help them the best I can, but it's a responsibility that goes both ways.'

6. CONCLUSION AND DISCUSSION

6.1 Main Findings

With the aim of enhancing the quality of teachers' judgement, research studies on data use show how data can be used in a way that complements intuitive judgements (Earl & Louis, 2013). In this study, we first needed to arrive at a clear conceptual distinction between the rational and intuitive bases of teacher judgement. Although concepts of data and intuition are often used in research, the broad definitions under which they are mostly reported inhibit the use of a clear lens that would enable us to study both concepts unambiguously. Based on theories of data-based decision-making and intuitive expertise, we defined rational data collection as deliberate and systematic strategies of

data collection and distinguished it from intuitive data collection which we defined as non-deliberate, non-systematic recognition-primed strategies of data collection. Subsequently, we used insights into teaching approaches to investigate how teachers differ in the way they use data to inform their judgement.

First, our results show that intuitive data collection still plays a dominant role in teachers' judgement. This form of judgement is largely based on recognition primed observations during daily practice. These non-deliberate and non-systematic observations relate to attitudes, work pace, concentration, emotional wellbeing or social interactions. In our study, none of the teachers mentioned the use of an observation protocol, or had deliberately planned systematic observations beforehand. Based on a non-deliberate recognition of data, teachers recognised patterns which directly led to expectancies that informed their judgement. These findings coincide with strategies described in models of intuitive expertise. Klein (2008), for example, established how experienced firefighters, military commanders or pilots were able to make decisions under time pressure because they could simulate plausible outcomes based on data they recognised in the immediate situation. Similarly, the value of intuitive expertise is often studied and described in fields where time pressure calls for quick decision-making strategies. Although these frameworks provide valuable insights into the study of intuitive expertise in the field of education, these models cannot be transposed without adjustment to any context. Our study suggests that teachers use the same intuitive strategies to recognise the most important cues and then identify a plausible course of action using, to a lesser extent, the deliberate and systematic collection of data. Although these strategies may be valuable for many decisions teachers make daily under time pressure, they are not appropriate for high-stakes decisions that require thoughtful analysis. Whether teachers adopt different decision strategies for high-stakes decisions compared to low-stake decisions, or whether they will unconsciously use the same decision strategy regardless of the stakes involved, remains a matter for speculation.

Our study also shows that teachers differ in the way they use data to inform their judgement, and such differences depend on their approach to teaching. Despite the expectation that teachers use data rationally to enhance the quality of their judgement, some teachers in our study did not do so to any great degree. Teachers who were less concerned with transmitting the curriculum (a nurturing teaching approach) made little to no use of data collected rationally in their judgement of pupils' competencies. Teachers with a high focus on the curriculum (transmission and developmental approaches) used data that were collected both rationally and intuitively. In these cases, non-deliberate and non-systematic observations were complemented, to a certain extent, by deliberate and systematic data collection. This implies that intuitive data collection does not necessarily exclude or replace rational data collection. We concluded that teachers with a high focus on achieving the goals of the curriculum use a

wide array of data, collected both intuitively and rationally, when they judge pupils' competencies. It is sometimes suggested that teachers prefer to use their intuition rather than data (Spillane, 2012). In our study, this only applies to teachers with a low focus on transmitting the curriculum as they predominantly focus on the socio-emotional aspects of teaching. Although teachers with a nurturing approach firmly believe that intuitive data collection allows them to be responsive to pupils' individual needs, research shows that valuable capabilities are wasted when teachers ignore data collected rationally. For example, Timperley and Phillips (2003) found that when teachers relied on their own assessments of pupils' knowledge rather than on (standardised) test results, they underestimated what pupils could do and were targeting their instructions at levels lower than those students were capable of achieving.

6.2 Limitations

However, we do have to acknowledge some limitations in this study. It proved very difficult to assess the quality of the teachers' decisions. In this regard, we can only describe the extent to which teachers collect data rationally or intuitively, we cannot assess the quality of data collection processes in relation to the quality of the decision made. Regarding confirmation bias, we can only highlight the possible pitfalls that have been outlined in various lines of research. In our study, the conclusions that teachers complement intuitive data collection with rational data, albeit to a limited extent, helps to raise awareness of potential errors in decision making. Furthermore, our conclusions are based on the statements and narratives teachers provided during the interviews. This contextualized and personal view of teachers' ways of thinking enabled us to obtain deep and rich insights into the processes underlying teachers' judgement. The same applies to statements about different approaches to teaching. We explored how the teachers in our study perceived themselves and what they believed good teaching should be. In this regard, our conclusions are based on teachers' self-perceptions; we did not triangulate our data by, for example, giving pupils questionnaires. Although this might appear to be a shortcoming, we found it especially important to gain insight in teachers' personal beliefs because these beliefs are said to influence changes in practice (Day, Kington, Stobart, & Sammons, 2006). Our study did not involve teachers with little in the way of teaching experience because they would lack the knowledge and experience needed in the field of intuitive expertise (Klein, 2008). This means, however, that we have no insight into the modes of data collection and approaches to teaching of novices. For further research, it would be interesting to study if and why novices and expert teachers differ in data collection and approaches to teaching, and how this affects their judgement. It would also be interesting to establish whether this was the case across different contexts and cultures. External expectations, (data use) policies or

the curriculum in teacher education may all influence teachers' conceptions of what it means to be a good teacher and thus their approaches to teaching.

6.3 Implications

Our conclusions highlight the importance of gaining further insight into the processes and beliefs underlying teachers' judgements, and the quality thereof. For further research, it would be useful to explore how teachers' approaches relate to personal characteristics that have been shown to influence data use such as self-efficacy, attitude, motivation, cognitive style or data-literacy (Mandinach et al., 2006; Schildkamp & Ehren, 2013; Spillane, 2012; Vanlommel et al., 2016). This study contributes to the existing knowledge base by showing that approaches to teaching can be used to understand differences in the way teachers use data to inform their judgement. All the teachers in our study strongly rely on process data collected intuitively, but teachers with a clear focus on the curriculum will also use data rationally as a valuable complement. However, teachers who focus their teaching on interpersonal relationship with their pupils and on loving, supporting and motivating pupils, might unwillingly compromise pupils' potential because they ignore rational data that challenges their intuitive judgement. Given the growing body of evidence suggesting data use enhances the quality of educational decisions, understanding why teachers differ in the way they use data is an important matter. Further research is needed to broaden our understanding of the complexity of teaching approaches that influence the quality of teacher judgement. In theoretical terms, this implies that teachers' decision making is more complex than simply applying a rational decision model, as it also involves personal dimensions concerning what it means to be a good teacher (Hargreaves & Fullan, 1992; Kelchtermans, 2009).

For the purposes of policy and practice, it is important to offer frameworks for guidance on teacher judgement at an early stage during teacher training, a time when teachers' conceptions and approaches to teaching are partially formed. Once teachers' conceptions and approaches are established, they are resistant to change (Elbaz, 1983; Kelchtermans, 2009; Pajares, 2003). This means that awareness of, and explicit attention to, different conceptions and approaches are needed when educating teachers, as this is an important phase in forming a conception of what it means to be a good teacher.

For data use policies, it is important to consider differences in teachers' approaches to teaching. Because teachers differ in the way they use data to inform their judgement, different interventions and support will be needed. Our conclusions show that teachers' modes of data collection is not just a matter of data literacy, it also depends on what teachers believe good teaching should be. Because teachers differ in their approaches to teaching, there is no one size fits all intervention model. Furthermore, given that

intuitive data collection still appears to be an important aspect of teacher judgement, awareness of the pitfalls of confirmation bias needs to be raised in schools, especially in teacher education. Overconfidence in one's own judgement might lead to severe bias, such as self-fulfilling prophecies (Agirdag et al., 2013; Sharma & Sharma, 2015). In the face of demands for objectivity and fairness, rational data use is an important complement to the intuitive bases of teacher judgement.

In summary, we conclude that teacher judgement is largely based on the intuitive collection of process data complemented, to a certain extent, by the rational collection of input and output data. Although research stresses the importance of challenging and complementing the intuitive bases of teacher judgement through the use of rational data, this was only the case to a limited extent. Teachers who focused their teaching approach on socio-emotional processes rather than on transmission of the curriculum made little use of data collected rationally to inform their judgement. Given that teachers' individual judgements still have a significant influence on important decisions that are made regarding pupils' educational trajectories, these conclusions raise critical questions concerning the quality of teachers' judgement.

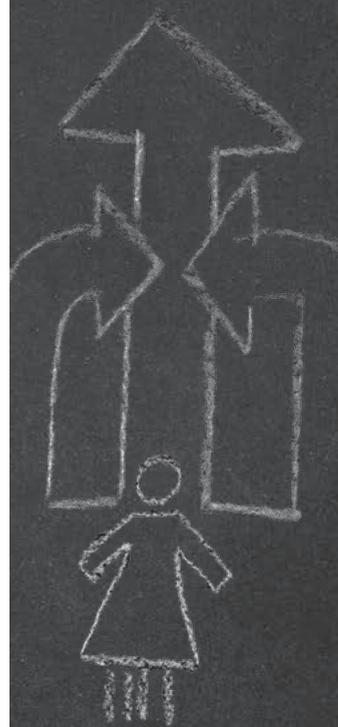
6

Chapter

How do teachers make sense of data in the context of high-stakes decision making?

This chapter is based on:

Vanlommel, K., & Schildkamp, K. How do teachers make sense of data in the context of high-stakes decision making? *American Educational Research Journal*, Article accepted for publication



1. INTRODUCTION

Within educational research and policy there is growing concern regarding how schools can provide equitable educational opportunities. Teachers need to make high-stakes decisions that have proven to be a major determinant of pupils' progress within educational tracks, as well as access to further educational opportunities (Agirdag et al., 2013; Allal, 1988; Brookhart, 2013). Therefore, it is important that teachers try to make high-quality decisions, as these decisions will influence students' lives, especially when the stakes are high (e.g., passing or failing, graduating or not graduating). Not all teacher decisions influence pupils' educational trajectories to the same extent. As the stakes associated with a judgment go up, the need for a solid evidence-base increases (Epstein, 2008). As the stakes go up, there is also pressure to increase standardization in order to promote comparability of conclusions across pupils and occasions, and thereby, to promote a kind of objectivity (i.e., lack of subjective judgment). As Shepard (2001) noted, standardization involves a basic matter of fairness.

Several types of theories on decision making can be used to study teachers' decision-making process. These theories often differ in the extent to which they rely on rational data-use processes, as in theories centred around data-based decision making, or intuitive processes, as in theories on intuitive expertise (Bertrand & Marsh, 2015; Blackwell et al., 2006; Evans, 2008; Hoy & Miskel, 2001; Ikemoto & Marsh, 2007; Kaiser et al., 2013; Klein, 2008; Mandinach, Honey, Light, & Brunner, 2008; Mandinach et al., 2006; Schildkamp & Lai, 2013). Common elements that can be found in both types of theories describe how teachers collect and make sense of data to inform their judgements. However, the theories differ in their viewpoint on how these data are collected, analysed and interpreted. Most theories of data-based decision making prescribe fixed and systematic procedures in which data collection, analysis, and interpretation are driven by a deliberate and systematic use of pre-set criteria (Mandinach et al., 2006; Schildkamp & Ehren, 2013). Theories of intuitive processes highlight the importance of data that are collected through the spontaneous recognition of cues and highlight the value of the expert knowledge (Klein, 2008).

Key to both processes is that the collected data are used formatively, which is called formative assessment. The field of research on formative assessment emerged based on the shared idea that educators have the responsibility to gather data on the learning process of individual pupils (Harlen, 2005). Formative assessment involves using the data about pupils' learning processes to monitor and guide these learning processes (Van der Kleij, Vermeulen, Schildkamp & Eggen, 2015). These data can be collected more or less deliberately and systematically. The data can be collected in a non-systematic manner, for example through on-the-fly assessments, by observing pupils, and listening to them talking in a group discussion (Heritage, 2007). These modes of data collection have always been part of teachers' work, and can be described as

teachers' intuitive processes. These data can also be collected in a more deliberate and systematic matter, for example through curriculum embedded assessments (Heritage, 2007) and standardized assessments, which can be described as a more rational process.

Although in empirical research these processes are separated for reasons of conceptual clarity, intuition is not the opposite of rationality. In practice rational and intuitive processes are expected to be intertwined and mutually influence each other (Hammond et al., 1987; Kahneman & Frederick, 2005).

Over the past decade, there has been an growing expectation in education that teachers should deliberately and systematically use data to inform their decision making, starting from the hypothesis that rational data use enhances the quality of educational decisions, since it helps prevent and correct the possible biases associated with intuitive judgement (Earl & Katz, 2006; Park & Datnow, 2017; Schildkamp, Poortman, & Handzelzalts, 2016; Strayhorn et al., 2009). Moreover, data use has gained a lot of attention since a growing body of literature has shown that data use can lead to school improvement in terms of higher student achievement (e.g., Carlson, Borman, & Robinson, 2011; Lai, Wilson, McNaughton, & Hsiao, 2014; Van Geel, Keuning, Visscher, & Fox, 2016), and can contribute to equity in education (Park, John, Datnow, & Choi, 2017)

Although using data is considered to be an important way to improve education and to detect and correct the pitfalls of intuitive decisions, it is rather simplistic to expect that using data will automatically lead to decisions that enhance student learning. For one thing, teachers' data collection might not be as rational as intended by research and policy. Previous research has shown that teachers' data collection may vary from a rational, deliberate search for data to an intuitive, recognition-primed data collection (Vanlommel, Van Gasse, Vanhoof, & Van Petegem, 2017).

But even if data are collected rationally, teachers still need to make sense of the data (Bertrand & Marsh, 2015). The same data might have different meanings to different teachers, or data collected rationally might be interpreted on the basis of teachers' personal beliefs. Decisions can never be completely driven by data; teachers filter data through their own lenses and experiences, and intuition also plays an important role (Datnow, Greene, Gannon-Slater, 2017). Therefore, the sensemaking process will inevitably influence the extent in which teachers' conclusions are supported by the data (Bertrand & Marsh, 2015). To be able to engage in this sensemaking process, teachers need knowledge, skills and dispositions to interpret data effectively and responsibly (Mandinach & Gummer, 2016). According to these authors, data-literate teachers continuously, effectively and ethically collect and interpret multiple sources of data to improve decision-making in a manner appropriate to teachers' professional roles and responsibilities (Mandinach & Gummer, 2016).

How do teachers make sense of data in the context of high-stakes decision making?

Sensemaking is not necessarily a rational process in which an extensive elaboration of alternative explanations based on clear criteria will lead to conclusions. Instead, teachers, as do all people, often use simpler, quick strategies that require less cognitive effort (Kahneman & Frederick, 2005). These judgmental heuristics may lead to false interpretations (fallacies) when teachers try to fit data into a frame that confirms their assumptions without searching for alternative explanations, when their conclusions are based on a limited set of data (lack of data triangulation), or when their interpretation is greatly influenced by beliefs (Hitchcock, 2017; Kahneman & Frederick, 2005; Kaufmann, Reips, & Merki, 2016). In order to prevent these fallacies, data triangulation, testing alternative explanations, and using pre-set criteria for coming to a decision are also identified as important aspects of teachers' data literacy in the interpretation phase (Mandinach & Gummer, 2016).

In education, it is important that teachers try to make high-quality decisions, as these decisions will influence students' lives, especially when the stakes are high (e.g., passing or failing, graduating or not graduating). Sensemaking is a critical aspect of teacher judgment to consider in the light of educational decisions, but in-depth insight into how teachers make sense of data is still lacking (Coburn & Turner, 2012; Datnow et al., 2012; Kane, 2013; Little, 2012; Spillane, 2012). An emerging field of research indicates that data use may not follow a rational model (Bertrand & Marsh, 2015; Coburn & Turner, 2011; Datnow & Hubbard, 2016; Jimerson, Cho, & Wayman, 2016; Schildkamp & Lai, 2012). On a related note, this reconceptualization acknowledges that teachers may use data in non-normative ways.' Moreover, disparities in education are often deeply rooted in teachers' daily classroom activities and beliefs about what it means to work toward equitable educational trajectories, which is why sensemaking needs more attention as a central process in teacher judgment (Braaten, Bradford, Kirchgasser, & Barocas, 2017). Therefore, in order to critically examine teachers' sensemaking, the following research questions are put forward:

RQ 1: How do teachers make sense of data in a high-stakes decision making process?

1.1 What data sources do teachers use when making inferences?

1.2 To what extent do teachers triangulate data when they develop inferences based on data?

1.3 To what extent do teachers evaluate alternative explanations when they develop inferences based on data?

1.4 What criteria do teachers use when they make sense of data?

2. THEORETICAL FRAMEWORK

2.1 Teachers' data sensemaking

Sensemaking theory describes the process by which teachers give meaning to data. In this chain of reasoning, teachers make inferences that lead from data to conclusions, starting from the question: what do the data tell me? (Coburn, Honig, & Stein, 2003; Weick, 1995). In this study, we will take into account a broad array of data that teachers may use when they judge pupils' competencies, quantitative as well as qualitative data, collected rationally as well as intuitively:

Rational data collection: quantitative and qualitative data that were collected deliberately and systematically, as described in most theories of data-based decision making. Examples include assessment data, survey data, and structured classroom observations (Schildkamp & Lai, 2013).

Intuitive data collection: spontaneous, recognition-primed data collection. Based on their experiences, teachers' attention can be drawn by certain cues they recognize in all the information that surrounds them, without a pre-set question or goal, or without a thought-out and systematic method. Examples include spontaneous observations during daily classroom activities, a talk with a student, a conversation with parents (Vanlommel et al., 2017).

Independent of the rational or intuitive nature of teachers' data collection, data need to be interpreted before they can inform decisions (Bertrand & Marsh, 2015). Throughout the sensemaking process, mental models (teachers' beliefs about causal relationships) will be used to give meaning to data (Spillane & Miele, 2007). Data interpretation may unfold in different ways because teachers' process of making sense of data may be influenced by the beliefs teachers have about (groups of) pupils, by the (dis)trust they have in the data, or by personal feelings of knowing (Schneider & Ingram, 1993). Because data need to be understood by the individual teacher, individual assumptions, preferences or feelings might lead to invalid interpretations and thus biased conclusions (Kahneman & Frederick, 2005). In order to critically examine teachers' inferences, a clear elaboration of these inferences and the criteria used is therefore needed, for which purpose interpretive arguments can be constructed by the teachers.

Teachers' interpretive arguments make explicit the teachers' inferences in a chain of reasoning that leads from data to conclusions. Different inferences may be drawn from the same data. In this paper we will explore how teachers make sense of these data. The argument provides an elaboration of the intended interpretation of the data, and it includes the assumptions and criteria involved in that interpretation. An explicit construction of the sensemaking process and transparent criteria are needed to foster the traceability of teachers' conclusions (Cronbach & Wainer, 1988; Kane, 2013).

How do teachers make sense of data in the context of high-stakes decision making?

It is suggested that, although rational models prescribe optimal procedures for coming to valid conclusions (Bosker et al., 2007; Leonard et al., 1999), in practice people are more likely to take mental shortcuts (heuristics) to come to quick and easier conclusions (Evans, 2006; Kahneman, 2003; Klein, 2008). Heuristics can be defined as simple procedures for reaching satisfying, but possibly invalid conclusions. Teachers, who often report high work pressure, might be especially likely take mental shortcuts in order to keep moving on with their work (Ballet & Kelchtermans, 2009; Pelletier & Sharp, 2009). False inferences (fallacies) may be drawn when teachers' conclusions are not supported by the data because of a biased interpretation (Evans, 2006; Kahneman & Frederick, 2005).

In order to prevent these fallacies and study teacher inferences, we will critically study the interpretive arguments made by teachers, by examining whether and how teachers (a) triangulate data (b) consider alternative explanations and (c) use pre-defined criteria when they draw conclusions about pupils' competencies.

2.1.1 Data triangulations

When studying teachers' inferences, data triangulation is an important concept. Data triangulation is not only an attempt to explain the complexity of conclusions related to pupils' competencies in a more detailed and balanced way by studying them from more than one viewpoint (Cohen et al., 2008), it is also an important means to cross-check data from different sources (Creswell & Miller, 2000). This is especially important with regard to the use of assessment data, as all educational tests have some degree of measurement error (Gardner, 2013). For example, measurement error may arise due to variation in human performance, variations in the environment within which measurements are obtained, variations in the evaluation of responses, and variation arising from the selection of the test items used (Feldt & Brennan, 1989). However not only assessment data may be subject to bias as all data are likely to have a certain degree of bias. This is why using multiple data sources is important. Therefore, it is important to triangulate multiple sources of data when it comes to making high-stakes educational decisions (AERA, APA, & NCME, 2014; Gulek, 2003; Jones, 2007). Triangulation of data will help teachers make better decisions about students or programs (Gulek, 2003).

Furthermore, teachers still rely strongly on data collected intuitively during their daily classroom activities (Schildkamp & Ehren, 2013; Vanlommel et al., 2017). Since these data are collected spontaneously on the basis of recognition, there is a risk of confirmation bias (Harteis et al., 2008; Kahneman & Frederick, 2005). Confirmation bias refers to the idea that once teachers have a hypothesis about pupils' competencies, they tend to interpret all data so as to confirm rather than challenge this assumption. In this manner, teachers interpret data in a way that confirms their subjective assumptions about pupils' competencies, which may lead to self-fulfilling prophecies and

stereotyping (Agirdag et al., 2013; Brophy, 1983). For example, a teacher who believes that a certain pupil lacks motivation to learn might interpret a pupil asking whether it is almost lunch time as a sign of lack of interest while, in reality, the pupil is hungry because he/she left home without breakfast.

Studies have shown, for example, that students from disadvantaged home situations are more likely to be placed in (specific) lower educational tracks, despite making average test scores (Callahan, 2005; Marks, Creswell, & Ainley, 2006; Park et al., 2017). Bertrand and Marsh (2015), for example, found that several teachers in their study attributed student results to certain unchangeable student characteristics, such as being English Language Learners (disproportionally composed of students of colour), which further hinders equity in education, as it may reinforce low expectations. Recently, data use for equity has gained increased attention as for example visible in the special issue on this topic by Datnow, Greene and Gannon-Slater (2017).

To prevent this confirmation bias, the deliberate and systematic collection of data from multiple sources is important in order to question and complement information derived from data collected intuitively (Earl & Katz, 2006; Kahneman & Klein, 2009). Using multiple data sources (triangulation) can help with addressing these false inferences, as data from one source can help confirm or disconfirm information from another (Gulek, 2003).

Alternative explanations

As stated above, false inferences are often explained in terms of confirmation bias, when teachers frame the data to fit their existing beliefs (Harteis et al., 2008; Kahneman & Frederick, 2005). The focus is often on confirming hypotheses, not challenging them. Another way to tackle an invalid interpretation of data because of confirmation bias is to search for contrasting explanations that question pre-held beliefs and assumptions (Kahneman & Frederick, 2005). Assessing plausible rival explanations in order to question a priori assumptions is an important precondition for assuring validity (Onwuegbuzie & Leech, 2007).

Furthermore, similar heuristics (mental short-cuts) may also lead to false causality (Kahneman & Frederick, 2005). This means that teachers make the false assumption that because there is a correlation between two variables, therefore one caused the other, without taking into account the other factors that might be involved. Again, this is an easier and quicker way to come to a conclusion without deliberate weighing of alternative explanations. For example, although there is a correlation between low results on a math test and the fact that a pupil is a non-native speaker, this does not necessarily mean that the pupils' language status causes bad mathematics results. Other alternative explanations might be possible; for example, the non-native-speaking pupil might not be familiar with the techniques used for calculation. In this case, a

How do teachers make sense of data in the context of high-stakes decision making?

deliberate consideration of alternative explanations can enhance the validity of teachers' inferences.

2.1.2 Using pre-defined criteria

Looking at the criteria used when teachers make inferences is also important. Heuristics may lead to quick conclusions that are mainly based on feelings of knowing (i.e., personal criteria) instead of rational data analyses (i.e., pre-defined criteria) (Kahneman & Frederick, 2005). The affect heuristic is a mental shortcut in which emotional responses allow teachers to come to a decision that feels good and therefore is considered to be the right decision (Kahneman & Frederick, 2005). In this case teachers make inferences based on feelings or personal beliefs instead of criteria based on pre-defined standards. For example, a pupil might score 60% on a standardized test; the teacher makes the inference that this grade is just a lucky shot, because the teacher feels that this pupil is not ready for secondary education. Although the data are collected rationally, the criterion that is used in the argument is based on the teacher's subjective belief, and different criteria might be used depending on the pupil. Since teacher expectations may lead to confirmation bias, as stated above, there is a need for clear, pre-defined criteria within the sensemaking process (Creighton, 2007), which means that the conclusions should be supported by data and not just by subjective beliefs.

In summary, in order to understand how teachers make sense of data, we need to critically examine teachers' interpretive arguments that specify how teachers make sense of data to reach conclusions based on the data they encounter. A first important precondition is that teachers clearly explicate the construction of and criteria used in their interpretive arguments. Subsequently, we can investigate teachers' interpretive arguments by questioning how teachers triangulate data, consider alternative explanations and use pre-defined criteria.

An overview of the theoretical framework is provided in Figure 1. Although we depicted it here as a linear process, we acknowledge that in practice it is a cyclic, iterative process (Ikemoto & Marsh, 2007; Mandinach & Gummer, 2016).

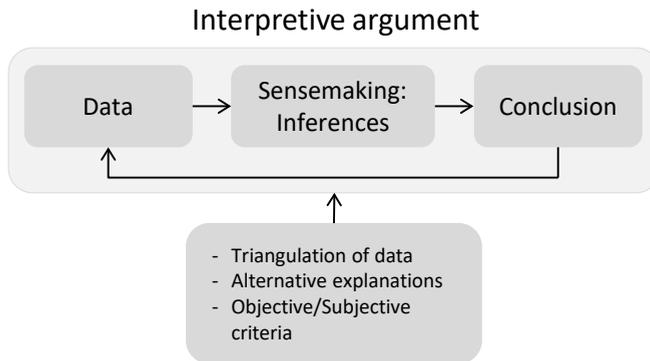


Figure 1: Overview of the theoretical framework

3. METHOD

3.1 Context of this study

Not all teacher decisions influence pupils' educational trajectories to the same extent. As the stakes associated with a judgment go up, the need for a solid evidence-base increases (Epstein, 2008). As the stakes go up, there is also pressure to increase standardization in order to promote comparability of conclusions across pupils and occasions, and thereby, to promote a kind of objectivity (i.e., lack of subjective judgment). As Shepard (2001) noted, standardization involves a basic matter of fairness.

Therefore, this study focuses on teacher sensemaking in the process where they will need to make a high-stakes decision at the end of the year, namely a transition decision that places pupils in different educational tracks. The transition from primary to secondary education involves a decision with high stakes for the pupils involved, since it is a first major transition towards a future position in society (Terwel, 2006) in which the judgment of the individual teacher still plays a prevailing role (Eurydice, 2011). This is especially the case in the liberal and autonomous educational system of Flanders (Belgium), which does not use a binding nationwide standardized test at the end of primary school that affects pupils' future educational careers (Eurydice, 2011; Penninckx, Vanhoof, & Van Petegem, 2011). Schools can choose to make use of existing standardized tests to inform decision making, but these results are not binding for the transition decision. Mostly, teachers use or adjust tests that have been developed by the publishers of a particular educational method, or teachers make their own tests. Other examples of data collected rationally teachers may use in their decision making concerning the transition are homework, certificates of learning disorders, or class assignments.

How do teachers make sense of data in the context of high-stakes decision making?

The context of Flanders is also characterized by high decision-making autonomy for the individual teacher. The transition decision is officially a team decision, but in practice it appears that the judgment of the individual teacher is still of decisive importance (Eurydice, 2011). In Flanders, pupils typically make the transition from primary to secondary education by the age of 12. In primary education, pupils have one teacher for all subject, except gymnastics. At the end of primary education, teachers need to make the transition decision. In exceptional cases, teachers may decide not to give a certificate of primary education. In other cases, teachers will make an official transition recommendation with the following options: general secondary education (GSE, broad curriculum preparing for more demanding academic careers in university or college), technical secondary education (TSE, technical curriculum), vocational secondary education (VSE, practical curriculum) and artistic secondary education (ASE, artistic curriculum). Because of this early orientation in which pupils at a young age are already sorted into different tracks as they progress through education, the teacher's transition decision is crucial (LeTendre, Hofer, & Shimizu, 2003).

Since decisions about pupils' placement and promotion are influenced to a great deal by the judgment of the individual teacher, questioning the quality of teachers' inferences about pupils' competencies is an important matter in the light of equity and fairness (Brookhart, 2013). Therefore, we will critically examine how the teachers in our study make sense of data when they make inferences on their pupils' competencies in relation to the transition decision.

3.2 Design

We used a case study design in our study, because our focus is on understanding how teachers make sense of data, which requires an in-depth description of the underlying processes in a contextualised way (Yin, 1994). This qualitative research design allows us to gain a rich understanding of the complexity of the phenomenon in a real-life context, trying to understand the viewpoint of the teachers. A case study design is suited for investigating a phenomenon in depth within its real-life context, especially when such understanding is strongly embedded in the specific context (Yin, 1994). The central focus among all types of case studies is that the case study tries to illuminate a decision or set of decisions: why and how they were made (Schramm, 1971, in Yin, 1994). In our research, the cases being studied are the inferences teachers make when they make sense of data. Using semi-structured interviews, we seek to answer our research questions, which aim to gain a deeper understanding of teachers' individual sensemaking processes and reasoning in their specific context.

3.3 Participants

The focus of this study was on 6th grade (pupils aged 11 – 12) primary education in Flanders (Belgium). Fifty teachers were randomly selected from a list of all primary schools in the same province. Half of the teachers were contacted by researcher 1 in a phone call in which the purpose of the interview was explained, and a total of 16 teachers voluntarily agreed to participate voluntarily. The other teachers who were called, but did not agree to participate in the interview, all argued that they did not have time to participate. About one-third (31%) of the 16 teachers were male ($n = 5$) and 69% were female ($n = 11$). The majority (56%) of the teachers had more than 10 years of experience, and the remaining 44% had between 5 and 10 years of teaching experience. All teachers signed an informed consent form stating that they had been informed about the goals of the research, that they understood that their anonymity was guaranteed, and that they could end their cooperation at any time. A descriptive overview of the participants is presented in Table 1.

Table 1: Descriptive Overview of the participants

Teacher	Gender	Years of Teaching Experience
1 Emma	female	11
2 Frank	male	32
3 Bart	male	15
4 Roy	male	32
5 Amy	female	13
6 Ann	female	8
7 Joyce	female	5
8 Peter	male	4
9 Sophie	female	8
10 Bob	male	19
11 Julie	female	29
12 Lisa	female	7
13 Mary	female	25
14 Pamela	female	30
15 Liz	female	7
16 Katy	female	8

3.4 Interviews and Procedure

All participants were interviewed at the end of the school year, when they had to make the transition decision. Participants answered open-ended questions that explored their judgements about pupils' competencies in relation to the transition from primary to secondary education. Examples of questions include: "What are your arguments for this transition advice?"; "What is the evidence for this argument?"; "How did you make sense of this evidence?". All teachers discussed a transition problem involving 2 specific

How do teachers make sense of data in the context of high-stakes decision making?

pupils, which meant that a total of 32 cases were discussed. At the start of the academic year, each teacher chose (a) one pupil of whom the teachers expected that he/she would not be able to make the transition to general secondary education at the end of the year and (b) a more difficult case, a pupil for whom the teacher found it hard to know in which direction the pupil would evolve during the year to come. In this study, we investigated the interpretative arguments and the data that were used to underpin teachers' advice and how they made sense of the data. The open-ended questions in the interview protocol addressed all the concepts discussed in the theoretical framework, ensuring that all of the relevant conceptual topics were asked about across all interviews.

The in-depth interviews lasted for an average of one hour and were conducted by a single researcher. The same interview protocol was used in all 16 interviews to ensure methodological consistency (Cohen et al., 2008). All of the interviews were digitally audio-recorded and the files securely saved for reasons of reliability (Cohen et al., 2008). Peer-debriefing sessions (investigator triangulation) were then conducted, in which the different methodological choices, data analysis procedures and interpretations were critically examined (Creswell & Miller, 2000). With the aim of enhancing the reliability of our research, we clearly described our chain of evidence, so that the external observer can trace back the steps in either direction (from conclusions back to research questions or from questions to conclusions).

3.5 Coding and analysis

The interviews were transcribed verbatim and analysed with the aim of capturing variation across teachers in types of data used, in teachers' inferences and in their conclusions. In step one, researcher 1 developed a coding scheme based on the theoretical framework. Subsequently, this coding scheme was discussed with researcher 2. After both researchers had come to an agreement on the content of the coding scheme, first one interview was analysed and discussed by both researchers. This discussion stressed the need for a better conceptualisation of what was meant by 'pre-defined' versus 'personal' criteria and it appeared that intuitive data could not be interpreted by pre-defined criteria. Therefore, it was agreed that only data collected rationally would be coded as to the extent to which they were interpreted by pre-defined or personal criteria. Subsequently, the same interview and two other randomly selected interviews were analysed by both researchers using the revised coding scheme, and the inter-rater reliability (Cohen's Kappa) was found to be 0.72 (Miles & Huberman, 1994). Disagreements in the codings by both researchers were resolved by discussing and reflecting on the content of the different concepts and its boundaries. No additional revisions were made to the coding scheme at this point. In the last step of the coding process, researcher 1 went back and re-analysed the interviews that had been analysed before the inter-rater reliability check and finally all interviews were

analysed based on the revised coding scheme by researchers 1. An overview of the codes is provided in Table 2.

Table 2: Overview of the coding scheme

Headcode	Subcode	Conceptual characteristics	Example
1. Data		Quantitative and qualitative cognitive and non-cognitive indicators related to the pupil	Test results, conversations with pupils, observations, pupil files
	<i>1.1 Rational</i>	Collection started from a pre-defined goal or question and was carried out according to a pre-defined plan or method	A test taken to measure a specific curricular goal.
	<i>1.2 Intuitive</i>	Collection did not start from a pre-defined goal or question, nor was it carried out according to a pre-defined plan or method. Indicators are collected spontaneously based on the recognition of a cue.	During daily classroom activities, a teacher notices that a pupil cannot sit still for more than 10 minutes.
2. Inference		An explicit statement of how the teacher interprets the data with regard to pupil characteristics.	'He scores 49% on his test for mathematics, this means that he scores below average.'
3. Conclusion		Teachers come to a determination of a certain aspect of pupils' characteristics, based on the inference.	'He does not reach the curricular goals for mathematics.'
4. Alternative explanation		A statement that explicates another possibility for making sense of the same data.	(He does not do his homework because he is not interested in school.) First, I thought it was because his parents were not involved, but then I had a conversation with the parents and it appeared they try to motivate him as much as they can.
5. Criteria	<i>5.1 Pre-defined</i>	Based on clear, measurable and shared (school level) goals.	49% on her standardized test is in the E-zone, a pupil in this zone is not allowed to go to general secondary education.
	<i>5.2 Personal</i>	Based on teachers' personal feelings or beliefs.	I don't believe a pupil with 65% on mathematics will make it in general secondary education.

4. RESULTS

In this research, we wanted to understand how teachers make sense of data in a high-stakes decision process by investigating: (1) what data teachers use when they make inferences, (2) to what extent they triangulate data (3) to what extent they evaluate alternative explanations and (4) what criteria they use when they interpret data. In this manner, we wanted to explore how teachers make inferences on pupil characteristics

How do teachers make sense of data in the context of high-stakes decision making?

when they make sense of data. Table 3 provides an overview of these elements for all teachers in our interviews. Only unique citations were counted; for example, if a teacher mentioned four times that a pupil is bad at mathematics because he/she failed a test, this data source and this inference were only counted once. In the next paragraphs we will discuss our findings in depth.

Table 3: Overview of the different codes for all teachers

Teacher	Data collected rationally	Pre-defined criteria**	Personal criteria	Data collected intuitively	Inferences Total	Alternative explanation	Triangulation
Emma	11	10	1	3	14	2	+
Amy	9	7	2	4	13	1	+
Ann	6	4	2	4	10	1	+
Lisa	18	12	6	11	29	1	+
Frank*	1	1		7	8		
Roy	4	2	2	13	17	1	
Joyce	7	6	1	10	17	1	+
Sophie	5	3	2	10	15		
Bob	5	4	1	12	17		
Julie*	1	1		9	13		+
Mary	5	2	3	7	12		
Pam	3	2	1	7	10		
Liz	2	2		10	12		
Katy	4	4		7	11		+
Bart	3	2	1	4	7		
Peter	4	1	3	4	8		
TOTAL	91	69	22	122	213		

(*discussed only 1 pupil, since 1 pupil left school) (**only applicable to data collected rationally)

First, when we study Table 3 we see that the inferences teachers make range from 7 to 29 and that all of the inferences are based on data collected rationally or intuitively to a certain extent. Lisa, the teacher with most inferences (29) based her inferences on both deliberate and systematic (18) as well as non-deliberate and non-systematic data collection (11), but almost exclusively relies on pre-defined criteria to make sense of the data collected rationally (15/3). In our interviews, the teachers who use the least inferences are Frank (8), Bart (7) and Peter (8). Frank, Bart and Peter differ into the extent in which they collect data deliberately and systematically, but they all predominantly rely on personal criteria when they make sense of data. In the following paragraphs we will discuss teachers' evidence base and sensemaking process with regard to pupils' characteristics more in-depth.

4.1 What data sources do teachers use when making inferences with regard to pupil characteristics?

4.1.1 Data collected deliberately and systematically

In our interviews 91 out of the 213 inferences (43%) were based on data collected deliberately and systematically. Rational data collection predominantly referred to cognitive output indicators, mostly test results. Mostly, these were tests based on a teaching method or developed by the teacher, although in some cases teachers referred to the results of standardized tests. To a lesser extent, rational data collection referred to home or class assignments and project work. However, teachers strongly differed in how transparently and precisely they described these data collected deliberately and systematically. One group of teachers referred to specific test results for a specific subject matter, for example *'60% on a test French vocabulary'* (Amy), whereas most teachers referred to data collected rationally in a holistic way, for example a pupil has *'bad test results'* (Peter).

4.1.2 Data collected non-deliberately and non-systematically

The results of our study further showed that 122 out of 213 inferences (57%) were based on data collected intuitively. This spontaneous, recognition-primed data collection predominantly referred to observations during daily classroom activities, with regard to non-cognitive indicators such as motivation, attitude and wellbeing. Sometimes, observations informed teachers about practical competencies with regard to the transition decision. For example, when Sophie noticed that a pupil was handy when he helped her repair the computer, Sophie used this in her argument for technical/vocational education. Furthermore, intuitive data also referred to spontaneous conversations with parents, pupils or colleagues. Also, when it came to the description of these intuitive data, teachers differed in the transparency and clarity with which they described these intuitive data sources. Some teachers said that *'when I see how he acts, I just know that he is not motivated for school'* (Peter). Other teachers described concrete cues that led to a conclusion, as for example when Frank explained: *'She started crying during this assignment for mathematics. It was a really difficult exercise where all things came together, it showed me that it became too much for her.'*

4.2 Identifying two categories of teachers

Based on the results presented in table 3 we saw two main categories of teachers emerging: (a) teachers who based more than half of their inferences on data collected rationally and (b) teachers who based more than half of their inferences on data collected intuitively.

How do teachers make sense of data in the context of high-stakes decision making?

Only four teachers, Emma, Amy, Ann and Lisa, predominantly used **data collected rationally** in the decision process, referring to a wide array of test data that provided insight into how well pupils had mastered different parts of the curriculum. All of these teachers described the data they used in clear and transparent terms, referring to specific subject matter. For example, Lisa described the results in specific ways as she explained: *'On his standardized test, he scored average for writing, but he failed for listening skills. He failed grammar exercises too. He failed on his final test for French, but he did well on geography.'* These data collected deliberately and systematically were complemented by data collected in a non-deliberate and non-systematic manner, although these data were used to a lesser extent. These data collected intuitively, mainly observations and conversations with parents and pupils, predominantly referred to general cognitive indicators and attitude. These data did not necessarily confirm the data collected rationally. For example, although the test results of a non-native-speaking boy were low, Emma said: *'based on the way he answers my questions during class, I can tell he has competencies.'*

The largest group of teachers (10 teachers: Frank, Roy, Joyce, Sophie, Bob, Julie, Mary, Pam, Liz and Katy) based more than half of their inferences on data they collected spontaneously, in a non-deliberate and non-systematic manner during daily classroom activities. Most of these inferences were based on observations with regard to non-cognitive indicators such as engagement, motivation, home situation, interest and wellbeing. To a lesser extent, teachers mentioned observations with regard to general and practical competencies. Data collected intuitively were complemented by data collected rationally to a certain extent. However, in many interviews, test results were described in more general terms, referring to all tests, or all grades for this particular pupil. For example: *'I will not recommend him for general secondary education because of his results.(...) On what this is based? What I mean? Of course this is based on all his tests during the year...'* (Pam). In a minority of the interviews, teachers referred to (different) subject matters. Katy, for example, explained: *'He scores below average for mathematics as well as Dutch.'*

Two teachers (Bart, Peter) could not be placed in either one of these categories since they made almost equal use of data collected rationally and intuitively. However, Bart and Peter also differed from the others in that they used fewer inferences than the other teachers to reach a conclusion. For both teachers, the inferences were almost equally based on data collected rationally and intuitively. Both teachers described grades in a very holistic way, as *'the grades are not great, but good enough'* (David). In both interviews, teachers inferences were also based on non-deliberate and non-systematic observations with regard to non-cognitive indicators.

Data that are collected need to be interpreted by the teacher before they can be used in the decision process. In the following paragraphs, we will study (a) to what extent

teachers triangulate data, (b) search for alternative explanations and (c) use pre-set criteria when they make sense of the data they collected.

4.3 To what extent do teachers triangulate data when they develop inferences based on data?

4.3.1 Teachers using multiple data collected intuitively

We critically examined to what extent teachers used more than one data source to underpin a conclusion with regard to pupil characteristics. The type of data triangulation we saw most often in the interviews was when teachers used multiple data sources collected intuitively. Teachers often used non-deliberate, non-systematic observations on (mostly non-cognitive) aspects of the pupil to underpin a conclusion. For example, teachers used observations with regard to motivation and the situation at home to underpin the conclusion that a pupils' personal circumstances inhibited or promoted a transition to general secondary education. We also often saw that teachers used a combination of observations and conversations with parents, pupils or colleagues to underpin their conclusions.

4.3.2 Teachers using multiple data collected rationally

We also found examples of triangulation in which one source of data collected rationally was complemented with other data collected rationally. This was mostly the case when teachers based their conclusions on test results from different subjects, or on different test results from the same subject. Sometimes, cognitive output indicators were complemented with cognitive input indicators that were consulted in pupils' files (e.g., learning disorders) leading to for example a conclusion that a pupil did not reach the curricular goals. Furthermore, all four teachers who predominantly made inferences on the basis of data collected rationally also triangulated by combining two or more rational data sources in their judgement.

4.3.3 Teachers using both data collected rationally and intuitively

A third form of data triangulation we encountered in the interviews was when data collected intuitively were complemented by data collected rationally. Most often, multiple sources of data collected intuitively were complemented by only one data source collected rationally (test results). For example, when the teacher observed a lack of motivation, and when the parents told the teacher that the pupil refused to do his/her homework, combined with low test results, the teacher concluded that the pupil lacked a proper attitude with regard to the transition. Mostly, we found that data collected rationally were explained in a way that made them coincide with the data collected intuitively. For example, the low scores were seen as a result of the wrong

How do teachers make sense of data in the context of high-stakes decision making?

attitude. So, in these examples, data collected rationally were not used to question data collected intuitively, but rather to confirm it. For example:

'I have seen that he is at his wit's end, he is not ready for general secondary education. He will pass his final test for Dutch, true, but it's not really that difficult. He just passed with 50% while other pupils easily score 90%.' (Sophie)

When we searched for data triangulation in which at least two different data sources collected rationally were mentioned, potentially complemented by one or more data sources collected intuitively, these examples were less frequent. The teachers within the rational data user category mostly triangulated on the basis of multiple data sources collected deliberately and systematically. From the intuitive data user category, only Joyce, Julie and Katy mentioned multiple data sources collected rationally that underpinned their judgement. Their conclusions were, for example, based on test results for languages and technical assignments, a certificate of dyslexia and information about the child's interests that was derived from work on a project. These data collected rationally were combined with observations and conversations to underpin the conclusion of Joyce.

4.4 To what extent do teachers search for alternative explanations when they develop inferences based on data?

We investigated the extent to which teachers consider alternative interpretations when they make sense of one specific data source. In our study, we found little evidence of alternative explanations. Few teachers described how they question information that is in the pupil's file, for example, when the teacher from the previous year has written down that a pupil lacks motivation. Some teachers described how they use their personal knowledge of this colleague to interpret the information. For example, Emma explained:

'The pupil's file said that Joanna did not have the capacities needed for 6th grade and that she would not be able to get a certificate at the end of primary education. I know I have another approach than the teacher from 5th grade, I can imagine that her approach didn't work, so I wanted to try if I could get more out of Joanna.' So, Emma questions the data she found in the pupils' file.

So, in the limited examples we encountered, the search for alternative explanations was mainly guided by data collected intuitively. Only Roy and Lisa described a deliberate and systematic search for an alternative explanation. For example, for Roy, at first it appeared that his pupil, Rosemary, did not meet the curricular goals for mathematics. Then he administered an extensive test which showed that she could not count. When she was allowed to use a calculator, she passed all other areas of mathematics, such as geometry and applied math.

Although the use of alternative explanations was limited, it appeared that all teachers who mostly used data collected rationally, also searched for alternative explanations when they interpreted data.

4.5 What criteria do teachers use when they make sense of data?

4.5.1 Teacher who mostly use pre-defined criteria to make sense of data collected rationally

Data collected rationally can be interpreted by pre-defined criteria that refer to clear and specific measures, but also by personal criteria that refer to subjective beliefs. When we looked at the interviews, 91 out of the 213 inferences were based on rational data collection. Of the 213 inferences 69 (32%) were based on data collected deliberately and systematically and also used pre-defined criteria.

In our results, we saw that Emma, Amy, Ann and Lisa based more than half of their inferences on data they collected rationally. When we zoomed in on the criteria they used, we saw that these teachers also predominantly used pre-defined criteria to make sense of the data collected rationally. For example, they described in specific terms how test results were below average, how curricular goals were not met based on fixed standards associated with standardized tests, how a pupil failed (below average) on a specific subject matter, or how an increase/decrease in grades could be seen based on the change in test results. An example of this was given by Lisa:

'On his standardized test, he is in the D3-zone. It is a fixed standard, pupils in the D3 and E zone did not reach the curricular goals. On our final test, he has an average score of 55%. His reading level has increased with 6 levels during the past year, that is extraordinary, but they need level 6 to go to general secondary education.' In this school, it is agreed among the teachers that all pupils need to reach level 6 to go to general secondary education. So, Lisa uses a pre-defined criteria to make sense of the results of the standardized test.

4.5.2 Teachers who mostly use personal criteria to make sense of data collected rationally

The inferences of the second group of teachers were predominantly based on data collected intuitively. When we examined the criteria these teachers used to interpret the data they collected rationally, we saw a different picture. First, there were a few cases in which these teachers did use data collected rationally, but when they did, they used pre-defined criteria to interpret these data. For example, Joyce, Sophie, Bob, Julie, Pam, Liz and Katy used pre-defined criteria to interpret the rational data in more than half of the cases. When we tried to deepen our understanding of the kind of pre-defined criteria they used, we mostly saw a broad, holistic description of norms and

How do teachers make sense of data in the context of high-stakes decision making?

standards. For example, Sophie explains: *'His results for Dutch are low.'* (Joyce), *'He did not pass for mathematics.'*

Two teachers, Roy and Mary, predominantly used data collected intuitively and they mainly used personal criteria to interpret the rational data. For example, as Mary puts it: *'Her percentages are average, but that is too weak to make it in general secondary education.'*

In summary, we saw that teachers differed in the criteria they used to make sense of data collected rationally. The category of teachers who predominantly used data collected rationally also mainly used clear and transparent pre-defined criteria for their interpretation. The second category of teachers who mainly used data collected non-deliberately and non-systematically can be divided into two groups. One group used little rational data, but when they did use rational data, they mainly used pre-defined criteria to make sense of these data. A second group of teachers mainly used personal criteria to interpret the little rational data they used for the transition decision.

Taking all this together, we found some teachers who approached high-stakes decision making very rationally because they predominantly used rational data interpreted by pre-defined criteria, they searched for alternative explanations to some extent, and they triangulated data.

A second group of teachers took a mixed approach. They predominantly used data collected intuitively, however, this was complemented by rational data that were interpreted by pre-defined criteria to a certain extent. These teachers did not search for alternative explanations, nor did they triangulate data.

A third group of teachers approached high-stakes decision making very intuitively, since they mainly used data collected intuitively, they mostly interpreted rational data by personal criteria, they did not search for alternative explanations, nor did they triangulate data.

5. CONCLUSION AND DISCUSSION

5.1 Main findings

With the aim of understanding and enhancing the quality of (high stakes) educational decision making by teachers, this study investigated teachers' sensemaking process. In our study, two categories of teachers emerged for the way they made high-stakes decisions. One group of teachers followed rational data use processes, as they mainly collected data deliberately and systematically, used pre-defined criteria for their interpretation, triangulated data and searched for alternative explanations. However, the largest group of teachers based their conclusions on intuitive processes of data use,

in which data were mainly gathered spontaneously and recognition-primed, without triangulation or consideration of alternative explanations.

Starting from the idea that rational data use is a valuable contribution to high-stakes decision making, our study shows that in practice rational data use is still limited. The results show that teachers' inferences are only based in part on data collected rationally; teachers still collect data intuitively to a great extent when they make decisions. The data that are collected rationally are interpreted by pre-defined criteria to a certain extent; however, a significant part of rational data is also interpreted by personal criteria. Furthermore, we found little proof of data triangulation and consideration of alternative hypotheses when teachers make sense of data. Finally, the conclusions in this study were not necessarily supported by the rational evidence base that was collected. Some teachers interpreted data collected rationally in a way that made these cognitive indicators coincide with non-cognitive indicators collected intuitively. Therefore, stressing the importance of data use alone is not enough if we want to improve decision making in education. It is also important to confront and change certain beliefs about student abilities (Park, Daly, & Guerra, 2012).

The fact that some teachers based their conclusions ultimately on data collected intuitively, often related to non-cognitive pupil characteristics, sometimes even despite test results that indicated the contrary, is worrisome, especially from an equity perspective. Confirming the result from previous studies (e.g., Bertrand & Marsh, 2015; Kaiser et al., 2013; Urahne, 2015), we found that teacher beliefs about student motivation and work ethics also influenced their judgement. Some teachers believed that high engagement would overcome weak results, while teachers' came to more negative conclusions for pupils with these same or sometimes better results but low (perceived) engagement. Teachers inaccurately base part of their judgment of student achievement on students' perceived behavioural engagement in the classroom, as they assume that high engagement and high achievement go hand in hand (Kaiser et al., 2013; Urahne, 2015). However, as Urahne (2015) pointed out, teachers who perceive pupils as less motivated often underestimate students, which means that these pupils incorrectly end up in lower educational tracks. Studies also have shown that teachers overestimated the academic abilities of pupils when they were perceived as independent and interested (Alvidrez & Weinstein, 1999) or easy to manage during lessons (Hinnant, O'brien, & Ghazarian, 2009). Thus, when teachers assume correlation of non-cognitive data collected intuitively and actual achievement when making conclusions with regard to the transfer, they may assign pupils to the wrong educational tracks.

The results of our study also show that teachers use different criteria and thresholds for different students in their classroom, influenced by their beliefs about these non-cognitive indicators. Whereas one student who passes a test threshold of 50% is

How do teachers make sense of data in the context of high-stakes decision making?

perceived to be ready for a higher track, another student with the same test threshold is considered to be not. Oláh, Lawrence, and Riggan (2010) also found that these types of achievement thresholds differed considerably, and varied by student, by class, and even by time. Therefore, especially when making high-stakes decisions, it is important to develop pre-defined thresholds and criteria beforehand. To validate teachers' conclusions with regard to pupil characteristics, it is important to make these thresholds and criteria, as well as the whole sensemaking process, more public, transparent, traceable and reproducible (Cohen et al., 2008; Kane, 2013; Senge, 2001).

In conclusion, teachers use the majority of data collected intuitively when they make high-stakes decisions, such as the transition decision under study. However, given the high stakes for the pupils involved, decisions with regard to placement and promotion require deliberate and systematic processes of data use, analyses and interpretation to counterbalance the pitfalls of intuitive judgment (Blackwell et al., 2006; Kahneman & Frederick, 2005). Furthermore, data use is often considered to be a straightforward process, without sufficient attention to the complexity of the sensemaking processes and teacher beliefs that influence decisions. Having good data does not lead to good decisions when the sensemaking process is biased. An important theoretical contribution of this study is the finding that although data may be collected in a rational (deliberate and systematic) manner, the actual use may be less rational. The results of our study show that often even data that is collected in a deliberate and systematic manner is interpreted using personal criteria to come to a conclusion, making the whole data use process less objective than is desirable, especially from an equity perspective. Fair educational decisions require deliberate, systematic and transparent decision-making processes in which teachers reflect upon data, triangulate data collected rationally and intuitively and elaborate alternative hypotheses.

5.2 Limitations and suggestions for future research

Although our findings are important for gaining a deeper understanding of teachers' decision making, we do have to acknowledge some limitations of this study. First, the choice of a small-scale qualitative study in one specific, low-accountability (no central exams, no obligation to use standardized tests) context implies that we need to be careful with generalisations of our findings. Replication of our findings in other contexts, especially high-accountability contexts, is needed. Although replication studies are often viewed as unoriginal (Lindsay & Ehrenberg, 1993, in Makel & Plucker, 2014), and are not seen as contributing much to the field (Sterling et al., 1995, in Makel & Plucker, 2014), they are needed to develop a robust knowledge base on what works in education, and the conditions under which it works (Granger & Maynard, 2015; Makel & Plucker, 2014).

Unfortunately, we can only critically discuss the processes of teacher judgment, but we cannot evaluate the quality of the conclusions being made. Several decisions were based on data collected intuitively, and influenced by teachers' deficit beliefs about non-cognitive student characteristics. However, the next question that needs to be answered is, how do these decisions work out for the students in question? Longitudinal research in which pupils are followed in the different educational tracks to which they were assigned would be needed to answer this question.

In this research, we focused on a specific type of decision that has a discrete set of alternative options related to the transition. Possibly, the decision process differs when teachers are making more open-ended types of decisions based on data, such as how to adapt one's instruction to pupils' individual needs. Also, the decision under study involved high stakes for the pupils, but not for the teachers themselves. For future research, it is interesting to examine if and how teachers' approaches to decision making differ based on the decisions.

We only discussed the criteria teachers used for the interpretation of rational data. Traditional viewpoints that start from a dichotomy between objective and subjective are not suited for understanding the quality and interpretation of data collected intuitively. Objective interpretation of data collected intuitively would be an oxymoron. Since teachers still use the majority of data collected intuitively to inform their judgment, the question is what criteria can be used to adequately assess the quality and interpretation of these data collected intuitively. Also, for future research it is interesting to investigate how the criteria teachers use and the level of specificity of their inferences might be related to teachers' data literacy.

Finally, our research did not involve novices because we aimed at studying the intuitive processes of data collection from the field of intuitive expertise (Klein, 2008). This means, however, that we have no insight into processes that underlie the judgement of novices. For further research, it would be interesting to study if and how novices and expert teachers differ in the rational and intuitive processes they use in judgement. According to decision theory, intuitive processes can only be used as reliable and skilled expertise in judgement when a professional had enough practice in a similar environment and with similar cases (Kahneman & Klein, 2009). From an educational perspective, this would imply that novices need to rely on predominant rational processes to prevent judgemental bias, because they lack expertise. For future research, this is something that clearly needs to be investigated.

5.3 Implications for practice

School leaders can influence data use processes by teachers (e.g., Bertrand & Marsh, 2015; Datnow & Park, 2014; Halverson, Grigg, Prichett, & Thomas, 2007; Knapp, Copland, & Swinnerton, 2007; Datnow et al., 2012). Bertrand and Marsh (2015)

How do teachers make sense of data in the context of high-stakes decision making?

suggested that school leaders should encourage teachers to reflect on their sensemaking process and attributions. Moreover, school leaders need to confront cultures of low student expectations for specific sub-groups of students. The focus should be on ensuring more equal student placement (Datnow et al., 2012). Furthermore, school leaders can stress the importance of collaboration around the use of data, and data sharing (Datnow et al., 2012). By collaborating around data use and sharing data, the decision-making process of teachers can be more public, transparent, traceable and reproducible. The latter is crucial, as teachers' often long-held implicit assumptions about student ability levels and capacity for learning need to be made explicit in order to create more equitable outcomes (Datnow et al., 2012).

Following a systematic collaborative cycle of inquiry might overcome the pitfalls of individual intuitive judgement, since it forces teachers to share, reflect and discuss their beliefs, the inferences they make and the criteria that are used for the decision. It is crucial that teachers explicitly discuss their personal beliefs with colleagues and come to a shared understanding of decision criteria that will be used to evaluate alternative options. Furthermore, data need to be triangulated and alternative options should be discussed to challenge personal assumptions. Where individual teachers often struggle to analyse and interpret data, collaboration is considered to solve these problems (Hubbard et al., 2014; Van Gasse et al., 2016). Collaboration incorporates support and mutual reflection among teachers when making sense of data, alignment in and transparency of decision criteria, and a shared responsibility with regard to the high-stakes decisions (Datnow et al., 2012; Jimerson et al., 2016; Mandinach & Jimerson, 2016).

Finally, although the use of rational data is crucial, especially in the context of high-stakes decision making, this does not mean that data collected intuitively do not serve a purpose in education or that non-cognitive outcomes do not matter. These process data spontaneously collected during daily classroom activities are important as well (Yan & Cheng, 2015), and can be seen as an important part of what is called Assessment for Learning. Assessment for Learning involves continuous data collection during daily classroom activities, for example, through dialogues and observations (Klenowski, 2009). Based on these (often) intuitive data sources, feedback is used to direct further learning (Stobart, 2008). As the feedback loops are short, and the stakes are low, this type of intuitive data use process can serve the purpose of constantly monitoring and improving the quality of instruction and learning in the classroom.

7

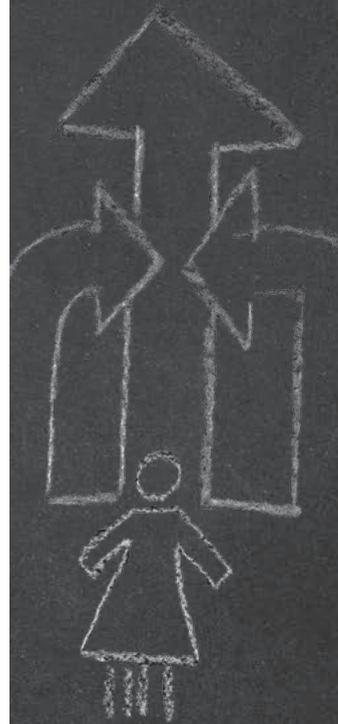
Chapter

Examining teacher judgement from a dual-process perspective: how rational and intuitive processes mutually influence teachers' high stake decisions.

This chapter is based on:

Vanlommel, Van Gasse, Vanhoof & Van Petegem. Examining teacher judgement from a dual-process perspective: how rational and intuitive processes mutually influence teachers' high stake decisions.

Article submitted for publication in
Journal of Educational Psychology



1. PROBLEM STATEMENT

Teacher judgement is an important issue, given the great impact of high-stakes decisions such as placement and promotion on pupils' educational trajectories (Bonvin, 2003; Eurydice, 2011; Goos et al., 2013). For many years, teachers' experiential knowledge was considered to be a solid base for teacher judgment; it is only recently that teachers have been expected more and more to use data to inform their decision making (Mandinach & Jimerson, 2016; Schildkamp et al., 2012). This expectation is based on critiques questioning the accuracy of intuitive teacher judgment. Research has shown that intuitive teacher judgment can be inaccurate when prompted by expectancy effects and different sorts of bias (Kahneman & Klein, 2009; Kaiser et al., 2013).

Frameworks have been developed to guide data use, involving different steps that constitute a systematic decision cycle. Generally, data-based decision making starts from a question or problem definition, followed by data collection, data processing (analysis and interpretation) and evaluation of alternatives before a decision is made (Coburn & Turner, 2011; Mandinach et al., 2006; Schildkamp et al., 2012). In the final step of the decision process, all data that were collected are deliberately weighed against pre-defined criteria, and teachers evaluate alternatives until they arrive at the decision that best meets a clearly defined purpose.

Other scholars argue that these maximizing rational procedures do not coincide with decision making in complex contexts. It is argued that classical rational theories are not suited for understanding how teachers make decisions in ambiguous and uncertain situations, as is the case in practice. According to Klein (2008), contextualized experiential knowledge is needed to make decisions in complex circumstances with uncertainty about the outcomes. In the field of naturalistic decision-making, the recognition-primed decision model, based on earlier theories of intuition as expertise (e.g., Simon, 1987), describes how experts develop patterns and mental models that allow them to recognize relevant cues automatically without deliberate attention. (Klein, 2008). In the final step of the decision process, teachers will likely not evaluate all alternatives and weigh all evidence that was collected because rationality is bounded. The rationality of teacher judgement might be bounded by limited time or limited cognitive capabilities to process all available data (Kahneman, 2003; Kahneman & Frederick, 2005; Klein, 2008; March, 1978; Simon, 1987). Decision makers are likely to choose satisfying solutions rather than searching for data and evaluating alternatives until the optimal decision is reached (Kahneman, 2003; March, 1994; Simon, 1987).

Although the question whether to trust in intuitive or rational approaches to judgement is a controversial topic in education, many researchers in the field of decision making agree that it seems appropriate to assume that rational and intuitive processes both

influence teacher judgement (Epstein, 2002; Evans, 2008; Ferreira et al., 2006; Goldstein & Hogarth, 1997; Klein, 2008; Myers, 2002; Tversky & Kahneman, 1981). This dual-process approach to human judgement (Evans, 2008), also described as 'System 1 and System 2 Thinking' (Kahneman & Frederick, 2005; Tversky & Kahneman, 1981) or 'Cognitive Continuum Theory' (Hammond, Hamm, Grassia, & Pearson, 1987) starts from the idea that the rational system (System 2) involves deliberate processes of problem diagnosis and data collection, while the intuitive system (System 1) is guided by an automatic process of spontaneous recognition.

This dual-process approach to human judgement suggests that we need to take into account both rational and intuitive processes when we want to gain clear insight into teacher judgement. Although a growing body of scholars agree that a combination of both data and teacher expertise are needed for wise and professional decision making in a contextualised fashion (e.g., Hammond et al., 1987), insight into how rational and intuitive processes mutually influence teacher judgment is scarce. Moreover, there is little insight into the processes that underlie teacher judgement (Little, 2012). Often, teacher judgement is discussed as an outcome, without insight into what happens during the different steps of the decision process. To overcome this shortcoming, we must describe and explain the processes of teacher judgment throughout the different steps of decision making, taking into account both rational and intuitive processes and how they mutually influence each other.

A decision process is often depicted as a cyclic process in which a problem or goal is defined, more data are collected and processed and alternatives are evaluated before a decision is made (Blackwell et al., 2006; Datnow & Hubbard, 2016; Klein, 2008; Mandinach et al., 2006; Schildkamp et al., 2012; Vanlommel et al., 2017). However, data-based and recognition-primed approaches to judgement differ in the extent to which these steps are based on rational or intuitive processes. In this study, we aim at understanding how rational and intuitive processes mutually influence the different steps of teachers' decision process and how this may lead to different approaches to decision making. However, despite the processes involved in the different steps, the final step of evaluation of alternatives will greatly influence the rationality and intuitiveness of the final decision. In the last step of the decision process, where teachers evaluate alternative options based on all the information derived from the previous steps, an important question concerns what data are . Data-based decision making can end in intuitive judgment when, for example, information based on one intuitive cue overrules all information deriving from rational analysis in the evaluation of alternative options (Kahneman & Frederick, 2005; Klein, 2008; Mandinach et al., 2006; Schildkamp et al., 2012). In this manner, even rational processes may lead to intuitive judgement. Given the importance of evaluation of alternatives, we will pay extra attention to this last step of the decision process. We will not only critically examine what evidence is taken into account in teachers' process of evaluating alternatives, we

will also investigate the extent to which the final decision is based on data collected rationally and/or intuitively. To our knowledge, no research so far has disentangled the different steps of teacher judgement that lead to a decision, taking into account both rational and intuitive processes. Given the importance of teacher judgment, the following research questions are put forward:

How rational or intuitive is teacher judgement?

- 1.1 To what extent are teachers' decisions based on rational or intuitive processes during the decision process?
- 1.2 What data are taken into account when teachers evaluate alternatives?
- 1.3 What data are of decisive importance when teachers make a decision?
- 1.4 How can the relation between rational and intuitive processes explain different approaches to decision making?

2. THEORETICAL FRAMEWORK

Starting from a dual-process approach to human judgement, we will elaborate on both rational and intuitive theories of teacher judgment. Theories of data-based decision making will be used to study the rational processes in teacher judgement (e.g. Datnow & Hubbard, 2016; Mandinach et al., 2006; Schildkamp et al., 2012) while the recognition-primed decision model (Klein, 1997, 2008) will be used as a guiding framework to investigate the role of intuitive processes in teacher judgement. Since we aim at understanding how teachers' decision process is influenced by rational and intuitive processes, these theories will be discussed and integrated according to the following phases in the decision process: (a) problem definition; (b) data collection; (c) data processing; and (d) evaluation of alternatives.

However, before we begin with the conceptualisation of rational and intuitive processes within the different steps of teacher judgement, we do need to carefully add some nuance to this dichotomous approach to rationality and intuition. Although we will separate rational and intuitive processes for empirical reasons of conceptual clarity, we need to acknowledge that intuition is not the opposite of rationality. In practice, rational and intuitive processes are expected to be intertwined and mutually influence each other (Hammond et al., 1987; Kahneman & Frederick, 2005). For example, in Hammond's cognitive continuum theory, rational and intuitive processes are defined as the opposing ends of a continuum, while most processes involved in teacher judgement are probably neither completely rational nor completely intuitive (Hammond, 1996). Professional teacher judgement is based on a combination of rational and intuitive

processes that are expected to be intertwined (Barber, 2004; Spencer, Detrich, & Slocum, 2012).

2.1 Problem definition

A problem or goal is defined when the actual state of affairs is weighed against personal or shared standards with regard to the decision that needs to be made (Mintzberg & Westley, 2001; Schildkamp, Poortman, & Handelzalts, 2016). For example, a teacher might define it as a problem when a pupil writes with a lot of mistakes on his or her homework, if the teacher expects pupils to write without mistakes. Insufficient attention is often paid to the stage of problem definition in the decision process (Hegarty, 1991; Lyles & Mitroff, 1980; Mintzberg & Westley, 2001). Nevertheless, how teachers define whether something is or is not a problem will influence whether and how a decision process is initiated (Klein, 2008; March, 1994). Especially when high stakes are involved, decision makers are expected to obtain a clear and accurate understanding of the problem situation in order to know how to continue in the decision process (Blackwell et al., 2006; Mintzberg et al., 1976).

Starting from a naturalistic approach to decision making, a decision process may be initiated when a teacher recognizes a cue spontaneously. This recognition-primed problem definition is considered to be a valuable aspect of expertise, since it allows teachers to identify problems in an early stage (Klein, 2008). However, decision theory stresses the need for further problem diagnosis, using data to test or to elaborate teachers' problem definition (Cowan, 1986; Mintzberg & Westley, 2001; Schildkamp et al., 2016). In practice, problem recognition is often the first mechanism that triggers the decision process, since intuitive processes operate more quickly than rational processes (Kahneman & Frederick, 2005; Mintzberg & Westley, 2001). Despite the merits of rapid problem definition, research has shown that teachers' problem definitions may be biased (Schildkamp et al., 2016). Because the entire decision process might be inaccurate when it is guided by a false problem definition, initial problem recognition needs to be tested and refined by rational problem diagnosis (Mintzberg et al., 1976; Mintzberg & Westley, 2001)

In this research, problem diagnosis refers to the use of a least one output or process indicator collected deliberately and systematically. When teachers base their problem definition solely on intuitive recognition, or on an input indicator, as, for example, the fact that a pupil is a non-native speaker, their assumption about the problem might be one-sided or even wrong (Earl & Louis, 2013). In order to prevent bias, such as self-fulfilling prophecies, teachers' problem recognition needs to be challenged by rational problem diagnosis (Cowan, 1986; Kahneman & Frederick, 2005; Klein, 2008; Mintzberg et al., 1976).

2.2 Data collection

Assuming that teachers need to use data to inform their judgement, this implies that data first need to be collected before they can be brought into the decision process. How teachers collect data has been shown to have an important impact on their decisions, since the quality of the data greatly influences the quality of the decision (Schildkamp et al., 2016). Before we can study teachers' data collection, first we need to come to a clear understanding of what can be understood as 'data' in the context of teacher judgement.

Theories of data-based decision prescribe a fixed and systematic procedures of data collection following an iterative circle of inquiry (Mandinach et al., 2008; Wohlstetter et al., 2008). Starting from a pre-set goal and guided by a plan, classroom observations may be conducted rationally, for example, using an observation protocol that denotes a form of systematic data use, intended to find out why a certain type of mistake is recurring for a pupil (pre-set goal) (Vanlommel, Van Gasse, Vanhoof, & Van Petegem, 2017).

The recognition-primed decision model, on the other hand, describes how experts are able to focus their attention on only a limited set of data, guided by automatic recognition. Throughout their careers, teachers develop a framework of personal knowledge and beliefs based on learning and experience (Kelchtermans, 2009; Klein, 2008). These personal knowledge frameworks guide teachers' attention when searching for data (Dane & Pratt, 2007; Klein, 2008). Building on the same example mentioned above, classroom observations are considered to be collected intuitively when they are conducted without a pre-defined, explicit method such as a protocol and without a pre-set, deliberate goal.

Based on these insights, in our research we will conceptualise rational data collection as a deliberate and systematic search for indicators. Intuitive processes of data collection imply that certain indicators draw teachers' attention automatically during daily practice and thus, the search is not deliberate and not systematic.

2.3 Making sense of data

The data that are collected provide no valuable input for the decision in the original form in which they are presented (Cousins & Leithwood, 1993). Only after data are analysed and interpreted are they transformed into information that can be used as a basis for decision making (Davenport, Prusak, & Tuijl, 1998). Transforming data into information occurs within a sense-making process in which teachers try to understand what the data mean in relation to the problem they have defined (Datnow et al., 2012; Spillane, 2012).

It is suggested that, although rational models prescribe optimal procedures for data analysis and interpretation based on pre-defined criteria (Bosker et al., 2007; Leonard et al., 1999), in practice people are more likely to take mental shortcuts (heuristics) to come to quick and easier conclusions, using personal criteria (Evans, 2006; Kahneman, 2003; Klein, 2008). Applying the recognition-primed decision model, patterns and mental models stored in teachers' memory may create expectancies for the future (Klein, 2008). Based on experiences with (perceived) similar cases in the past, mental models are expected to trigger scenarios about future events. If these scenarios lead to an outcome that is acceptable for the teacher, they might not look at other data (Klein, 1997, 2008). For example, when a non-native pupil scores below average on math test, the teacher might recall cases of non-native pupils in the past who failed their final exam, despite all the extra efforts the teacher made during the year. A combination of being a non-native pupil and a low test result may be seen as a pattern, triggering expectancies without a clear analyses of different curricular goals on (different) tests. In this manner, teachers might jump from data to conclusions without a thorough process of analysis and interpretation.

In summary, teachers may process data rationally as they deliberately analyse and interpret data based on pre-defined criteria. Intuitive processes lead directly to conclusions, based on pattern recognition, and guided by teachers' personal criteria without deliberate and systematic analyses.

2.4 Evaluation of alternatives

Finally, teachers are faced with alternative options deriving from the decision process. Although teachers might have collected a wide array of data rationally and intuitively during the decision process, this does not necessarily mean that all these data are taken into account in the final evaluation of alternatives. Teachers may evaluate alternatives based on all data collected during the decision process or teachers may select a limited amount of data (Blackwell et al., 2006; Kahneman & Klein, 2009; March, 1994). When there is a decision to be made, teachers compare alternative options with regard to how the decision information deriving from rational and intuitive data collection is weighted. Information deriving from both rational and intuitive evidence may coincide and support one choice of alternatives, or it may provide contrasting information that leads to different alternatives. In this case, an important question concerns what evidence base is decisive in the final decision.

In summary, teacher judgment is expected to be a complex, iterative process mutually influenced by rational and intuitive processes during the different steps of the decision process. Teachers may diagnose or recognize a problem, collect data rationally (deliberately and systematically) or intuitively (non-deliberately, non-systematically), use pre-defined criteria or personal criteria to make sense of data and evaluate alternatives

based on data collected rationally or intuitively when a final decision is made. These processes may lead to rational or intuitive decisions, or decisions based on a combination of both processes. An overview of the theoretical framework is provided in Figure 1.

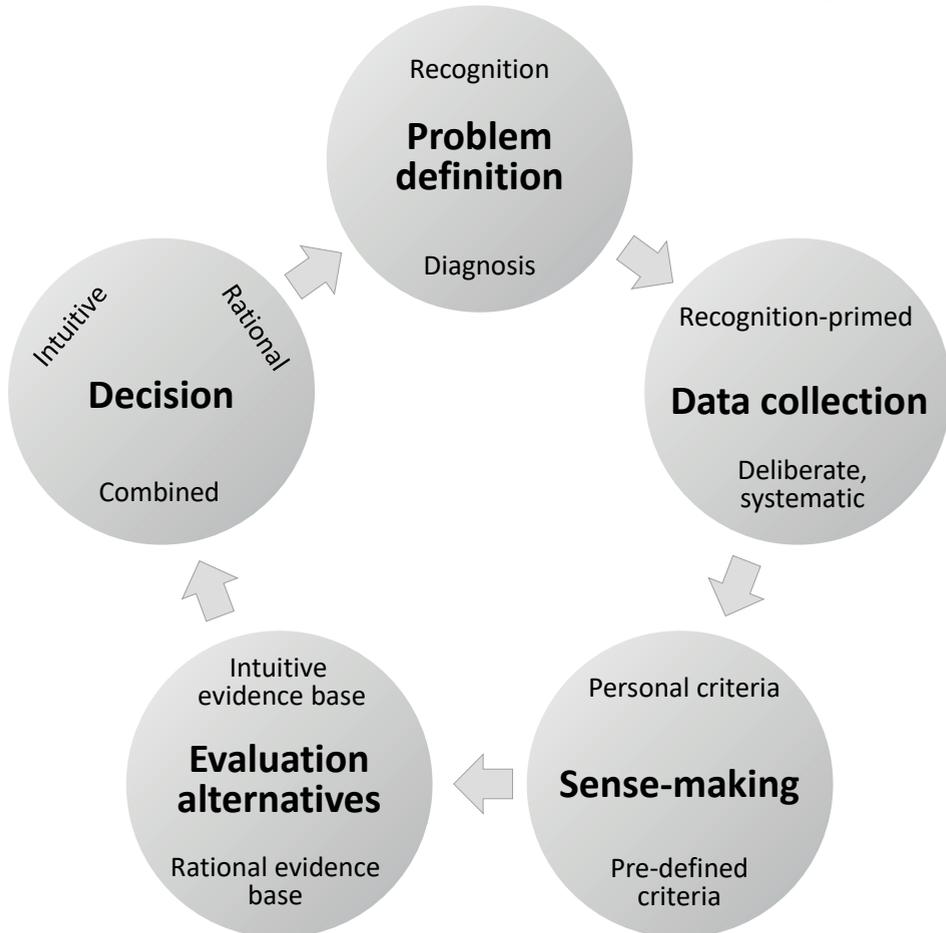


Figure 1: The process of teacher judgement from a dual-process perspective

3. METHOD

3.1 Context of this study

Not all teacher decisions influence pupils' educational trajectories to the same extent. As the stakes associated with a judgment go up, the need for a thorough, fair decision process increases (Epstein, 2008). Therefore, this study focuses on a specific case of high-stakes decision making, namely a transition decision. The transition from primary to secondary education involves a decision with high stakes for the pupils involved,

since it is a major transition towards a future position in society (Terwel, 2006) in which the judgment of the individual teacher still plays a prevailing role (Eurydice, 2011). This is especially the case in the liberal and autonomous educational system of Flanders (Belgium), which does not use a binding nationwide standardized test at the end of primary school that affects pupils' future educational careers (Eurydice, 2011; Penninckx et al., 2011). Schools can choose to use existing standardized tests to inform decision making, but these results are not binding for the transition decision. Mostly, teachers use or adjust tests that have been developed by the publishers of a particular educational method, or teachers make their own tests.

The context of Flanders is also characterized by high decision-making autonomy for the individual teacher. The transition decision is officially a team decision, but in practice it appears that the judgment of the individual teacher is still of ultimate importance (Eurydice, 2011). In Flanders, pupils typically make the transition from primary to secondary education by the age of 12. In primary education, pupils have one teacher for all subjects, except gymnastics. At the end of primary education, teachers must make the transition decision. In exceptional cases, teachers may decide not to give a certificate of primary education. In other cases, teachers will make an official transition recommendation with the following alternatives: future path in general secondary education (GSE) or no future path in general secondary education. In the latter case, pupils are advised to choose a school that offers a future track in technical secondary education (TSE, technical curriculum), vocational secondary education (VSE, practical curriculum) or artistic secondary education (ASE, artistic curriculum). Because of this early orientation in which pupils are already sorted at a young age into different tracks as they progress through education, the teacher's transition decision is crucial (LeTendre et al., 2003).

3.2 Participants

The focus of this study was on 6th grade (pupils aged 11-12) primary education in Flanders (Belgium). Twenty-five teachers were randomly selected from a list of all primary schools in the same province. After these teachers had been contacted by researcher 1 in a phone call in which the purpose of the interview was explained, a total of 16 teachers agreed voluntarily to participate. The other teachers who were called but did not agree to participate in the interview all argued that they did not have time to participate. About one-third (31%) of the 16 teachers were male ($n = 5$) and 69% were female ($n = 11$). The majority (56%) of the teachers had more than 10 years of experience, and the remaining 44% had between 5 and 10 years of teaching experience. All teachers signed an informed consent form stating that they had been informed about the goals of the research, that they understood that their anonymity was guaranteed, and that they could end their cooperation at any time.

3.3 Design

We conducted a longitudinal extended case study to gain an in-depth description of teachers' decision process in a contextualised way (Yin, 1994). A case study design is suited for investigating a phenomenon in depth within its real-life context, especially when such understanding is strongly embedded in the specific context (Yin, 1994). In our research, the case being studied is the transition decision from primary to secondary education. Through the longitudinal prospective approach, data were collected repeatedly at fixed intervals. In our study, the same teachers were interviewed three times during the academic year (within a month after the start, after six months, at the end of the academic year).

All 16 teachers discussed transition problems involving 2 specific pupils, which meant that a total of 32 cases were discussed at the start. Since two pupils left school during the year, in sum 30 cases (decisions) could be examined. The most important distinction between longitudinal and cross-sectional studies, for our purposes, is the timeline. Instead of a researcher collecting data from varying subjects in order to study the same variables, the same subjects are surveyed multiple times with the aim of finding patterns (Yin, 1994). Table 1 provides an overview of the measurement points and aims of the semi-structured interviews that were conducted throughout one school year.

Table 1: Overview of measurement points and aims for the semi-structured interviews with 16 teachers (* 2 pupils left school)

Measurement Point	Month	Aim	Pupils	Total
MP 1	October	Problem definition	A + B	32
MP 2	March	Search for Data + Processing	A + B	32
MP 3	June	Evaluation + Decision	A + B	30*
Total				94

3.4 Interviews and Procedure

Participants answered open-ended questions that explored their judgements about pupils' competencies and characteristics in relation to their advice regarding the transition from primary to secondary education. Examples of questions are: "What is your advice for this pupil with regard to the transition from primary to secondary education."; "What are the decisive arguments for this advice?"; "What is the evidence for this argument?" (measurement point 3). "Why do you believe pupil X might not be able to make the transition to general secondary education at the end of the year?"; "How did you define this problem?" (measurement point 1). "How did you collect information to gain a better understanding of problem X?"; "How did you make sense of these data?" (measurement point 2). The open-ended questions in the interview protocol addressed all the concepts discussed in the theoretical framework, ensuring that all of the relevant conceptual topics were asked about across all interviews.

The in-depth interviews lasted on average one hour and were conducted by a single researcher. The same interview protocol was used in all 16 interviews to ensure methodological consistency (Cohen et al., 2008). All of the interviews were digitally audio-recorded and the files securely saved for reasons of reliability (Cohen et al., 2008). Peer-debriefing sessions (investigator triangulation) were then conducted, in which the different methodological choices, data analysis procedures and interpretations were critically examined (Creswell & Miller, 2000). With the aim of enhancing the reliability of our research, we clearly described our chain of evidence, so that the external observer can trace back the steps in either direction (from conclusions back to research questions or from questions to conclusions).

3.5 Coding and analysis

We conducted analyses of the data from all three waves of the longitudinal study. The interviews were transcribed verbatim and analysed with the aim of capturing variation across teachers in types of problem definition, data collection and sense-making as well as evaluation of alternatives. A coding scheme was developed, based on the theoretical framework and was discussed in a peer-debriefing session. After both researchers had come to an agreement on the content of the coding scheme, first one interview of a specific measuring point was analysed and discussed by both researchers. This discussions for example stressed the need for a better conceptualisation of what was meant by 'pre-defined' versus 'personal' criteria. Subsequently, the same interview and two other randomly selected interviews were analysed by both researchers using the revised coding scheme, the interrater reliability (Cohen's Kappa) being 0,90 for measuring point 1 and 0,72 for measuring point 2 and 3. Disagreements in the codings by both researchers were resolved by discussing and reflecting on the content of the different concepts and its boundaries. In the last step of the coding process, researcher 1 went back and re-analysed the interviews that had been analysed before the inter-rater reliability check and finally all interviews were analysed based on the revised coding scheme by researcher 1. After within-case analyses for each measurement point, a cross-case analysis over the three measurement points was conducted to explore patterns in teachers' decision process (Creswell, 2005). Table 2 provides an overview of the final coding scheme.

Table 2: Overview of the codes

Code	Conceptual characteristics	Example
Problem diagnosis	The teacher mentions at least one 1 output or process indicator that was collected deliberately and systematically to define the problem related to the transition decision.	<i>At the start of the year, a teacher sees a problem with reaching the curricular goals for French because first test results show that a pupil is not able to write French words that are supposed to be known in 6th grade.</i>
Problem recognition	The teacher mentions no output or process indicator that was collected deliberately and systematically to define the problem. The teacher describes how he/she was able to recognize a certain cue that indicates a problem.	<i>When a teacher notices a pupil staring outside the window during class time, he/she indicates that lack of motivation might be a problem in relation to the transition.</i>
Combined problem definition	The teacher mentions both how he/she recognized a cue intuitively and the deliberate and systematic use of an indicator	<i>A teacher automatically recognizes a specific kind of mistake on a writing task. Subsequently, the teacher administers a test to check whether the mistake may be part of a learning disorder.</i>
Rational data collection	Indicators collected deliberately and systematically	<i>For example: test results for different subject-matters, standardized tests, deliberate and systematic observations, deliberate conversations with parents or colleague, and so forth.</i>
Intuitive data collection	Indicators that are not collected deliberately/systematically but automatically, recognition-primed.	<i>These examples mostly refer to spontaneous observations during daily practice, or spontaneous conversations with parents or colleagues.</i>
Pre-defined criteria	Based on clear, measurable and shared (school level) goals	<i>49% on her standardized test is in the E-zone. A pupil in this zone is not allowed for general secondary education</i>
Personal criteria	Based on teachers' personal beliefs or feelings	<i>I don't believe a pupil with 65% on mathematics will make it in general secondary education</i>
Evaluation of alternatives	The different options teachers consider based on the evidence	<i>Based on the test results, a general educational track might be possible, but I feel she is not motivated for a general track.</i>

4. RESULTS: HOW RATIONAL OR INTUITIVE IS TEACHER JUDGEMENT?

In this study, we aim at explaining how rationally or intuitively teachers make decisions by describing and explaining how rational and intuitive processes influence the different steps of decision-making. Therefore, we will first provide a general overview of teachers' decision process and briefly discuss the different steps and how they lead to the final decision, to answer research question 1 (To what extent are teachers' decisions based on rational or intuitive processes during the decision process). Since the extent in which a decision is rational or intuitive largely depends on the final evaluation

of alternatives, in section 4.2 we investigate the evaluation of alternatives in greater depth, answering research question 2 (What data are taken into account when teachers evaluate alternatives) and research question 3 (What data are of decisive importance when teachers make a decision). Finally, we will explore how the relation between rational and intuitive processes explains different approaches to decision making, answering research question 4.

4.1. To what extent is teacher judgement based on rational or intuitive processes during the decision process?

Table 3 provides an overview of the different steps of the decision process each teacher reported for two pupils with regard to the transition decision, as discussed in the method section. We investigated whether the problem that initiated the process was based on rational problem diagnosis (Dia), on spontaneous recognition (Rec), or on a combination of both (Com), and how many unique indicators teachers collected deliberately and systematically (rational = Ra) or non-deliberately and non-systematically (intuitive = In) during the year. In the case of rational data collection, we examined how often data were interpreted by pre-defined criteria (instead of personal criteria). Further, we also indicate to what extent data collected rationally (Ra), data collected intuitively (In) or a combination of both (Com) were decisive when teachers evaluated alternatives. In the last columns, we provide an overview of the outcome of the decision process: the decision to advise a pupil towards general secondary education (GSE) (Yes) or (No). If a pupil did not get his or her certificate of primary education, this is also indicated (*)

In our findings, the decision process was shown to be mostly initiated by automatic problem recognition, although in half of the cases it was followed by rational problem diagnosis leading to a problem definition that was based on a combination of rational and intuitive processes. Teachers recognized cues automatically, while they observed their pupils in the classroom, and this recognition triggered expectancies with regard to the transition decision they needed to make at the end of the school year. Rational diagnosis means that the teachers used at least one output or process indicator collected deliberately and systematically (to question and complement the intuitive problem recognition). In the interviews, half of the teachers came to a problem diagnosis in this manner. Mostly, they described how they look first at test results to gain more understanding about the problem they recognized. In most cases, the data confirmed the problem identified intuitively, and seldom challenged it. In exceptional cases, teachers mentioned a deliberate conversation with a colleague, or a search for information in the pupil's file. Peter, for example, explained how he recognized a problem that made him question Brahim's transition to a general educational track at the end of the year.

Examining teacher judgement from a dual-process perspective

Table 3: Overview of the different steps in the decision process for each pupil (P)

Teacher		Rational Data Collection	Interpreted by Pre-defined criteria	Intuitive Data Collection	Evaluation of Alternatives	Advice GSE
Emma	<i>P1</i>	7	6	1	Ra	*
	<i>P2</i>	4	4	2	Ra	*
Amy	<i>P1</i>	5	4	2	Ra	Yes
	<i>P2</i>	4	3	2	Ra	No
Ann	<i>P1</i>	1	1	3	In	No
	<i>P2</i>	5	3	1	Ra	*
Joyce	<i>P1</i>	5	4	6	Com	No
	<i>P2</i>	2	2	4	Com	No
Katy	<i>P1</i>	2	2	6	Ra	Yes
	<i>P2</i>	2	2	1	Ra	No
Lisa	<i>P1</i>	6	4	3	Ra	*
	<i>P2</i>	12	8	8	Ra	*
Frank	<i>P1</i>	/	/	/	/	/
	<i>P2</i>	1	1	7	In	No
Bart	<i>P1</i>	2	1	4	In	No
	<i>P2</i>	1	1	0	In	No
Roy	<i>P1</i>	1	0	6	In	No
	<i>P2</i>	3	2	7	In	No
Peter	<i>P1</i>	2	0	3	In	No
	<i>P2</i>	2	1	1	In	No
Mary	<i>P1</i>	2	0	4	In	No
	<i>P2</i>	3	2	3	In	No
Sophie	<i>P1</i>	3	2	6	Com	No
	<i>P2</i>	2	1	4	Com	No
Bob	<i>P1</i>	3	2	5	Com	*
	<i>P2</i>	2	2	7	Com	No
Julie	<i>P1</i>	/	/	/	/	/
	<i>P2</i>	1	1	9	Com	*
Pam	<i>P1</i>	2	1	6	Com	Yes
	<i>P2</i>	1	1	1	In	No
Liz	<i>P1</i>	1	1	5	In	No
	<i>P2</i>	1	1	5	Com	No

(/ = pupil left school) (* = pupil did not get certificate of primary education)

(Dia = diagnosis, Rec = recognition, Com = combination, Ra = rational, In = intuitive)

'Brahim, he lacks common sense, when you ask him a question about the weight of a car, and he answers 'one kilo and a half', without the blink of an eye, then you know,... As is the case for many pupils in our school, it is probably also related to his linguistic skills (family does not speak Dutch at home). I feel that Brahim sometimes misses parts of the instruction, because of the linguistics. However, I don't see him making a lot of effort, so if his attitude is not going to change, I don't see him going to a general educational track at the end of the year.'

In three cases, the problem was exclusively diagnosed based on poor test results, and not identified through intuitive recognition.

In the next step of the decision process, all teachers collected data both rationally and intuitively. Rational data collection here predominantly refers to cognitive output indicators, almost exclusively non-standardized test results. Although we considered test results as data collected deliberately, few teachers described it as a deliberate practice in which they carefully consider the goal of their testing. Rather, administering tests was described as part of the routine. Some teachers also mentioned input indicators, referring to certificates of a (learning) disorder), for example. In our research, we found little evidence of process indicators or non-cognitive indicators collected in a deliberate and systematic manner. The teachers in our interviews collected data related to many indicators intuitively during their daily practice, when observations related to non-cognitive indicators such as motivation, effort or well-being spontaneously drew their attention. Without a deliberate or systematic search, teachers find themselves able to recognize relevant cues in their pupils' behaviour. In our research, intuitive data collection almost exclusively refers to non-cognitive (process) indicators.

Subsequently, we studied how teachers transformed data collected rationally into information that can be used in the decision process. In the interviews, we found that data collected rationally was interpreted by pre-defined criteria in almost two-thirds of the cases. For example, teachers used curricular goals to make sense of test results or they mentioned a shared criterion that was agreed upon by the school team. For example, Lisa explained: *'His result on this big test for mathematics unfortunately means that he did not reach the curricular goals.'* This also means that approximately one-third of the data collected rationally were interpreted using teachers' personal criteria. It appeared that teachers' personal criteria are largely based on beliefs about what matters most for teaching and learning in general and for success in secondary education more specifically. For example, Mary explained: *'She scores only 70% on mathematics, I don't feel that this is the right profile for general secondary education.'*

Also, some teachers interpreted a certain (average or low) test score as a good result for a specific pupil because the teacher felt that he or she had to work hard for this result. For example, Amy explained: *'Mostly, she scores about 29 out of 50, sometimes*

33 or 34 in a total score of 50. When you know she needs to work extra hard because of her disability, these are great results.'

In contrast, teachers could also interpret an average test result as too low for a general secondary track when this grade results from (perceived) lack of effort or motivation. As Roy, for example, told us: *'Well, he scored 7/10 on that test while he should have been able to do better than that. There is no motivation or effort. You have to understand that 70% in the end will not be enough for general secondary education when it results from lack of effort and his attitude...'*

Finally, at the end of the school year one-third of the teachers exclusively based their decision on data collected deliberately and systematically. Although all of these teachers had also collected data intuitively during the year, in the end, the test results were said to be decisive. Another third of the teachers in our research exclusively based their final decision on data collected intuitively. These teachers relied on information deriving from spontaneous observations of non-cognitive indicators such as effort, motivation or well-being when they made the decision. For the last group of teachers, the final decision was based on data collected both rationally and intuitively. Since this last phase greatly influences the final decision, in the next section we will provide an answer to the following research questions: what data are taken into account when teachers evaluate alternatives; what data is decisive when the decision is made?

4.2 What data are taken into account when teachers evaluate alternatives?

Table 4 provides a refined view of the last two columns of table 3. In this table, we give an overview of the data teachers took into account in the process of evaluating alternative options with regard to the transition decision. Unique counts for each data source are pictured as (+) when they supported the decision for a transition to general secondary education in a positive sense and (-) when the data were used in a negative sense to question the transition to general secondary education. Table 4 also shows which data were decisive and whether the decision incorporated positive advice towards a general educational track in secondary education (Yes or No). When the pupil did not get his/her certificate, this is also indicated (*). Teachers may have collected a wealth of data during the year (the data collection pictured in table 3), but this does not necessarily mean that these data are all taken into account when alternative options are evaluated in the last phase of the decision process (data teachers mention in table 5).

Chapter 7

Table 4: Overview of the data teachers mention in the evaluation of alternatives related to the decision and the data that were decisive. (/ = pupil left school) (* = the pupil did not get his/her certificate of primary education)

		<i>Test Results</i>	<i>Standardized Tests</i>	<i>Conversation parent</i>	<i>Conversation pupil</i>	<i>Input indicator</i>	<i>Observations effort</i>	<i>Observations interest</i>	<i>Observations well-being</i>	<i>Observations skills</i>	<i>Indicators parental support</i>	Decisive in evaluation	Positive advice GSE
Teacher		Data collected rationally					Data collected intuitively						
Emma	P1	-				-	+				-	Ra	*
	P2	-		-	-							Ra	*
Ann	P1	-	-			-	+		+		-	In	No
	P2	-	-						+	-		Ra	/
Amy	P1	+					+	-		-	-	Ra	Yes
	P2	+							-			Ra	No
Lisa	P1	-	-		-		+	-				Ra	*
	P2	-					-				-	Ra	*
Katy	P1	+	+							+		Ra	Yes
	P2	-		+			+		-	-		Ra	No
Bart	P1	-	+							-		In	No
	P2	+				-						In	No
Peter	P1	+					+	-		-		In	No
	P2	+					-	-		-		In	No
Mary	P1	+				-	+					In	No
	P2	+					-					In	No
Frank	P1	+					-	-			-	In	No
Roy	P1	-						-	-	-		In	No
	P2	-					+	-	-	-		In	No
Joyce	P1	-		-	-	-		-				Com	No
	P2	-		-	-				-			Com	No
Sophie	P1	-		-	-	-		-	-			Com	No
	P2	-					-	-				Com	No
Bob	P1	-					+	-		-		Com	*
	P2	-	-			-	-	-		-		Com	No
Julie	P2	-				-	-		-			Com	*
Pam	P1	+	+				+					Com	Yes
	P2	+					-			-		In	No
Liz	P1	-			-			-				In	No
	P2	-					-			-		Com	No

First, table 4 shows that all teachers took into account data collected both rationally and intuitively when they considered alternative options with regard to the transition decision. In our interviews, all teachers mentioned test results for evaluating whether they should advise a pupil to go a general educational track or not. Test results were used to evaluate pupils' possibilities in a general track in both a positive sense and a negative sense. The results of standardized tests were only taken into account to a limited extent, both to support and to question the likelihood of a successful transition to general secondary education. Further, some teachers mentioned deliberate conversations with parents or with pupils. For example, teachers described how they tried to find out what interests pupils with regard to further educational tracks.

All teachers in our interviews also mentioned data collected intuitively when they evaluated alternatives with regard to the decision, mostly referring to spontaneous observations with regard to non-cognitive factors. In table 4 we see that indicators with regard to effort were almost exclusively discussed in a positive sense to support the alternative option towards a general track. Pupils who showed a lot of effort during class were expected to have a better chance in a general track, since most teachers consider effort to be an important predictor for future success in secondary education. All other indicators collected intuitively were mostly used in a negative sense when teachers evaluated pupils' future chances in a general educational track. For example, when the teachers in our study felt that a general secondary track would increase the pressure on a pupil too much, or that failure in a demanding track would lower pupils' self-esteem, well-being was mentioned as an important indicator in the evaluation of alternatives. For example, Ann described how she weighs information deriving from observations with regard to effort and poor results on standardized test to evaluate options regarding the certificate of primary education.

'I was not sure to give him his certificate of primary education because of the low results on his standardized test. To be strict, he doesn't meet the threshold that has been set in the school. Personally, I believed he needed to get his certificate. The difficult situation he is in at home, it is not his fault. Generally speaking, his test results during the year were around 50%, so for his future success in secondary education, a lot depends on how the situation at home will evolve. If the situations stays the same, it doesn't look good... I feel that giving him his certificate is better for his well-being, although going to a year in 1B (preparation for vocational track), might give him some breathing room,... It can also make him unhappy. I would feel responsible if he falls apart... I find it more important that he feels that we have faith in him, that people believe in him, that he feels that he is not alone, so I want to reward him for his effort. I believe this will make him more motivated to start in secondary education and give him a better starting position then when we send him to 1B without a certificate of primary education.'

In contrast, Roy weighed information deriving from intuitive observations with regard to lack of motivation to evaluate whether advice towards a future vocational track would be a better option, despite average test results.

'The danger of sending him to general secondary education is that he is going to hate school. At this point in time, there is no intrinsic motivation. His results are average, but he doesn't like working for school, there is no parental support and when he fails in secondary education because he doesn't work for school, because he lacks the will to study, he will become so demotivated that his school career will be over. Maybe it is better to give him at least a chance by sending him to vocational education where he hopefully will find joy in working on practical tasks. Maybe this can get him motivated, there is more to it than his test results.'

In this section, we discussed what evidence base (data collected rationally and data collected intuitively) was taken into account when the teacher weighed alternative options in the evaluation process. In the next section, we examine what data were decisive when the decision was made.

4.3 What data are decisive when teachers make a decision regarding retention or promotion?

First, we will discuss the decisions that were exclusively based on data collected rationally. Table 4 shows that half of the decisions with an exclusively rational evidence base referred to cases in which pupils did not get their certificate of primary education. These decisions were made based on test results that showed that the pupils did not meet the curricular goals. In 3 out of these 5 cases, a low level of proficiency with the Dutch language (non-native pupils) caused difficulties with different aspects of the curriculum. Both Emma and Lisa explained that they regretted the decision, because their pupils showed a lot of effort and they made considerable progress during the year. Unfortunately, at this point in time the boys did not reach the curricular goals, so they could not give them a certificate of primary education. For Amy and Katy, the test results at the end of the year appeared to be better than they had expected at the start of the year. Therefore, their initial problem definition was adjusted and they came to a positive recommendation with regard to a general track in secondary education without an extensive evaluation of alternatives. Ann based her negative advice on test results that were below average, combined with a certificate of a learning disorder (dyspraxia).

Other decisions were exclusively based on data collected intuitively. Although in all these cases, the teachers also considered data collected rationally when they evaluated alternative options, these data were not taken into account when the decision was made. Although we must be careful with this conclusion given the limited amount of cases, in our study we found that none of the decisions based on data collected

intuitively led to positive advice towards a general track. The advice was mostly based on indicators with regard to lack of effort, lack of interest in a general curriculum and lack of observed cognitive skills. For two-thirds of these pupils, teachers mentioned average test results, but based on spontaneous observations during the year, the teachers decided that a general track was not the best decision. Peter and Mary had pupils with overall average test scores who also showed effort to some extent. Nevertheless, both Peter and Mary felt that these pupils did not belong in a general track. For Mary, the main reason was that the girl had an autism disorder that inhibited her integration in a larger group and in a larger school. According to Mary, the girl needed extra care and less pressure, so that a future orientation towards a technical or vocational track was a better fit for her. Peter, on the other hand, felt that this boy did not have interest or competences regarding a general curriculum. Peter did not consider the boy to be a *'student'*, for example, because the boy did not like reading books, preferred to play football and did not give intelligent answers during class.

When we look further into the story of Ann, who discussed how she evaluated alternative options, she went on to explain her final decision:

'The poor results on the standardized tests at the end – they are not decisive. It is only a snapshot of three days, I have worked with him for the whole year. I feel the responsibility to decide upon the whole picture, and in this case, the well-being is decisive. He will get his certificate of primary education, but I will not advise a general track in secondary education for him. (...) Although we make the decision with the whole team, in the end, it is my opinion that counts. They will listen, in some cases they ask questions or they say 'why?', but if I have valid arguments, they will follow my decision. I did my best to convince my colleagues at the transition board, because the boy worked so hard.... It is my pupil after all, I know him best.'

In Table 4, we also see decisions that were based on a combination of data collected rationally and intuitively. Information deriving from poor test results and observations on, for example, interest in a general curriculum or wellbeing were used to discourage a transition to a general educational track.

'First, we do not believe that a general track is a good idea. Because of his dyslexia he experiences difficulties with everything that is related to language. In a general educational track, that would be a deficiency, and it doesn't interest him either. He is not interested in subject-matters related to languages, I have seen that during the year, he showed no effort, he has poor results. He is really good with technique, on mathematics he scores average, but on the project for technique, he scored well and he worked hard for it. He was really interested. (...) For a moment, we considered the recommendation for a general educational track, mainly because of a conversation I had with his parents. They preferred a

general track. I had doubts, because of his deficiencies with regard to languages, but I considered it as an alternative until we did the science project. When I saw his technical competences, his high grades on this project and his enthusiasm, for me it was clear that he should be oriented towards a technical track. The parents saw this too, so now, they agree.’ (Bob)

So far, we have described the rational and intuitive processes in the different steps of the decision process. In what follows, we will search for patterns that might explain how the different steps are related in teachers’ approaches to decision making.

4.4 How can the relation between rational and intuitive processes explain different approaches to decision making?

Based on our results, we found two main clusters in which the rational and intuitive processes in the different steps of the decision process could be linked to the final decision: (1) professional judgement based on both rational and intuitive processes and (2) intuitive judgement predominantly based on intuitive processes throughout the decision process. In our interviews, we found no examples of strict rational judgement.

4.4.1 Professional judgment: a combination of rational and intuitive processes in the different steps of the decision process

In our theoretical framework, we defined professional teacher judgement as a wise combination of intuitive processes and rational processes. Emma, Amy, Ann, Joyce, Katy and Lisa combined rational and intuitive processes in the different steps of the decision process. All of these teachers (except for Joyce) initiated a decision process based on intuitive problem recognition, followed by rational problem diagnosis. Once the problem had been diagnosed, these teachers collected a wide array of data, both rationally and intuitively. We found that all of these teachers combined information collected rationally from at least two data sources with data collected intuitively (data triangulation). Table 5 shows that this group of teachers collected more indicators rationally, when compared with the other teachers in our interviews. Also, they mostly used pre-defined criteria when they made sense of data collected rationally and tested alternative explanations. At the end of the year, although most of the teachers in this group took into account information deriving from both rational and intuitive data collection when they evaluated alternatives, cognitive indicators collected deliberately and systematically were decisive for the decision in most cases.

4.4.2 Intuitive judgment: a combination of intuitive processes in the different steps of the decision process

The decision processes of Roy, Bart and Mary were all initiated through a spontaneous recognition of cues related to non-cognitive factors. For example, when pupils were not

enthusiastic during assignments, when they were silent and had a disinterested look on their face, or when they handed in an assignment completed in a sloppy way, these teachers believed these cues to be part of larger patterns that triggered expectancies with regard to future (lack of) success in a general educational track. In the months to follow, these teachers collected more data in a predominantly non-systematic and non-deliberate manner, mostly referring to observations during daily practice. To a limited extent, these teachers collected data rationally (i.e., test results) during the decision process. When they made sense of these test results, the teachers used personal criteria to a great extent. Although the teachers in our interviews also mentioned test results in a positive or in a negative sense when they evaluated alternatives, data collected intuitively were decisive for the final decision. In our study, we found that these teachers believed non-cognitive factors (e.g., effort, well-being) to be more important than cognitive factors (i.e., test results) for the transition decision.

One group of teachers (Sophie, Bob, Peter, Julie, Pam and Liz) could not be assigned to either one of these clusters, because their processes differed not only over the pupils being discussed, but also between the steps of the decision process, or because they did not elaborate all steps of the decision process. One similarity across these teachers, with the exception of Pam, was that data collected both rationally and intuitively were decisive in their negative advice regarding a general educational track. For Sophie, Bob, Julie and Liz information deriving from rational and intuitive data collection agreed, and strengthened their decision to discourage a future general educational track.

Peter and Pam had a restricted decision process, using little data collected rationally or intuitively and they did not evaluate alternatives extensively. Based on a specific data source (collected rationally or intuitively) that was found to be of decisive importance, these teachers made a decision without elaborating all steps of the decision process. Peter, for example, recognized a problem with regard to the transition to a general educational track at the start of the year because the boy was not able to understand a simple instruction. However, at the end of the year, Peter makes a decision exclusively based on an average score on the final test. Although Peter felt that this boy lacks the competences needed for a general educational track, he did not consider alternatives once his personal criteria (threshold of 50%) was met. Pam on the other hand recognized a problem with the transition to general secondary education early in the year because the behaviour of a girl was socially maladjusted. Pam believed the girl had an autism disorder. Throughout the year, no data were collected to challenge this assumption and the final negative advice towards a general educational track was based on this indicator without an evaluation of alternative options.

In summary, in this research we were able to describe how both rational and intuitive processes influenced the different steps of the decision process. Also, we found that teachers differed in their approaches to decision making, varying from professional

judgement using both rational and intuitive processes to intuitive judgement based on intuitive processed through the decision process. However, not all teachers elaborated on the different steps of the decision process extensively. Some teachers collected almost no data during the year to elaborate on the problem and spent little effort in evaluation of alternative options with regard to the transition decision. In what follows, we will discuss the implications of our findings for theory and practice.

5. CONCLUSION AND DISCUSSION

5.1 Main findings

In many educational systems teachers still have great autonomy with regard to decisions having high stakes for pupils' educational trajectories, such as placement in educational tracks, retention or promotion (Bonvin, Bless, & Schuepbach, 2008; Brookhart, 2013). Yet, little is known about the way teachers make decisions. A dichotomous view of teacher judgement often supposes that teachers still rely too much on intuition, while their decisions should become more data-based. At the starting point of this study, no established theoretical framework was readily available that provides in-depth insight into the processes of teacher judgement. Starting from a dual-process approach to human decision making, we developed an integrated theoretical framework that takes into account both rational and intuitive processes. This theoretical framework that integrated insights from data-based decision making and the recognition-primed decision model (Klein, 2008) proved to be a valuable lens to study teacher judgement. Our findings show that we need to take into account both rational and intuitive processes in order to gain a full understanding of how teachers make decisions in practice. We found that both rational and intuitive processes contributed to the different steps of teacher judgement and mutually influenced each other. Professional judgement of teachers was defined as the requirement to combine intuitive processes based on expertise with a deliberate and systematic use of data (Barber, 2004, Spencer, Detrich, & Slocum, 2012). In our study, we found examples of professional teacher judgement to a certain extent. We also found teachers who used an intuitive approach to decision making, but we did not find examples of a strict rational decision approach. This contributes to the theoretical knowledge base about teacher judgement, since it offers a valuable framework for studying how teachers make decisions, taking into account both rational and intuitive processes in the different steps of the decision process. The integrated framework needs to be tested and validated in future research.

We also provided deeper insight into an important step in the decision process in which teachers identify alternative options. We found that, although most teachers took into account data collected both rationally and intuitively when they evaluated alternatives,

some teachers ignored the rational evidence base and relied on data collected intuitively. For some teachers, information deriving from spontaneous, recognition-primed observations during daily practice was decisive, sometimes despite (standardized) test results that provided contrasting information. We found that average test results that might allow a pupil into a general educational track in some cases, ended in negative advice regarding general secondary education in other cases. Based on intuitive evaluations of effort or well-being, teachers aimed pupils towards a different track than test results suggested. In our study, decisions that were based only on indicators collected intuitively never led to positive advice regarding the transition to a general educational track. These findings raise critical questions with regard to the accuracy of these decisions. Judgement mainly based on non-achievement factors has been shown in general to underestimate what pupils are able to do (Allal, 2013; Timperley & Parr, 2010) and more specifically to disadvantage certain groups such as low achievers, pupils with special educational needs or pupils from lower social classes (Briscoe, 1991; Brookhart, 2013; Kelly, 1914; Rugg, 1918; Starch & Elliott, 1912; Stiggins, 2005). Given that the educational context lacks sufficient stability and reliability to allow accurate intuitive judgement based on a limited amount of cues, these intuitive decisions may not guide pupils to the right educational track. In contrast to some other professional domains, in education, classroom situations and pupils' performance and behaviour change constantly and are influenced by many (unpredictable) factors. According to Kahneman and Klein (2009) a stable and predictable environment is an important condition for developing and using intuition in a trustworthy way.

Decisions with regard to retention, promotion and recommendation for educational tracks greatly influences pupils' educational trajectories. Our finding that a certain number of decisions are still solely based on intuitive judgement raises critical question with regard to the accuracy of the decisions. Both researchers and policymakers have a shared responsibility to investigate why teachers differ in their approaches to decision making and how the accuracy of high-stakes decisions can be monitored and enhanced for all teachers. Based on our findings, we will formulate implications for policy and practice in section 5.3, but first some limitations of our research will be discussed.

5.2 Limitations and suggestions for further research

Although our findings are important for gaining a deeper understanding of the processes that underlie teacher judgment, we do have to acknowledge some limitations of this study. First, the choice of a qualitative study in one specific, low-accountability context (no central exams, no obligation to use standardized tests) implies that we need to be careful with generalisations of our findings. Further research is needed, such as in high-accountability contexts where the final transition decision is informed by standardized tests to a greater extent. It is important to understand how the rational and intuitive processes in teacher judgement differ in these contexts.

Further, we need to acknowledge that we can only critically discuss the processes of teacher judgment, but we cannot evaluate the quality of the decision being made. An important question that needs to be answered is, how do these decisions work out for the students in question? Longitudinal research in which pupils are followed in the different educational tracks to which they were assigned would be needed to answer this question.

Thirdly, our research did not involve novice teachers, because we aimed at studying intuitive processes starting from the recognition-primed decision model based on expertise (Klein, 2008). This means, however, that we have no insight into how novice teachers evaluate alternatives and make the transition decision. For further research, it would be interesting to study whether and how novices and expert teachers differ in the rational and intuitive processes they use in their judgements. According to decision theory, intuitive processes can only be used as reliable and skilled expertise in judgement when a professional has had enough practice in a similar environment and with similar cases (Kahneman & Klein, 2009). From an educational perspective, this would imply that novices need to rely on predominantly rational processes when they evaluate alternatives and make a decision. For future research, this is something that clearly needs to be investigated.

5.3 Implications for policy and practice

In our study, we started from the idea that data collected both rationally and intuitively need to be taken into account when teachers evaluate alternatives and make a transition decision, since both processes have merits and shortcomings. However, at the outset of our research there was no framework available that took into account both rational and intuitive processes in teacher judgement. This finding highlights the lack of deliberate attention from policy and practice for intuitive processes in educational decision making. During the last decade, from both an accountability and a school development perspective, policymakers have focused a lot of effort on enhancing data-based decision making in education. Intuitive processes are often either ignored in these policies or are described as unintended forms of teacher judgement that need to be replaced by data-driven approaches. However, our study shows that teacher judgement can only be fully understood through the interplay of rational and intuitive process in the different steps of the decision process. Based on this insight, policy initiatives that aim to enhance the fairness and equity of teachers' decisions should start from an integrated view of teacher judgement. In this study, we described and explained how experienced teachers can wisely use a wide array of data, collected both rationally and intuitively, to gain a broad and contextualized view of pupils' competences.

However, not all teachers combine multiple sources of data or search for alternative explanations before they make a decision. This may be due to a lack of training and support that takes into account both rational and intuitive processes. Teachers need to be supported in developing the right knowledge, skills and dispositions to combine information deriving from rational and intuitive data collection. It requests specific competences to combine and weigh information deriving from rational and intuitive processes. A broader and more encompassing view of teachers' competences for decision making is needed in order to understand how rational and intuitive evidence bases can be combined in a wise manner that enhances the accuracy of educational decisions.

Over the past decade, many efforts have been made to enhancing data use and teachers' data literacy in education. Little effort has been made regarding understanding and supporting the contributions of intuitive processes to educational decisions. In order to prevent the overconfidence trap often associated with intuitive judgement, teachers need to gain insight into theories of judgmental errors and conditions that can help prevent bias. Therefore, decision theories should be included in teacher education and teacher training programs.

Further, supporting a systematic collaborative cycle of inquiry might overcome an individual lack of judgment literacy, since it forces teachers to share, reflect and discuss their beliefs, the inferences they make and the criteria they use when they evaluate alternatives. It is crucial that teachers explicitly discuss their personal beliefs with colleagues and come to a shared understanding of what is important with regard to the transition decision. Collaboration and feedback are not just important to enhance the rational processes of teacher judgment. As Kahneman and Klein (2009) pointed out, enhancing the likely quality of intuitive processes also requires the opportunity to learn through cooperation and feedback.

Altogether, as far as theory, this requires more research studying teacher judgement from a dual-process approach. For practice, an important responsibility lies in enhancing teachers' judgment literacy through teacher education and collaborative in-service training and support. Decision theories and practices deserve more deliberate attention, since teachers' decisions continue to greatly influence pupils' educational trajectories.

8

Chapter

Conclusion and discussion



This dissertation contributes to our understanding of the processes of teacher judgement and how they lead to rational, intuitive or professional (combined) decisions. Because a theoretical framework that takes into account both rational and intuitive processes was initially lacking, we will first discuss our integrated framework on teacher judgement that was developed through an extensive literature review and a first exploratory research phase. The framework combines insights on data-based (e.g., Datnow & Hubbard, 2016; Mandinach et al., 2008; Schildkamp & Lai, 2012) and recognition-primed (Klein, 2008) decision making. Our research showed that this integrated framework is a valuable lens for studying the processes of teacher judgement. The understanding that is created from the results of our studies is in itself a theoretical framework that should be subject to further validation (Scheerens, 2013). In what follows, our main findings are discussed, referring to our second, third and fourth research goals. At the end of this chapter, we will critically discuss both strengths and limitations of our research, and we include suggestions for future research as well as implications for practice.

1. THE NEED FOR AN INTEGRATED FRAMEWORK THAT TAKES INTO ACCOUNT BOTH RATIONAL AND INTUITIVE PROCESSES IN TEACHER JUDGEMENT

In education, there has been a shift in research that studies teacher judgement from a personal knowledge perspective based on expertise within the teaching profession towards an emphasis on rational models of data-based decision making. In the broader field of decision theory, many scholars agree that human judgement is guided by both rational and intuitive processes that influence the different steps of a decision process (Blackwell et al., 2006; Evans, 2008; Kahneman & Frederick, 2005). In this dissertation, we aimed to study teacher judgement from this dual-process perspective, starting from the idea that professional teacher judgement requires a wise combination of professional knowledge acquired through expertise complemented with and challenged by deliberate processes of data collection and analyses.

Our research shows that this integrated view of teacher judgement is needed to fully understand how teachers make decisions. The different steps of teachers' decision making are influenced by a mutual interplay of rational and intuitive processes. This implies that researchers who aim to study teacher judgement need to take into account this integrated view of decision making. Models of data-based decision making that are commonly used in educational research can be broadened and refined by acknowledging and integrating intuitive processes. Our study showed that teachers' decision process cannot be understood by studying only its outcomes or the extent to which teachers collect data. Data collected rationally may be interpreted by personal

criteria or teachers may ignore all data collected deliberately and systematically when they evaluate alternatives and make an intuitive decision instead. If we want to understand teacher judgement, we need to critically investigate how teachers recognize and/or diagnose a problem, how deliberately and systematically they collect data, what criteria they use to make sense of data, what evidence base is taken into account when they evaluate alternatives and what data are decisive in the final decision. When we want to understand and enhance the quality of teacher judgement, each of these steps needs to be investigated critically and the entire process needs to be taken into account. Figure 1 reprises our integrated framework on teacher judgement that was presented in the theoretical framework in Chapter 2. In our study we provided a refined view on the rational and intuitive processes of teacher judgment by defining them in relation to the different steps of the decision process:

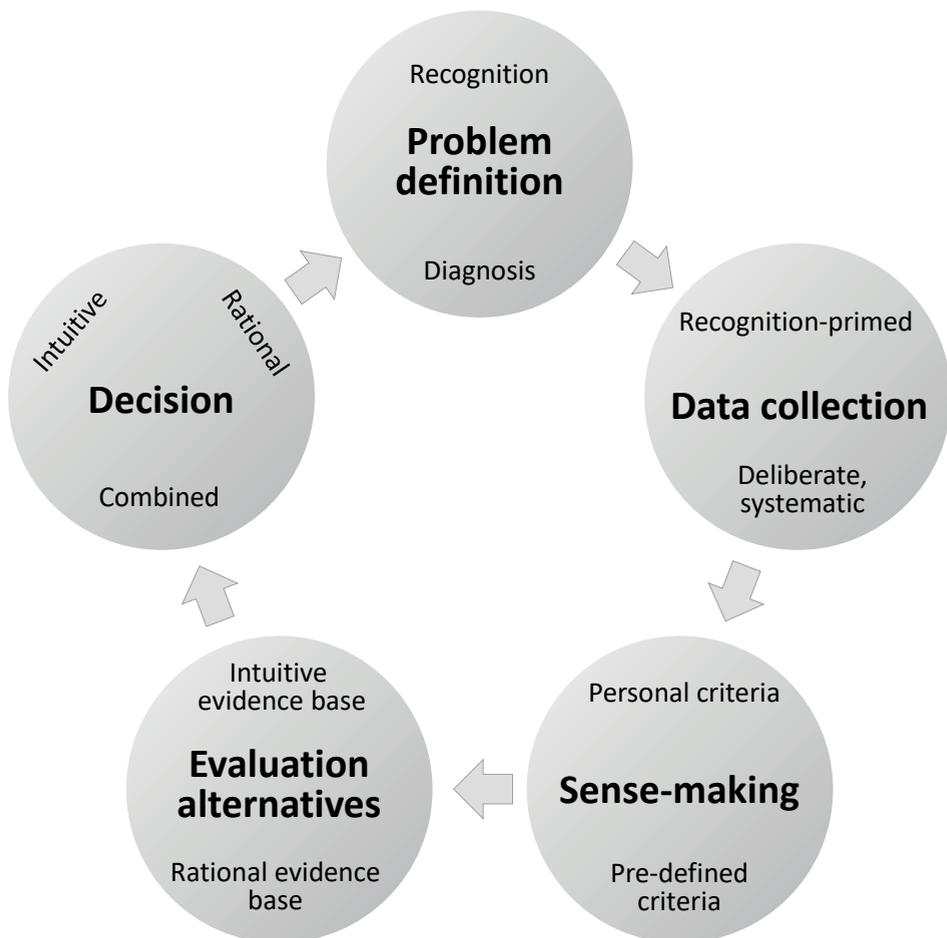


Figure 1: An integrated framework of teacher judgement

In the first step of the decision process, rational processes refer to problem diagnosis when teachers use at least one process or output indicator to define the problem or to challenge intuitive problem recognition. In the subsequent steps, rational processes refer to data being collected deliberately and systematically, interpreted by pre-defined criteria and an evaluation of alternatives that starts from a rational evidence base.

Intuitive processes on the other hand refer to problem recognition without further diagnosis, to a non-deliberate, non-systematic data collection guided by spontaneous recognition, an interpretation based on personal criteria and an evaluation of alternatives that starts from an intuitive evidence base. The final decision may be based on rational or intuitive processes or on a combination of both.

In this research, we tested our integrated framework by investigating how teachers made a transition decision and disentangling all of the rational and intuitive processes in the different steps of the decision process that preceded the transition decision. When the stakes are high for the pupils involved, as is the case when a transition to a general educational track is questioned, teachers are expected to initiate an especially thorough and thoughtful decision process (Lavigne, 2014).

The first step of the decision process, in which a teacher evaluates the actual characteristics of a pupil in relation to what the teacher perceives to be needed for the transition, may be based on (a combination of) intuitive problem recognition and rational problem diagnosis. Teachers can identify a problem automatically when they recognize a cue based on their experience as a teacher. This recognition-primed problem definition is considered to be a valuable aspect of expertise, since it allows teachers to identify problems in an early stage of the year, sometimes even before test results come in. However decision theory stresses the need for further rational problem diagnosis (Cowan, 1986; Mintzberg et al., 1976). When high stakes are involved, as is the case for pupils with regard to the transition decision, teachers are expected to gain an especially clear and accurate understanding of the problem situation in order to know how to continue in the decision process (Blackwell et al., 2006; Mintzberg et al., 1976). A rational problem diagnosis means that teachers collect at least one source of data deliberately and systematically to challenge or complement their intuitive problem recognition.

Subsequently, throughout the school year, teachers are likely to collect data that elaborate on or solve the problem. This second step of data collection has shown to have an important impact on the decision, since the quality of the data and the way they are collected greatly influences the quality of the decision (Schildkamp, Poortman, & Handelzalts, 2016). Theories of data-based decision making prescribe fixed and systematic procedures of data collection following an iterative circle of inquiry (Mandinach et al., 2008; Wohlstetter et al., 2008). The recognition-primed decision model, on the other hand, describes how experts are able to focus their attention on

indicators spontaneously, guided by automatic recognition (Kelchtermans, 2009; Klein, 2008). Although intuition is not the opposite of rationality, and in practice both processes are expected to be intertwined, for reasons of conceptual clarity we defined boundary conditions to separate rational from intuitive data collection. Rational data collection refers to a deliberate and systematic search for indicators, while intuitive processes of data collection imply that certain indicators draw teachers' attention automatically during their daily practice, without a pre-set goal or question or without a plan for data collection. Thus, intuitive data collection refers to data that are not collected deliberately or systematically.

Rational models of decision-making also expect teachers to collect a wide array of different data to come to an accurate decision (Strayhorn et al., 2009). However, applying the recognition-primed decision model, teachers may use patterns and mental models stored in teachers' memory to rely on only a limited number of indicators (Klein, 2008). Based on experiences with (perceived) similar cases in the past, mental models are expected to trigger scenarios about future events. If these scenarios lead to an outcome that is acceptable for the teacher, they might not look at other data (Klein, 1997, 2008).

Even if teachers collect a wealth of data rationally, this does not necessarily lead to a rational transition decision. For one thing, teachers need to make sense of data, since data as such provide no valuable input for the decision in the form in which they are originally presented (Cousins & Leithwood, 1993). Transforming data into information occurs within a sense-making process in which teachers try to understand what the data mean in relation to the problem they have defined (Datnow et al., 2012; Spillane, 2012). Rational models prescribe optimal procedures for data analysis and interpretation based on pre-set criteria. In order to prevent bias, teachers are expected to use different data sources (triangulate data) and to search for alternative explanations when they make sense of data. (Bosker et al., 2007; Leonard et al., 1999). Decision theory suggests that in practice teachers may use personal criteria to make sense of data or they may take mental shortcuts (heuristics) to come to quicker and easier conclusions (Evans, 2006; Kahneman, 2003; Klein, 2008).

In the final step, when teachers need to make the transition decision at the end of the year, they are confronted with alternative options identified during the decision process, and they need to weigh information deriving from different data they collected rationally or intuitively. Teachers will not necessarily consider all data they collected throughout the year when they evaluate alternatives, as they might not value or remember all data. When we want to investigate the rationality or intuitiveness of teachers' decisions, we need to investigate what data sources are considered in the evaluation of alternatives and what data are decisive in the final transition decision (Blackwell et al., 2006; March, 1994). Teachers may, for example, collect a wealth of

data rationally, but if the final decision is based exclusively on data collected intuitively, teacher judgement is still intuitive in the end (Blackwell et al., 2006; Kahneman & Klein, 2009; March, 1994).

In our research, this integrated framework that describes both rational and intuitive processes in the different steps of decision making proved to be a valuable lens for studying teacher judgement. We used this framework to critically investigate the different steps of teachers' decision process when they made a transition decision that allowed or denied pupils in a general educational track in secondary education. Main findings will be discussed in the next sections.

2. MAIN FINDINGS

In this section, we discuss our main findings. First, the main results with regard to research goals 2 and 3 describe the rational and intuitive processes in teacher judgement and conditions needed to prevent bias in each step of the decision process. In the subsequent section, we examine which conditions at the teacher and school levels influence both rational and intuitive processes in teacher judgement (research goal 4).

2.1 How do rational and intuitive processes influence teacher judgement and what preconditions must be met to prevent bias?

The research mostly defines teachers' decisions as either rational or intuitive. Our first research question aimed at describing to what extent teachers rely on rational and/or intuitive processes if both are taken into account and what it means to say that decisions are rational or intuitive. Our second research question wanted to disentangle the interplay between both processes in teacher judgement. Since intuitive judgement in an educational context does not fully meet the requirements for development of skilled expertise that leads to accurate decisions (predictability of environment and direct feedback), a third research question aimed at testing to what extent the necessary preconditions are met to prevent judgemental bias.

Teachers' decision process is initiated by rational diagnosis in only half of the cases

In our research, we found that teachers' decision process was almost always initiated by intuitive problem recognition. Teachers spontaneously recognized cues that triggered expectancies with regard to the transition decision they needed to make at the end. Only half of the teachers further went on to rational problem diagnosis. However, since the decision under study may greatly affect a pupil's educational trajectory and given the complexity and unpredictability of the educational context, a precondition for

prevention of bias was that teachers searched for at least one indicator in a deliberate and systematic way in order to come to a clear and transparent problem diagnosis. In our research, half of the teachers relied exclusively on intuitive problem recognition. This finding raises critical questions regarding the accuracy of teachers' problem definition. Research has shown that teachers' hypotheses about possible problem causes are often biased, leading to a false problem definition (Kahneman & Frederick, 2005; Schildkamp et al., 2016). Overconfidence in one's own intuitive problem definition may trigger the wrong data collection and will likely influence how teachers make sense of data and evaluate alternatives.

Looking at the interplay between rational and intuitive processes, we found that teachers' rational problem diagnosis seldom aimed to challenge intuitive problem recognition. Instead data were mostly used to support the cues that had evoked intuitive problem recognition. In our research, we also found that intuitive problem recognition mostly triggered a non-deliberate and non-systematic (intuitive) data collection, whereas rational problem diagnosis initiated a broad data collection driven by both rational and intuitive processes.

In sum, our findings highlight the importance of teachers' intuitive problem recognition being followed by rational problem diagnosis, challenging teachers' initial assumption and leading to broader data collection. These results are in line with data use research, suggesting that initial hypotheses need to be formulated and tested against data before the rest of the decision process is initiated (Schildkamp et al., 2016). Our findings contribute to the existing knowledge base by showing how teachers' problem definition also influences the following step of data collection. Intuitive problem recognition mostly triggers a limited collection of data, with little data collected rationally.

Teachers mostly collect non-cognitive process indicators intuitively and cognitive output indicators rationally

In our research, teachers predominantly collected cognitive output indicators rationally (results of non-standardised tests). Teachers seldom collect non-cognitive or process data rationally to inform their judgement regarding the transition decision. Although we considered test results as data collected deliberately, in our research few teachers described it as a deliberate practice in which they purposefully considered the goal of their testing. Administering tests was largely described as part of the routine.

Intuitive data collection predominantly referred to observations made during daily practice when teachers' attention was drawn by certain cues. Together with test results, intuitive observations of non-cognitive process indicators, such as motivation, interest or effort, were mentioned as the most important data sources to inform teacher judgement. In our research, it was not a common practice to define the goal of observations beforehand, to use an observation protocol or a logbook. Based on our

conceptualisation, these non-deliberate and non-systematic observations are considered to be an intuitive way of collecting data. This finding contributes to a refined understanding of data. In broad data use definitions, observations are often counted as qualitative data. In our research, we found that teachers' observations are mostly guided by intuitive processes, as described in the recognition-primed decision model. Thus, in practice, teachers' observations are mostly collected intuitively, not rationally.

We found few examples of process data collected rationally. Nevertheless, a rational collection of process data has shown to be an important means of monitoring pupils' learning (Van der Kleij, Vermeulen, Schildkamp, & Eggen, 2015). In our research, this was only the case to a limited extent. Teachers mainly used test results as an output indicator and the process data collected intuitively mainly referred to non-cognitive indicators.

When we looked at the interplay between rational and intuitive processes of data collection, we found that teachers' data collection is not always completely rational or intuitive. For one thing, we found that teachers relied on intuitive cues to adapt their instruction or the content of a test. For example, a stressed look on a child's face triggered an immediate action to lower the pressure and delete a question while administering a test. In this manner, the collection of these test results cannot be considered to be completely rational, since intuitive processes were hooked into the rational processes of data collection. Instead of pure rational processes, we found a sort of 'intuitive rationality'.

Contrasting examples also showed how intuitive processes of data collection were informed by data collected rationally. For example, when a pupil scored below average on a test, during the lesson the teacher's attention was automatically drawn to cues that might explain the low test results. Since the teacher did not plan to observe specific competences of this pupil beforehand, or did not consider a plan for data collection, we defined this as intuitive data collection. In practice, this distinction is probably not so dichotomous; rather, we might consider this form of data collection as a type of 'informed intuition', a term also mentioned by Creighton (2007). As suggested by Hammond's (1996) cognitive continuum theory, rationality and intuitive processes appeared to be the opposing ends of a continuum. In our research, we were able to describe a mutual influence of data collected rationally and intuitively, leading to a continuum of rational processes, intuitive rationality, informed intuition and intuitive processes. On the one end of the continuum, data are collected with a clear goal and through a thought-out method that is defined beforehand, as is the case for results of standardized tests, for example. Intuitive data collection, on the other end of the continuum, refers to spontaneous, recognition-primed collection of indicators without a pre-defined goal or a thought-out method. However, we found that although a clear goal and method for data collection were defined beforehand, during the process of

data collection the goal or method was sometimes adjusted intuitively. This intuitive rationality refers, for example, to grades that result from a test that was adjusted intuitively for a specific pupil while the test was going on, because the teacher recognized cues spontaneously. Further, we found examples of informed intuition. In this case, teachers collected data in a non-deliberate and non-systematic way, but (unconsciously) their attention was drawn by cues that provided more insight into information deriving from data collected rationally. For example, when a report from a psychologist mentioned a certain disorder, teachers' attention might be drawn to certain indicators that confirm or dispute this diagnosis, although teachers did not plan to look for these indicators deliberately or systematically. An overview of this continuum of teachers' modes of data collection is provided in figure 2.

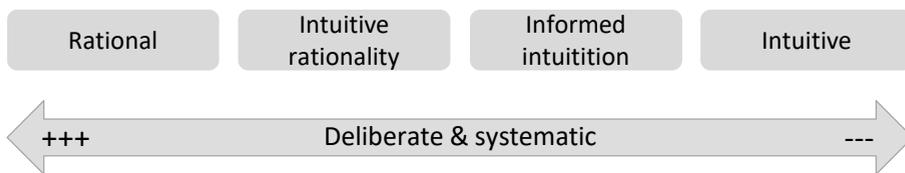


Figure 2: Continuum of teachers' modes of data collection

Teachers triangulate data to a limited extent

An important precondition for preventing judgemental errors involves the need to use different sources of data (triangulation) to prevent bias deriving from data collected rationally or intuitively. In our research, teachers mostly triangulated multiple data sources collected intuitively. However, this is not the sort of data triangulation that we considered to serve to prevent biased judgement. Because the intuitive systems works associatively and mainly detects cues that confirm existing patterns and assumptions, confirmation bias can lead to unreliable decisions (Kahneman & Frederick, 2005; Klayman, 1995). In our research, we found few examples of data triangulation in which at least two different data sources collected rationally were used to judge pupils' characteristics, potentially complemented by one or more data sources collected intuitively. More often, one data source collected rationally was used to confirm data collected intuitively, rather than to challenge it. When teachers mainly trust to information that is derived from automatic, recognition-primed data collection, this may lead to confirmation bias, as they mainly see what they expect to see and may (unconsciously) avoid data that question their assumptions. A limited, recognition-primed data collection may lead to accurate decisions in an environment of sufficient stability and predictability (Kahneman & Klein, 2009). However, since teachers' decisions are made in a complex, constantly changing environment, the lack of data collected rationally to triangulate data collected intuitively may lead to judgemental bias.

In the sense-making process, only a minority of teachers' inferences are based on data that are both collected rationally and interpreted by pre-defined criteria

In our research, we saw that teachers differed in the criteria they used to make sense of data collected rationally. The group of teachers who collected most of their data rationally also predominantly used pre-defined criteria to make sense of data. The group of teachers with a distinctly intuitive approach to data collection mainly used personal criteria to interpret the little data they did collect deliberately and systematically. Altogether, only a minority of the inferences were based on data collected deliberately and systematically that were also interpreted by pre-defined criteria. These findings contribute to the existing knowledge base, showing that, even if data are collected rationally, teachers may use personal criteria to make sense of data. The teachers in our research used intuitive evaluations (e.g., effort) to make sense of test results. Our findings coincide with previous research. Oláh, Lawrence, and Riggan (2010), for example, also found that the criteria teachers used for the interpretation of test results differed considerably, and varied by student, by class, and even by time. When making decisions with high stakes for the pupils involved, it is especially important that the sense-making process is guided by pre-defined criteria, some kind of standardization that involves a basic matter of fairness (Shepard, 2001).

In our research, we were not able to investigate how teachers made sense of data collected intuitively. As suggested by the recognition-primed decision model (Klein, 2008), we found that sense making for data collected intuitively an automatic process, done without deliberate attention. It does not involve deliberate analysis and interpretation of data, and therefore, the inferences are less transparent. Because the interpretative criteria derive from teachers' expert knowledge, they are personal by definition.

Teachers seldom test their assumptions by searching for alternative explanations

To prevent bias deriving from the process of sense making, we investigated to what extent teachers searched for alternative explanations to question the inferences they made based on data. Only a minority of the teachers deliberately searched for contrasting evidence that might question the inferences they made based on the data present. Most teachers have confidence in the way they make sense of data, or they are not consciously aware of the possible bias that can derive from the way they process information.

Not all data are taken into account in the final decision

Most teachers mentioned data collected both rationally and intuitively when they evaluated alternatives with regard to the transition decision. Teachers used test results in both a positive and a negative sense to evaluate whether a pupil is suited for a general track in secondary education, but the results of standardized tests were only

used to a limited extent. All teachers took into account information resulting from spontaneous observations of non-cognitive indicators such as effort when they evaluated alternative options.

Independent of the data mentioned in the evaluation of alternatives, for some teachers, test results were decisive in the final decision, whereas other teachers exclusively relied on data collected intuitively. In our research, teachers' decisions were not necessarily supported by the rational evidence base that was collected. For one group of teachers, the decision was exclusively based on non-achievement indicators deriving from intuitive processes, despite data collected rationally during the year. Since previous research has shown that teachers often underestimate pupils' competences when they ignore data collected rationally (Kaiser et al., 2013; Timperley & Parr, 2010), these findings raise critical questions about the extent to which teachers guide pupils to the educational tracks that enable them to develop to their full potential.

How can we relate the rational and intuitive processes in the different steps of the decision process to understand teachers' approaches to decision making?

In our research, we critically investigated to what extent the different steps in teacher judgment were based on rational or intuitive processes and how the different steps were related. We searched for clusters of approaches to decision making and explored if (a) teachers greatly relied on rational processes (rational judgement), (b) on intuitive processes (intuitive judgement), (c) on a combination of both rational and intuitive processes (professional judgement) or (d) went through a restricted decision process that involved little data (collected rationally or intuitively) and a limited evaluation of alternatives (arbitrary judgement). In this quadrant, teacher judgement involves little rational and intuitive processes.

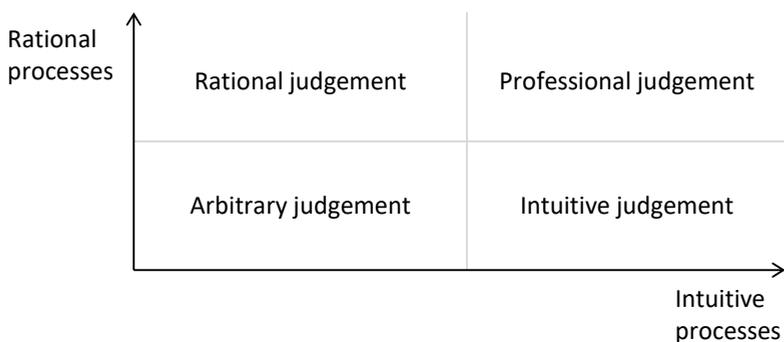


Figure 3: Different approaches to teacher judgement

In our research, we found examples of professional judgment. This group of teachers relied on both rational and intuitive processes in the different steps of decision making,

and followed a deliberate and broad decision process that met most of the preconditions needed to prevent bias. Teachers spontaneously recognized a problem, followed by rational problem diagnosis. Throughout the year, these teachers collected a wide array of data, both rationally and intuitively. Data collected rationally were largely interpreted by pre-defined criteria. This group of teachers all triangulated data and searched for alternative explanations when they made sense of data. At the end of the school year, when teachers evaluated whether a pupil would be advised to follow a track within general secondary education or not, data collected both rationally and intuitively were taken into account in the evaluation of alternatives, although the final decision was mostly based on test results.

We also found examples of intuitive judgement. These teachers mainly relied on intuitive processes during the year, based on a smaller and more narrow evidence base that largely consisted of data collected intuitively and met few of the preconditions needed to prevent bias. Teachers' decision process was triggered by spontaneous recognition of cues related to non-cognitive indicators, without further rational diagnosis. In the following months, teachers predominantly collected data spontaneously during their daily practice, complemented by test results to a limited extent. When making sense of the limited amount of data collected rationally, these teachers mostly used personal criteria. Almost none of these teachers triangulated data or searched for alternative explanations when they made sense of data. Although most teachers in this group took test results into account when they evaluated alternatives, information deriving from intuitive observations was decisive for their final decision.

In our research, there were also a few examples of what we called arbitrary judgement, since it involved a small evidence base with little data collected rationally or intuitively. Our finding showed that these teachers did not evaluate alternatives extensively, weighing information deriving from data collected rationally and intuitively. Rather, these teachers used one data source (collected rationally or intuitively) they felt to be of decisive importance. For example, a teacher mentioned that he did not formulate specific advice towards a future educational track (so there were no restrictions nor an orienting recommendation) because the pupil scored 50% on a final test. Although the teacher recognized a problem with regard to the pupil's interest in a general curriculum at the start, little data were collected and an evaluation of different alternative options was not really considered. We also found examples of arbitrary judgement based on one cue collected intuitively, such as indicators related to lack of motivation.

Our findings show no example of rational judgement that predominantly relied on rational processes in the different steps of the decision process.

Overall, the integrated framework that we developed has proven to be a valuable lens for studying teacher judgement. Our main findings show how the rational and intuitive processes mutually influence the different steps of the decision process.

2.2 Understanding how teacher and school factors influence teacher judgement.

We found that teachers differed in how rationally or intuitively they approached judgement. In this section we will try to explain how factors at the teacher level and the school level influence teacher judgement.

Autonomous motivation to use data, rational decision-making style and a teaching approach that focuses on the curriculum enhance teachers' use of data collected rationally.

Our research showed that teachers' autonomous motivation to use data had a significant positive effect on teachers' data use. However, teachers only felt autonomously motivated to use data to a certain extent. Teachers with a rational decision-making style found themselves to be more autonomously motivated to use data collected rationally, whereas teachers with an intuitive decision-making style felt more controlled motivation to use these data.

Our study also shows that teachers differ in the way they use data to inform their judgement depending on their approach to teaching. Teachers who were less concerned with transmitting the curriculum and mainly believed that good teaching focuses on socio-emotional elements (a nurturing teaching approach) made little to no use of data collected rationally in their judgement of pupils' competences. Teachers with a high focus on the curriculum (transmission and developmental approaches) used data that were collected both rationally and intuitively. This implies that intuitive data collection does not necessarily exclude or replace rational data collection. We concluded that teachers with a high focus on achieving the goals of the curriculum use a wide array of data, collected both intuitively and rationally. It is sometimes suggested that teachers prefer to use their intuition rather than data (Spillane, 2012). In our research, this only applied to teachers with a low focus on transmitting the curriculum as they predominantly focused on the socio-emotional aspects of teaching. Their evidence base was both small (few different data sources) and narrow (mainly data collected intuitively).

Reflective capacity and supportive relationships in the school team will enhance teachers' use of data collected rationally

Further, our research also pointed out the important role of school factors in teachers' data use. The reflective capacity of the school team with regard to data use has the greatest impact on teachers' autonomous motivation to use data. Autonomous motivation increases when the members of the school team are convinced of the importance of reflection that is based on data collected rationally and are willing to look critically at their own performance on the basis of data. Support from colleagues, collaboration and trust in each other (supportive relationships) also had a positive impact on the autonomous motivation of teachers to use data use. Teachers'

autonomous motivation increases if they can analyse and interpret data with other teachers and if they can call on the help and expertise of colleagues when they encounter difficulties. However, in line with other studies (e.g. Van Gasse, Vanlommel, Vanhoof, & Van Petegem, 2017) we found collaborative reflection and support with regard to data use to be fairly limited.

Summary considerations about the role of rational and intuitive processes in teacher judgment

In this dissertation, we developed and tested an integrated framework, starting from the idea that professional teacher judgement requires both intuitive processes acquired through expertise as well as rational processes of data collection and analysis. Based on our findings, we postulate that questions related to the accuracy of teacher judgement should not merely focus on discussions of rationality and intuition. Often, a lot of time and energy is used on research and initiatives that aim to enhance the amount of data use in schools. In our studies we found that data are not always collected deliberately or systematically, that they are not always interpreted rationally and that information deriving from data collected rationally is not always decisive when the final decision is made. Teacher judgement is less a matter of which data teachers use, because they all collect test results; it is more a matter of how teachers use data and how the data are combined with intuitive processes of judgement.

Teacher judgment is not a technical-rational process in a stable environment in which all data are available and all consequences of alternatives are known. Intuitive processes enable teachers to focus attention on relevant data, to connect different pieces of data into meaningful information and it helps them weigh evidence when they evaluate alternatives. However, since teacher judgement does not take place in a stable environment that provides sufficient and immediate feedback, preconditions need to be met to separate accurate intuitive judgement from overconfident and biased judgement (Kahneman & Klein, 2009). In our research, teacher judgement meets these preconditions only to a limited extent. Our findings suggest that this might be related to the different beliefs teachers have about what matters most for teaching and learning. Because we found little evidence of shared standards for decisions related to promotion or retention, teachers' personal beliefs about what matters most in teaching and learning greatly influence the outcomes of the decision process.

In order to assure and enhance the quality of teacher judgement, we will formulate recommendations for research and policy in the subsequent section but, first, limitations of our study will be discussed.

3. LIMITATIONS AND IMPLICATIONS FOR FURTHER RESEARCH

Although we feel that this dissertation has made an important contribution in disentangling the processes of teacher judgement, we need to acknowledge some limitations of our research. First, the choice of a predominantly qualitative research design limits the generalizability of our results. Our conclusions are largely based on the statements and narratives teachers provided during the interviews. In our research we were especially interested in this contextualized and personal view of teacher thinking, as it enabled us to develop theory with regard to the processes underlying teacher judgement. In this regard, our conclusions are based on teachers' self-perceptions; we did not triangulate data, for example, by studying pupils' report cards. For reasons of generalizability, future research is needed to test our findings through other methods (e.g., observations of teachers facing decision tasks), on a larger scale and for other decisions. Our choice to focus on one specific sort of decision related to promotion and retention has its limitations. The decisions under study offer only a limited number of alternative options; the findings might differ when teachers are making more open-ended types of decisions, such as how to adapt one's instruction. Based on the critical incidents method, we selected negative cases in which teachers defined a problem with regard to the transition. According to Klein (2008), if you get people to talk about tough cases, you get a pathway into their perspective. Future research should include more heterogeneous decisions in order to understand a broader spectrum of teacher judgement. In this research, we used high-stake decision making since teachers are expected to elaborate the entire decision process because of the high stakes that are involved with the final decision. Although these decisions involve high stakes for the pupils, these are not high-stakes decisions for the teacher or for the school. Other strategies might be used when teachers make decisions that involve high stakes for themselves. Because a solid research base was lacking, it was our aim to explore and explain the processes of teacher judgement. For reasons of generalizability, future research needs to focus on different kinds of decisions and test our theoretical framework on a larger scale.

In our study we found that that factors at the teacher level, such as motivation, decision-making style and approach to teaching influenced how teachers used data in the decision process. For future research it is interesting to gain a more deeper and broader insight in how teacher characteristics influence teacher judgment. Data use research has made important contributions in understanding in how for example teachers' data literacy, self-efficacy or attitude influences teachers' data use (e.g. Mandinach & Jimerson, 2016; Schildkamp & Lai, 2013). These are relations that clearly need to be investigated further in relation to our integrated view on teacher judgement.

Our research did not involve novice teachers because we wanted to examine both rational and intuitive processes. According to decision theory, accurate intuitive judgment requires expertise in the field (Klein, 2008). For further research, it would be interesting to study whether and how novices and expert teachers differ in the rational and intuitive processes they use in judgement. According to decision theory, intuitive processes can only be used as reliable and skilled expertise in judgement when a professional has had enough practice in a similar environment and with similar cases (Kahneman & Klein, 2009). From an educational perspective, this would imply that novices predominantly need to rely on rational processes to prevent judgemental bias, because they lack the knowledge patterns to recognize intuitive cues. For future research, this is something that clearly needs to be investigated.

In a complex context, such as education, it is not a straightforward undertaking to judge the quality of teacher judgement based on his or her outcomes. In this regard, we can only describe the processes that underlie teacher judgement and what conditions should be met to prevent bias. We cannot assess the quality of rational and intuitive processes in relation to the accuracy of the decision made. In our research, we advocated that both rational and intuitive processes are important for teacher judgement, but we were not able to define how it can lead to better judgement. Future research can build on our theoretical framework and try to explain how rational and intuitive processes can enhance the quality of teacher judgement. We made an important first step in this regard by defining conditions that need to be met to prevent decision bias. However, regarding the different sorts of bias, such as confirmation bias, we can only relate our findings to the possible pitfalls that have been outlined in various lines of research. For future research, it would be interesting to follow pupils' educational trajectories after the transition decision and investigate how the decision turns out.

4. IMPLICATIONS FOR POLICY AND PRACTICE

Teacher judgement is an important issue given the great impact of teachers' decisions on important matters such as placement and promotion of pupils in educational trajectories. This dissertation showed how both rational and intuitive processes can contribute to the different steps of the decision process. However, we also identified some critical questions that need attention. In this section we will translate our research findings into suggestions for policy and practice related to monitoring and enhancing the professionalism of teacher judgement.

4.1 Educate teachers on decision theory

In our research, we found that teacher judgement to a great extent does not meet the preconditions identified as necessary to prevent judgmental bias. Teachers will need strategies that help them rule out bias, but first teachers need to understand the essentials of decision theory. It seems that teachers seldom engage in a decision process in a deliberate and systematic manner. Skills, knowledge and dispositions are required in judgemental processes that imply a combination of rational and intuitive processes. Teachers will need the right competences to diagnose a problem, and collect and combine information deriving from rational and intuitive processes in a transparent manner, to understand what data mean in a specific context, to be willing and able to explicate their inferences and to challenge their assumptions using alternative data. These competences require specific curricular goals for pre-service and in-service training initiatives. Therefore, a first recommendation for policy and practice is to educate teachers about decision theory and to help them understand how both rational and intuitive processes influence the different steps of the decision process. Since habitual patterns and beliefs are difficult to change and since the development of teachers' knowledge base is formed at an early stage, we would especially recommend including decision theory in teacher education. In teacher education, decision theory should become part of the curriculum, teaching future educators the right competences needed for professional judgment.

4.2 Demystify intuition and educate teachers on the merits and pitfalls of intuition

Intuitive processes greatly influence teacher judgement. Our findings support previous research showing the important role of teachers' intuition in decision making. Therefore, instead of focusing all efforts on enhancing data-based decision making, we recommend training teachers in the skilful use of their expertise and explaining how it can contribute to good judgment. Insights into the processes of intuitive judgement can help raise teachers' awareness of both the merits and pitfalls of intuitive judgement. Because the educational setting does not provide an environment of sufficient regularity and predictability, teachers must consciously and deliberately evaluate their intuitive processes, to see if these meet the purposes of the evaluation task and make sense in the context.

Therefore, our second recommendation is to provide teachers with theoretical frameworks and training possibilities that help them understand how and under what conditions intuitive processes can contribute to decision making.

4.3 Provide organisational and cultural conditions for feedback and collective inquiry

Theory showed that teachers will need sufficient and direct feedback on intuitive processes of judgement to develop skilled expertise instead of overconfident intuition (Kahneman & Klein, 2009). Our research also showed that support from colleagues, collaboration and trust in each other (supportive relationships) can enhance teachers' autonomous motivation to use data deliberately and systematically. Teachers' autonomous motivation increases if they can analyse and interpret data with other teachers and if they can call on the help and expertise of colleagues when they encounter difficulties (Van Gasse et al., 2016). By collaborating around data use and sharing data, the process of teacher judgment can also become more public, transparent, traceable and reproducible. The latter is crucial, as teachers' often long-held implicit assumptions about student ability levels and capacity for learning need to be made explicit in order to create more equitable outcomes (Park et al., 2012). Thus, collaboration and feedback are not just important for enhancing the rational processes in teacher judgment. As Kahneman and Klein (2009) pointed out, enhancing the likely quality of intuition also requires the opportunity to learn through cooperation and feedback. Therefore, a third recommendation is to provide organisational and cultural conditions for feedback and collective inquiry to strengthen and support both rational and intuitive processes of teacher judgement.

4.4 Train school leaders in developing the competences to support reflective inquiry and feedback around professional teacher judgement.

School leaders have an important role in developing and supporting the organizational conditions for collaboration and feedback around teacher judgement (e.g., Bertrand & Marsh, 2015; Knapp, Copland, & Swinnerton, 2007). School leaders should encourage teachers to reflect on their sense-making process and stress the importance of collaboration around both rational and intuitive processes of judgement. This means that school leaders themselves need the right knowledge, skills and dispositions towards professional judgement. Secondly, school leaders should have the competences to provide a supportive and trustful environment in which teachers learn to give and receive feedback and to discuss their inferences in reflective and transparent manner.

Therefore, our fourth recommendation is to support school leaders in developing the necessary skills, knowledge and dispositions with regard to professional judgement and the competences to provide the right conditions for reflective inquiry and feedback within their school team.

4.5 Make teachers' decision processes and the underlying inferences more transparent, traceable and reproducible

In our research, we found that teachers largely differed in the data they used in the evaluation of alternatives and how they weighted the importance of different evidence bases. A limited group of teachers discussed test results in relation to the official curricular goals when they evaluated alternative options with regard to the transition. For other teachers intuitive evaluations with regard to effort or motivation appeared to be decisive in the decision. We found that pupils who were perceived to be less motivated for school and/or lacked parental support, are mostly oriented towards a future technical or vocational track. This means that, at least for some of the teachers in our research, technical and vocational education is still considered as a negative choice towards a less demanding track. Teachers' dispositions do not coincide with the demand of policy makers to orient pupils based on competences, not motivation or parental support. To validate teachers' decisions, it is important to make the benchmarks and criteria teachers use for their decision, as well as the whole sense making process, more public, transparent, traceable and reproducible (Cohen et al., 2008; Kane, 2013; Senge, 2001). Not all teacher decisions influence pupils' educational trajectories to the same extent. As the stakes associated with a judgment go up, the need for a solid evidence-base increases (Epstein, 2008). As the stakes go up, there is also pressure to increase standardization in order to promote comparability of conclusions across pupils and occasions, and thereby, to promote a kind of objectivity (i.e., lack of subjective judgment). As Shepard (2001) noted, standardization involves a basic matter of fairness. Therefore, our final recommendation is a requirement to make teachers' decision processes and the underlying inferences more transparent, traceable and reproducible.

KEY FINDINGS

- In order to fully understand teacher judgement it needs to be studied through an integrated framework that takes into account both rational and intuitive processes in the different steps of the decision process.
- Intuition in the context of teacher judgement involves non-deliberate, non-systematic processes based on the recognition of cues that is informed by knowledge patterns teachers have acquired through learning and experience.
- Intuitive processes help teachers recognize a problem quickly, focus attention on relevant data, understand what data mean in a specific context and weigh the importance of different data sources when a decision is made.
- The downfall of intuitive judgment is overconfidence in a limited amount of data collected intuitively without triangulating with data collected rationally or searching for alternative explanations.
- To disentangle conceptual confusion with regard to 'data' and 'data use' we need to critically examine how deliberately and systematically data were collected, what criteria were used to make sense of data and what evidence base was taken into account when the decision was made. Even data collected rationally may be interpreted by personal criteria or all data collected rationally may be ignored in the evaluation of alternatives, leading to intuitive judgement.
- Rational processes can help prevent (confirmation) bias when teachers collect indicators deliberately and systematically to diagnose, elaborate on and understand a problem, challenging and complementing information deriving from intuitive processes.
- Although we separated rational and intuitive processes for reasons of conceptual clarity, in practice this distinction is not so dichotomous. In our research, we found a continuum of rational processes, intuitive rationality, informed intuition and intuitive processes.
- Teachers differ in the extent to which the different steps of the decision process are based on rational or intuitive processes. Some teachers use professional judgement based on a combination of both rational and intuitive processes, whereas others mainly rely on intuitive processes throughout the decision process, or rely on arbitrary judgment when they collect little data and hardly evaluate alternative options.

- Teachers who predominantly collect data in a deliberate and systematic way also use a lot of data collected intuitively. This means that rational processes do not exclude intuitive processes. These teachers use a wide array of data to gain refined insight into pupils' competences in a contextualised manner.
- Teachers who predominantly collect data intuitively use little data collected rationally. These teachers do not use multiple data sources (data triangulation), instead they have great confidence in data collected intuitively.
- In order to prevent decision bias, teachers should collect at least one process or output indicator rationally to come to a clear problem diagnosis, use both data collected rationally and intuitively to triangulate data and search for alternative explanations, use pre-defined criteria to make sense of data and combine information deriving from rational and intuitive processes to evaluate alternatives when the decision is made.
- Teachers' beliefs with regard to good teaching influences how they collect data. Teachers with a clear focus on the curriculum and a structured teaching approach use more data collected rationally than teachers with a focus on the socio-emotional aspects of teaching.
- At the school level, supportive relationships with regard to data use and a reflective capacity of a school team that is willing to reflect upon data enhances teachers' autonomous motivation to use data for decision making.
- Because the educational context is not a predictable and stable environment and provides little opportunities for direct feedback, important conditions to prevent decision bias include problem diagnosis, data triangulation, searching for alternative explanations and the use of pre-defined criteria when making sense of data. In our study however, few of these conditions were met.

Chapter

9

Nederlandse samenvatting en
aanbevelingen (Dutch summary)



Hoewel leerkrachten vaak grote autonomie hebben bij het nemen van beslissingen en een deel van hun beslissingen (zoals overgangsbepalingen) een grote impact hebben op de onderwijsloopbaan van leerlingen, is er eigenlijk weinig geweten over hoe leerkrachten beslissingen nemen. Dit proefschrift levert een belangrijk inzicht in de besluitvormingsprocessen van leerkrachten en hoe zij tot een oordeel komen. We volgden leerkrachten gedurende een schooljaar en bestudeerden diepgaand hoe zij de overgangsbepaling nemen op het einde van de lagere school en leerlingen oriënteren naar het secundair onderwijs. Het uitgangspunt van dit doctoraatsonderzoek is dat professionele besluitvorming beïnvloed wordt door zowel rationele als intuïtieve processen om geïnformeerd beslissingen te kunnen nemen rekening houdend met de specifieke context van de leerling. We baseren ons hierbij op inzichten uit de cognitieve psychologie die aantonen dat menselijke besluitvorming bestaat uit een samenspel van rationele en intuïtieve processen, met beide hun sterktes en valkuilen (Evans, 2008; Kahneman & Frederick, 2005).

Besluitvorming in een onderwijskundige context wordt tot op heden echter nog niet vanuit deze bril bestudeerd. De laatste jaren is er een toegenomen aandacht voor datagebruik, of data-geïnformeerde besluitvorming (bv. Mandinach & Gummer, 2016; Schildkamp & Lai, 2013). Hoewel binnen dit onderzoeksveld vaak wordt vermeld dat leerkrachten nog teveel op hun intuïtie vertrouwen, is het onduidelijk wat auteurs precies onder dit concept verstaan. Bovendien vertrekt deze stelling van de aanname dat het gebruik van intuïtie als informatiebron voor besluitvorming moet afnemen ten voordele van een verhoogd datagebruik. Er is tot op heden echter weinig geweten over de wijze waarop intuïtie de besluitvorming van leerkrachten (nadelig) beïnvloedt. In dit onderzoek wilden we aan beide leemtes in de huidige kennisbasis tegemoet komen door kritisch te bekijken hoe we datagebruik en intuïtie in de besluitvorming van leerkrachten kunnen definiëren en hoe beide kunnen de professionele besluitvorming van leerkrachten kunnen versterken.

Gezien er in een onderwijskundige context nog geen theoretisch kader voor handen was dat besluitvorming bestudeert vanuit dit duaal-proces perspectief starten we met de bespreking van ons geïntegreerde kader. Hierbij conceptualiseren we de rationele en intuïtieve processen in functie van de verschillende stappen van het besluitvormingsproces. Vervolgens willen we in deze Nederlandstalige samenvatting de belangrijkste conclusies van ons onderzoek meegeven en hoe dit zich vertaalt in concrete aanbevelingen. Gezien de grote conceptuele onduidelijkheid die er echter vaak heerst m.b.t. data en intuïtie, willen we aan de lezer eerst duidelijk maken hoe we deze begrippen in ons onderzoek hebben gedefinieerd.

Het begrip data verwijst in dit onderzoek naar cognitieve en niet-cognitieve gegevens die rechtstreeks betrekking hebben op een leerling. Data kunnen op een rationele manier verzameld worden (doelgericht en systematisch) of op een intuïtieve manier (niet-doelgericht, niet-systematisch). Data worden pas informatie nadat ze geïnterpreteerd worden door de leerkracht die er betekenis aan geeft.

In dit onderzoek conceptualiseren we intuïtie als een persoonlijke kennisbasis van leerkrachten die bestaat uit patronen en mentale modellen opgebouwd door leren en ervaring en die leerkrachten in staat stelt automatisch en snel indicatoren te herkennen zonder doelgerichte aandacht of een systematische aanpak.

1. EEN GEÏNTEGREERD RAAMWERK VOOR BESLUITVORMING DAT REKENING HOUDT MET RATIONELE EN INTUÏTIEVE PROCESSEN

In de eerste fase van een besluitvormingsproces evalueert de leerkracht de eigenlijke karakteristieken van een leerling in verhouding tot wat de leerkracht belangrijk of nodig acht voor de overgang naar het algemeen secundair onderwijs. Deze probleemdefinitie kan gebaseerd zijn op (een combinatie van) probleemherkenning of probleemdiagnose. Het is mogelijk dat leerkrachten vanuit hun ervaring spontaan een indicator of een leerlingenkenmerk herkennen, zonder een doelgerichte of systematische diagnose van het probleem. Deze intuïtieve probleemherkenning is een belangrijk en waardevol aspect van expertise omdat het leerkrachten in staat stelt snel belangrijke signalen op te pikken. Theorie benadrukt echter dat deze probleemherkenning verder dient afgetoetst en verfijnd te worden aan de hand van bijkomende gegevens die doelgericht en systematisch verzameld worden. Vooral in een onderwijscontext, waar de trajecten van leerlingen door uiteenlopende factoren beïnvloed worden en de context voortdurend wijzigt, is het belangrijk dat een leerkracht zijn of haar spontane herkenning van een patroon kritisch in vraag stelt en aftoetst aan rationeel verzamelde data.

In een tweede fase van het besluitvormingsproces wordt een leerkracht geacht doorheen het schooljaar verder data te verzamelen om meer inzicht te krijgen in het voorliggende probleem. De leerkracht kan meer informatie verwerven door een doelgerichte en systematische verzameling van data (rationeel) of door een niet-doelgerichte en niet-systematische verzameling van data (intuïtief) wanneer de aandacht van leerkrachten spontaan getrokken wordt door een indicator die opvalt of die hij/zij herkent. Rationele modellen van besluitvorming verwachten dat leerkrachten op een doelgerichte en systematische manier meerdere data verzamelen en met elkaar vergelijken om tot een accurate beslissing te komen (Strayhorn et al., 2009). Theorieën die besluitvorming bestuderen vanuit intuïtieve processen gebaseerd op expertise stellen echter dat experts op basis van de herkenning van één of slechts enkele indicatoren tot accurate beslissingen kunnen komen (Klein, 2008). Dit vereist echter dat de context

voldoende stabiel is, met andere woorden dat gelijkaardige situaties zich telkens opnieuw onder dezelfde omstandigheden voordoen en hierdoor voorspelbaar worden. We kunnen betwijfelen of in onderwijs aan deze voorwaarde wordt voldaan. De situatie en de ontwikkeling van leerlingen kunnen gelijkaardige elementen vertonen, maar zijn zelden identiek. Om die reden is het belangrijk dat databronnen getrianguleerd worden, dat met andere woorden meerdere databronnen (rationeel en intuïtief) verzameld en vergeleken worden. Waar intuïtieve processen kunnen helpen om de aandacht te focussen op de gegevens die in een welbepaalde situatie relevant zijn, kunnen rationele processen een waardevolle en kritische toetssteen zijn om denkfouten, zoals stereotypering of self-fulfilling prophecies tegen te gaan (Earl & Katz, 2006; Kahneman & Frederick, 2005).

In een volgende fase van het besluitvormingsproces moeten leerkrachten nog betekenis geven aan de data die werden verzameld. Data hebben geen betekenis in het besluitvormingsproces voor leerkrachten deze hebben geïnterpreteerd en omgevormd tot informatie (Vanhoof, Mahieu, & Van Petegem, 2009). Rationele besluitvormingstheorieën verwachten dat de interpretatie gebaseerd is op vooraf bepaalde criteria (in plaats van persoonlijke criteria) en dat leerkrachten hun conclusies kritisch in vraag stellen door op zoek te gaan naar alternatieve verklaringen. Als leerkrachten persoonlijke criteria gebruiken om gegevens te interpreteren, kunnen rationeel verzamelde data tot intuïtieve beslissingen leiden.

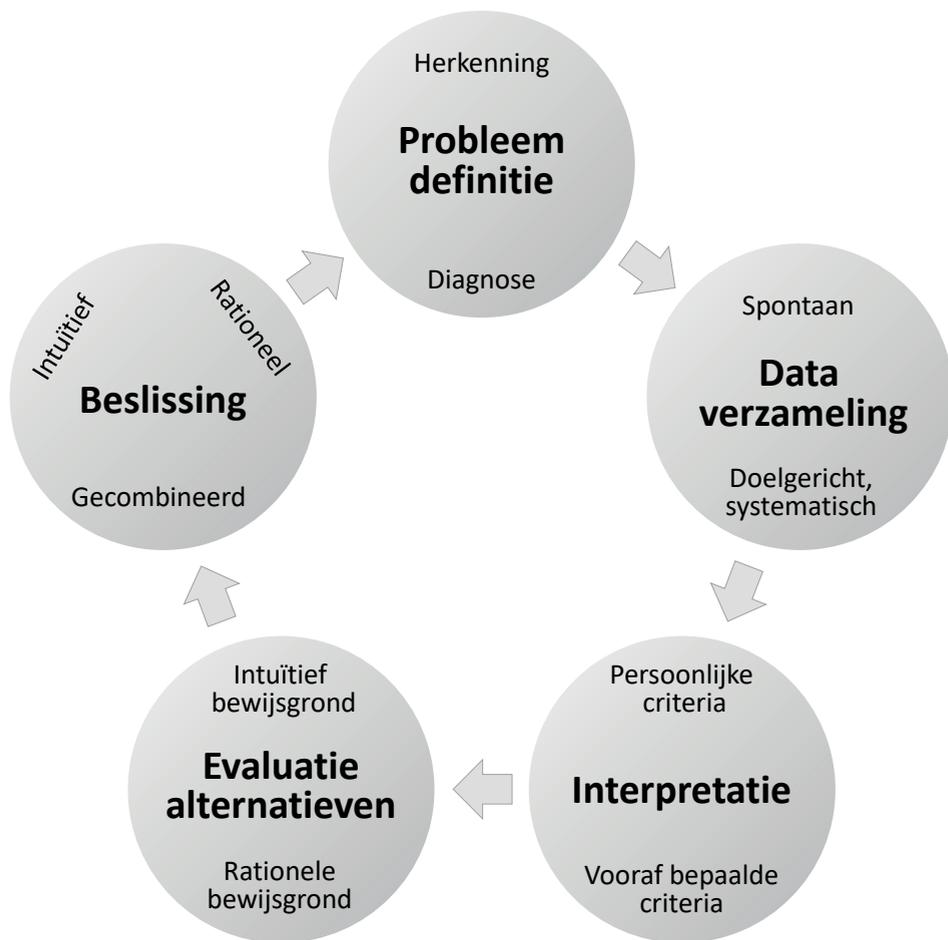
Op het einde van het schooljaar kunnen leerkrachten verschillende alternatieven afwegen op basis van alle informatie die ze doorheen het jaar hebben verzameld. Daarbij zullen leerkrachten niet noodzakelijk alle data meenemen in deze fase van het proces omdat ze zich bijvoorbeeld niet alle data nog herinneren of omdat ze bepaalde gegevens minder belangrijk vinden. Tot slot nemen leerkrachten een beslissing die gebaseerd kan zijn op de uitkomst van rationele processen, van intuïtieve processen of op een combinatie van beiden.

Samenvattend kunnen we stellen dat rationele besluitvormingsprocessen vertrekken vanuit een vooraf bepaald doel (doelgericht) en een vooraf bepaalde, doordachte methode die nauwgezet wordt gevolgd (systematisch). Bij rationele besluitvorming is er de verwachting dat leerkrachten een probleem diagnosticeren aan de hand van ten minste één proces- of outputindicator die doelgericht en systematisch wordt verzameld. Tijdens het schooljaar worden data vervolgens rationeel verzameld en geïnterpreteerd aan de hand van vooraf bepaalde criteria. De evaluatie van alternatieven is gebaseerd op een rationele bewijsgrond, die uiteindelijk ook doorslaggevend is in de beslissing.

Intuïtieve besluitvormingsprocessen vertrekken vanuit spontane probleemherkenning die meteen een dataverzameling triggert zonder dat deze probleemdefinitie wordt afgetoetst aan de hand van een indicator die doelgericht en systematisch werd verzameld. Tijdens het schooljaar wordt de aandacht van leerkrachten automatisch

getrokken door de herkenning van opvallende signalen of patronen die verwachtingen creëren op basis van ervaringen uit het verleden. Intuïtieve processen zorgen er in de interpretatiefase voor dat rationeel verzamelde data geïnterpreteerd worden aan de hand van persoonlijke criteria en dat de intuïtieve bewijsgrond hoofdzakelijk wordt meegenomen bij de evaluatie van alternatieven en doorslaggevend is bij het nemen van de uiteindelijke beslissing.

Het uitgangspunt van dit doctoraatsonderzoek is dat professionele besluitvorming gebaseerd is op een goede combinatie van rationele en intuïtieve processen om geïnformeerde, doordachte beslissingen te kunnen nemen die rekening houdt met de specifieke context van de leerling. Een overzicht van dit geïntegreerde raamwerk wordt weergegeven in figuur 1.



Figuur 1: Geïntegreerd raamwerk van besluitvorming

2. CONCLUSIES

2.1. De geschiktheid van het geïntegreerde raamwerk voor besluitvorming

De resultaten van ons onderzoek tonen in de eerste plaats aan dat het geïntegreerde raamwerk hierboven beschreven een geschikte lens is om de besluitvorming van leerkrachten te onderzoeken en te begrijpen. Zowel rationele als intuïtieve processen oefenen een invloed uit op de verschillende stappen in het besluitvormingsproces. Bovendien bleek het van belang om de zwarte doos van besluitvorming te openen door het procesmatige karakter dat aan de beslissing van een leerkracht vooraf gaat zichtbaar te maken. We stelden vast dat we de beslissing van een leerkracht niet kunnen begrijpen op basis van het resultaat. Zo verzamelen sommige leerkrachten bijvoorbeeld heel wat data op een rationale manier, maar interpreteren deze data vervolgens aan de hand van persoonlijke criteria. De beslissing is uiteindelijk dus minder rationeel dan wat men zou vermoeden op basis van de aard van de dataverzameling.

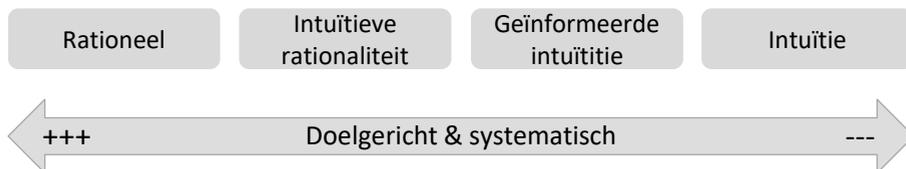
2.2 Resultaten met betrekking tot de verschillende fasen van het besluitvormingsproces

Aan de verwachting dat het besluitvormingsproces van leerkrachten geïnitieerd wordt door rationele probleemdiagnose, al dan niet vooraf gegaan door intuïtieve probleemherkenning werd binnen ons onderzoek slechts in de helft van de gevallen voldaan. Bovendien stelden we vast dat slechts in zeldzame gevallen doelgericht data werden gezocht om de intuïtieve probleemherkenning kritisch aan af te toetsen. In de meeste gevallen werden gegevens gezocht die de probleemherkenning bevestigden.

De leerkrachten in deze studie verzamelden vooral cognitieve output gegevens op een rationale manier en procesgegevens op een intuïtieve manier. Deze niet-doelgerichte en niet-systematische vorm van gegevensverzameling had overwegend betrekking op observaties van socio-emotionele indicatoren zoals motivatie, interesse of welbevinden. De doelgerichte en systematische dataverzameling verwijst overwegend naar toetsresultaten (zelden naar gestandaardiseerde toetsresultaten). We vonden nauwelijks voorbeelden van procesgegevens of socio-emotionele gegevens die doelgericht en systematisch verzameld werden.

Wanneer we naar het samenspel tussen de rationele en intuïtieve gegevensverzameling kijken, stellen we vast dat in de praktijk de tweedeling tussen datagebruik en intuïtie niet altijd zo duidelijk is, zoals eerder al werd gesuggereerd door Hammond (1996). In ons onderzoek identificeerden we een continuüm gaande van rationale dataverzameling, intuïtieve rationaliteit, geïnformeerde intuïtie en intuïtieve dataverzameling (zie figuur 2). Aan de ene kant van het continuüm vinden we een dataverzameling die start vanuit een vooraf bepaald doel en waarbij een doordachte

methode wordt gevolgd (rationeel). Een voorbeeld hiervan zijn toetsresultaten. In ons onderzoek stelden we echter vast dat intuïtieve processen er soms voor zorgen dat het doel of de methode wordt aangepast tijdens het proces van dataverzameling. Tijdens het afnemen van een toets kan een leerkracht bijvoorbeeld bepaalde vragen schrappen of een hulpmiddel geven als hij/zij aanvoelt dat de druk te hoog wordt voor een leerling, gebaseerd op de spontane herkenning van een indicator (bv. tranen in de ogen). Het resultaat van deze toets kunnen we bijgevolg niet als strikt rationeel beschouwen, maar eerder als intuïtieve rationaliteit. Verder vonden we naast een strikt intuïtieve vorm van dataverzameling ook een vorm van geïnformeerde intuïtie. Dit is bijvoorbeeld het geval wanneer een verslag van een psycholoog ervoor zorgt dat een leerkracht een bepaalde indicator opmerkt tijdens de observatie. Hoewel bepaalde indicatoren spontaan de aandacht van de leerkracht trekken, zonder vooraf bewust over het doel en de methode van observatie na te denken, wordt de dataverzameling (deels) gestuurd door informatie verkregen uit de rationele dataverzameling.

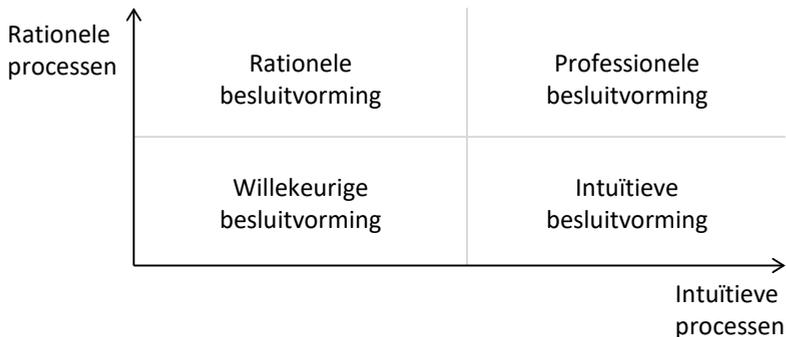


Figuur 2: Continuüm van vormen van dataverzameling

In de interpretatiefase concludeerden we dat leerkrachten voor een aanzienlijk deel persoonlijke criteria gebruiken om rationeel verzamelde data te interpreteren. Vooral leerkrachten die hoofdzakelijk intuïtief data verzamelen, gebruiken ook persoonlijke criteria om betekenis te geven aan het beperkte deel rationeel verzamelde data. Leerkrachten die data voornamelijk doelgericht en systematisch verzamelen, gebruiken ook hoofdzakelijk vooraf bepaalde criteria voor de interpretatie. In ons onderzoek zocht slechts een minderheid van de leerkrachten naar mogelijke alternatieve verklaringen om hun assumpties te testen wanneer ze data interpreterden. Wanneer leerkrachten op het einde van het jaar alternatieven afwegen, worden zowel rationele als intuïtieve bewijsgronden in de argumentatie opgenomen, hoewel er ook een beperkte groep leerkrachten is die nauwelijks alternatieven tegen elkaar afwegen. De uiteindelijke beslissing wordt echter vaak genomen op basis van een bepaalde bewijsgrond die voor de leerkracht van doorslaggevend belang is, los van de data (rationeel of intuïtief) die besproken werden in de evaluatie. Voor een groep leerkrachten was de uiteindelijke beslissing uitsluitend gebaseerd op niet-cognitieve elementen die intuïtief verzameld werden, zoals motivatie, interesse en welbevinden, soms ondanks toetsresultaten die een andere beslissing suggereren. Voor een andere groep leerkrachten waren toetsresultaten van doorslaggevend belang, ook al waren die soms in tegenspraak met informatie uit intuïtieve processen.

2.3 Verschillende benaderingen t.o.v. besluitvorming: rationeel, intuïtief, professioneel en willekeurig

In dit onderzoek zochten we ook naar patronen om verschillende benaderingen van leerkrachten met betrekking tot besluitvorming te identificeren. Op basis van de mate waarin leerkrachten veel of weinig gebruik maakten van rationale en intuïtieve processen doorheen de verschillende fasen van het besluitvormingsproces kwamen we tot vier mogelijke vormen van besluitvorming die weergegeven worden in onderstaande figuur 3:



Figuur 3: Verschillende benaderingen van besluitvorming

Het uitgangspunt van dit doctoraatsonderzoek is dat professionele besluitvorming gebaseerd is op zowel rationale als intuïtieve processen. In onze studie vonden we voorbeelden van professionele besluitvorming waarbij leerkrachten intuïtieve processen gebruiken om snel problemen te herkennen, relevante data te zoeken, te begrijpen en af te wegen. Rationale processen werden aangewend om problemen te diagnosticeren, verder te onderzoeken en eigen aannames af te toetsen. We vonden echter ook voorbeelden van intuïtieve besluitvorming waarbij de besluitvorming van de leerkracht in kwestie hoofdzakelijk gebaseerd was op intuïtieve processen, met beperkte aanwezigheid van rationale processen. Een kleine groep leerkrachten liep slechts in beperkte mate doorheen het besluitvormingsproces. Ze gebruikten weinig data (noch rationeel, noch intuïtief verzameld) en wogen nauwelijks alternatieven af. Een beslissing werd genomen zonder een uitgebreid, geïnformeerd besluitvormingsproces, wat we definieerden als willekeurige besluitvorming. In dit onderzoek vonden we geen voorbeelden van strikt rationele besluitvorming. Daarbij merken we op dat het niet het uitgangspunt was van dit onderzoek dat (overgangs)beslissingen strikt rationeel genomen moeten worden, eerder dat er een goede balans is tussen rationale en intuïtieve processen in de professionele besluitvorming van leerkrachten.

2.4 Beïnvloedende factoren op leerkracht- en schoolniveau

We stelden vast dat leerkrachten verschillen in de mate waarin ze op rationele en intuïtieve processen vertrouwen in hun besluitvorming. In onze resultaten vonden we een aantal verklarende factoren op leerkracht- en schoolniveau. Zo stelden we vast dat de autonome motivatie van leerkrachten om rationeel verzamelde data te gebruiken positief samenhangt met het (rationele) datagebruik. In ons onderzoek ervaren leerkrachten echter slechts in beperkte mate een autonome motivatie om rationeel verzamelde data te gebruiken. Leerkrachten met een rationele besluitvormingsstijl voelden zich meer autonoom gemotiveerd om rationeel verzamelde data te gebruiken dan leerkrachten met een intuïtieve besluitvormingsstijl. Verder concludeerden we ook dat de overtuiging van leerkrachten over wat goed lesgeven is een invloed uitoefent op hun besluitvorming. Zo zullen leerkrachten die meer belang hechten aan het overbrengen van het curriculum meer doelgericht en systematisch data verzamelen dan leerkrachten die meer belang hechten aan socio-emotionele elementen binnen de klaspraktijk.

Op het niveau van de school stelden we vast dat het reflectieve vermogen van een schoolteam het sterkst samenhangt met de autonome motivatie van leerkrachten om op een rationele manier data te gebruiken. Onder het reflectief vermogen verstaan we de bereidheid van een schoolteam om het eigen handelen in vraag te stellen door doelgericht en systematisch data te verzamelen. Verder toonden onze resultaten aan dat ondersteunende relaties met betrekking tot het verzamelen en interpreteren van data de autonome motivatie van individuele leerkrachten om (rationele) data te gebruiken positief beïnvloedt. In ons onderzoek bleek er echter binnen de schoolteams slechts in beperkte mate sprake te zijn van reflectief vermogen en ondersteunende relaties met betrekking tot datagebruik.

3. AANBEVELINGEN

Gezien de grote impact die heel wat beslissingen van leerkrachten hebben op het onderwijskundige traject van leerlingen, willen we op basis van ons onderzoek enkele aanbevelingen formuleren om de besluitvorming van leerkrachten te verbeteren.

3.1 Geef leerkrachten vorming in besluitvormingstheorie

In dit onderzoek stelden we vast dat het beoordelingsproces van leerkrachten maar in beperkte mate voldoet aan de voorwaarden om beslissingsfouten te voorkomen. Zo start bijvoorbeeld maar de helft van de leerkrachten vanuit rationele probleemdiagnose, gebruiken heel wat leerkrachten persoonlijke criteria om rationeel verzamelde data te interpreteren, wordt er maar beperkt informatie van verschillende databronnen

vergeleken of naar alternatieve verklaringen gezocht. Leerkrachten hebben inzicht nodig in besluitvormingstheorie om de sterktes en de valkuilen van rationale en intuïtieve processen te kennen en te begrijpen hoe ze deze processen op een goede manier kunnen combineren in de verschillende fasen. Verder is het belangrijk dat leerkrachten inzicht verwerven in de verschillende denkfouten (bv. de bevestigingsfout) die voortvloeien uit intuïtieve besluitvorming die niet kritisch wordt onderzocht of aangevuld met andere databronnen. Een eerste aanbeveling is om leerkrachten te vormen in besluitvormingstheorie. We suggereren om besluitvormingstheorie mee op te nemen in het curriculum van de lerarenopleidingen en ook navormingen rond dit onderwerp te voorzien.

3.2 Geef intuïtie een duidelijke plaats in besluitvormingsmodellen en opleidingen

Aanvullend bij deze eerste aanbeveling pleiten we voor een duidelijke plaats en erkenning van intuïtie in besluitvormingsmodellen en (leraren)opleidingen. De laatste jaren is er veel aandacht besteed aan opleiding en vorming rond datagebruik in onderwijs. Ons onderzoek toont aan dat rationeel datagebruik een belangrijk deel is van professionele besluitvorming, maar dat ook intuïtieve processen een sterke invloed uitoefenen op de besluitvorming van leerkrachten. Hierbij bevestigen we wat onderzoekers en praktijkmensen al langer vermoeden, maar niet eerder diepgaand onderzochten. Waar rationeel datagebruik belangrijk is als kritische toetssteen, helpen intuïtieve processen om de aandacht te focussen op data die relevant zijn in een gegeven context en om te begrijpen wat deze data betekenen voor een specifieke leerling. Leerkrachten hebben inzicht nodig in hoe en onder welke voorwaarden intuïtie kan bijdragen aan professionele besluitvorming. Bewustwording in de mogelijke valkuilen die tot beslissingsfouten kunnen leiden, kan bovendien helpen om overmatig vertrouwen in intuïtieve besluitvorming te voorkomen.

3.3 Bouw organisatorische en culturele voorwaarden voor feedback en collectieve reflectie

Steun van collega's, samenwerking en vertrouwen kunnen de autonome motivatie van leerkrachten verhogen om doelgericht en systematisch data te gebruiken. Bovendien wordt het proces van betekenis geven meer transparant en reproduceerbaar gemaakt als leerkrachten met collega's hun gevolgtrekkingen en de achterliggende criteria bespreken en elkaars aannames kritisch in vraag stellen. Samenwerking en feedback is niet alleen belangrijk om de rationale processen van datagebruik te ondersteunen, maar is ook een belangrijke voorwaarde voor het ontwikkelen van betrouwbare intuïtie. Volgens Kahneman en Klein (2009) vergt het ontwikkelen van betrouwbare intuïtie de mogelijkheid om frequent en rechtstreeks feedback te krijgen op het handelen. Zonder directe feedback bestaat het risico dat leerkrachten teveel vertrouwen krijgen in hun

eigen manier van werken, zonder hier met andere ervaren collega's over te reflecteren. Op deze manier wordt de kennisbasis van leerkrachten aangevuld met patronen en mentale modellen die niet kritisch in vraag werden gesteld.

3.4 Vorm directeurs in het ontwikkelen van competenties om professionele besluitvorming te ondersteunen

Directeurs hebben een belangrijke rol in het ontwikkelen en ondersteunen van de organisatorische voorwaarden voor samenwerking en feedback met betrekking tot besluitvormingsprocessen van leerkrachten (Bertrand & Marsh, 2015; Knapp, Copland, & Swinnerton, 2007). Dit betekent allereerst dat directeurs zelf over de nodige competenties moeten beschikken om aan professionele besluitvorming te doen. Verder vereist dit dat directeurs de nodige kennis en vaardigheden hebben om een ondersteunende omgeving te creëren waarbinnen gezamenlijke reflectie en feedback gestimuleerd worden. Hiervoor hebben directeurs de nodige vaardigheden, kennis en de juiste attitudes nodig om deze ondersteunende context te creëren waarbinnen professionele besluitvorming wordt aangemoedigd en de nodige culturele en organisatorische condities aanwezig zijn voor gezamenlijke reflectie en feedback.

3.5 Benut het potentieel van klassenraden voor kritische en transparante reflectie op het besluitvormingsproces van de individuele leerkracht

Hoewel overgangsbepalingen officieel teambepalingen zijn die op klassenraden tot stand komen, stelden we in ons onderzoek vast dat er in vele gevallen een groot vertrouwen is in het individuele leerkrachtenoordeel, zonder het achterliggende besluitvormingsproces kritisch in vraag te stellen. Dat maakt dat willekeurige besluitvormingsstrategieën of intuïtieve bepalingen van een individuele leerkracht een grote impact kunnen hebben op de uiteindelijke bepaling en dus ook op het onderwijstraject van de leerling. Het is daarom van belang dat het potentieel van klassenraden ten volle wordt benut als een plaats waar het besluitvormingsproces van de leerkracht, met de onderliggende inferenties en criteria op een transparante manier wordt geëxpliciteerd en kritisch wordt besproken. Hierdoor worden overgangsbepalingen transparanter en reproduceerbaarder voor alle betrokkenen binnen de school, maar ook voor ouders en leerlingen en kan de betrouwbaarheid worden verhoogd. Gezien het belang van de overgangsbepaling voor de leerling, is het onze aanbeveling om met het team doelgericht en systematisch met een kritische, onderzoekende houding de bewijsgrond te bestuderen, verschillende databronnen te vergelijken en samen op zoek te gaan naar alternatieve verklaringen. Klassenraden bieden de mogelijkheid om binnen een bestaande structuur tot geïnformeerde, transparante en gedeelde besluitvorming te komen.

References



- Agirdag, O., Van Avermaet, P., & Van Houtte, M. (2013). School segregation and math achievement: A mixed-method study on the role of self-fulfilling prophecies. *Teachers College Record*, 115(3), 1-50.
- Airasian, P. W. (1994). *Classroom assessment*. New York: McGraw-Hill.
- Allal, L. (2013). Teachers' professional judgement in assessment: A cognitive act and a socially situated practice. *Assessment in Education: Principles, Policy & Practice*, 20(1), 20-34.
- Allal, L. K. (1988). Quantitative and qualitative components of teachers' evaluation strategies. *Teaching and Teacher Education*, 4(1), 41-51.
- Alvidrez, J., & Weinstein, R. S. (1999). Early teacher perceptions and later student academic achievement. *Journal of Educational Psychology*, 91(4), 731-746.
- Ballet, K., & Kelchtermans, G. (2009). Struggling with workload: Primary teachers' experience of intensification. *Teaching and Teacher Education*, 25(8), 1150-1157.
- Barber, M. (2004). The virtue of accountability: System redesign, inspection, and incentives in the era of informed professionalism. *The Journal of Education*, 185(1), 7-38.
- Beijaard, D., & Verloop, N. (1996). Assessing teachers' practical knowledge. *Studies In Educational Evaluation*, 22(3), 275-286.
- Beijaard, D., Verloop, N., & Vermunt, J. D. (2000). Teachers' perceptions of professional identity: An exploratory study from a personal knowledge perspective. *Teaching and Teacher Education*, 16(7), 749-764.
- Bennett, R. E., Gottesman, R. L., Rock, D. A., & Cerullo, F. (1993). Influence of behavior perceptions and gender on teachers' judgments of students' academic skill. *Journal of Educational Psychology*, 85(2), 347-356.
- Bertrand, M., & Marsh, J. A. (2015). Teachers' sensemaking of data and implications for equity. *American Educational Research Journal*, 52(5), 861-893.
- Blackwell, R., Miniard, P., & Engel, J. (2006). *Consumer behavior* (10th ed.). Mason, OH: Thomson-South-Western.
- Bloland, H. G. (2005). Whatever happened to postmodernism in higher education?: No requiem in the new millennium. *The Journal of Higher Education*, 76(2), 121-150.
- Bonvin, P. (2003). The role of teacher attitudes and judgement in decision-making: the case of grade retention. *European Educational Research Journal*, 2(2), 277-294.
- Bonvin, P., Bless, G., & Schuepbach, M. (2008). Grade retention: decision-making and effects on learning as well as social and emotional development. *School Effectiveness & School Improvement*, 19(1), 1-19.
- Bosker, R. J., Branderhorst, E. M., & Visscher, A. J. (2007). Improving the utilisation of management information systems in secondary schools. *School Effectiveness and School Improvement*, 18(4), 451-467.
- Briscoe, C. (1991). The dynamic interactions among beliefs, role metaphors, and teaching practices: A case study of teacher change. *Science Education*, 75(2), 185-199.
- Brookhart, S. M. (1994). Teachers' grading: Practice and theory. *Applied Measurement in Education*, 7(4), 279-301.
- Brookhart, S. M. (2003). Developing measurement theory for classroom assessment purposes and uses. *Educational Measurement: Issues and Practice*, 22(4), 5-12.
- Brookhart, S. M. (2013). The use of teacher judgement for summative assessment in the USA. *Assessment in Education: Principles, Policy & Practice*, 20(1), 69-90.
- Brown, C., Schildkamp, K., & Hubers, M. D. (2017). Combining the best of two worlds: a conceptual proposal for evidence-informed school improvement. *Educational research*, 59(2), 154-172.
- Bryk, A. S., & Schneider, B. (2003). Trust in Schools: A Core Resource for School Reform. *Creating Caring Schools*, 60(6), 40-45.
- Buchanan, R. (2015). Teacher identity and agency in an era of accountability. *Teachers and Teaching*, 21(6), 700-719.
- Burgess, S., Greaves, E., Vignoles, A., & Wilson, D. (2009). *What parents want: school preferences and school choice*. Bristol, UK: CMPO.
- Calderhead, J. (1996). Teachers: Beliefs and knowledge. In D. Berliner & R. Calfee (Eds.), *Handbook of educational psychology* (pp. 709-725). New York: MacMillan.

- Calderhead, J., & Robson, M. (1991). Images of teaching: Student teachers' early conceptions of classroom practice. *Teaching and Teacher Education*, 7(1), 1-8.
- Callahan, R. M. (2005). Tracking and high school English learners: Limiting opportunity to learn. *American Educational Research Journal*, 42(2), 305-328.
- Carlson, D., Borman, G., & Robinson, M. (2011). A multistate district-level cluster randomized trial of the impact of data-driven reform on reading and mathematics achievement. *Educational Evaluation and Policy Analysis*, 33(3), 378-398.
- Chase, W. G., & Simon, H. A. (1973). Perception in chess. *Cognitive Psychology*, 4(1), 55-81.
- Clandinin, D. J., & Connelly, F. M. (1987). Teachers' personal knowledge: What counts as 'personal' in studies of the personal*. *Journal of Curriculum Studies*, 19(6), 487-500.
- Coburn, C. E., Honig, M. I., & Stein, K. (2009). What is the evidence on districts' use of evidence? In J. D. Bransford, D. J. Stipek, N. J. Vye, L. M. Gomez, & D. Lam (Eds.), *The role of research in educational improvement* (pp. 67-86). Cambridge, MA: Harvard Education Press.
- Coburn, C. E., Touré, J., & Yamashita, M. (2009). Evidence, interpretation, and persuasion: Instructional decision making at the district central office. *Teachers College Record*, 111(4), 1115-1161.
- Coburn, C. E., & Turner, E. O. (2011). Research on data use: A framework and analysis. *Measurement: Interdisciplinary Research and Perspectives*, 9(4), 173-206.
- Coburn, C. E., & Turner, E. O. (2012). The practice of data use. *American Journal of Education*, 118(2), 99-111.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Cohen, L., Manion, L., & Morrison, K. (2008). *Research methods in education*. New York: Routledge.
- Cousins, J., & Leithwood, K. (1993). Enhancing knowledge utilization as a strategy for school improvement. *Knowledge: Creation, Diffusion, Utilization*, 14(3), 305-333.
- Cowan, D. A. (1986). Developing a process model of problem recognition. *Academy of Management Review*, 11(4), 763-776.
- Creighton, T. B. (2007). *School and data: The educator's guide for using data to improve decision making*. London: Sage.
- Creswell, J. W., & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory into Practice*, 39(3), 124-130.
- Creswell, J. W. (2005). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. New Jersey: Pearson Prentice Hall.
- Cronbach, L. J. (1988). Five perspectives on the validity argument. In H. Wainer & H. I. Braun (Eds.), *Test validity* (pp. 3-17). Hillsdale, NJ: Lawrence Erlbaum Associates
- Dane, E., & Pratt, M. G. (2007). Exploring intuition and its role in managerial decision making. *Academy of Management Review*, 32(1), 33-54.
- Datnow, A., Greene, J. C., & Gannon-Slater, N. (2017). Data use for equity: implications for teaching, leadership, and policy. *Journal of Educational Administration*, 55(4), 354-360.
- Datnow, A., & Hubbard, L. (2016). Teacher capacity for and beliefs about data-driven decision making: A literature review of international research. *Journal of Educational Change*, 17(1), 7-28.
- Datnow, A., Park, V., & Kennedy-Lewis, B. (2012). High school teachers' use of data to inform instruction. *Journal of Education for Students Placed at Risk (JESPAR)*, 17(4), 247-265.
- Datnow, A., Park, V., & Wohlstetter, P. (2007). *Achieving with data. How high performing school systems use data to improve instruction for elementary students*. Los Angeles: Center on Educational Governance.
- Davenport, T. H., Prusak, L., & Tuijil, G. (1998). *Kennismanagement in de praktijk (Knowledge management in practice)*. Harvard: Harvard Business Press
- Day, C. (2002). School reform and transitions in teacher professionalism and identity. *International Journal of Educational Research*, 37(8), 677-692.
- Day, C., Kington, A., Stobart, G., & Sammons, P. (2006). The personal and professional selves of teachers: Stable and unstable identities. *British Educational Research Journal*, 32(4), 601-616.
- De Groot, A. D. (1978). *Thought and choice in chess* (2nd ed.). The Hague: Mouton Publishers.
- Denzin, N. K., & Lincoln, Y. S. (2000). *Handbook of qualitative research*. Thousand Oaks: Sage.

- Downey, C., & Kelly, A. (2011). *Examining the association between training and professional development frequency and teachers' confidence in using school effectiveness data*. Paper presented at the ICSEI 2011 congress, Limassol, Cyprus.
- Drake, C., Spillane, J. P., & Hufferd-Ackles, K. (2001). Storied identities: Teacher learning and subject-matter context. *Journal of Curriculum Studies*, 33(1), 1-23.
- Earl, L., & Katz, I. (2002). Leading schools in a data-rich world. In K. Leithwood & P. Hallinger (Eds.), *Second international handbook of educational leadership and administration* (pp. 1003-1022). Dordrecht: Kluwer Academic.
- Earl, L., & Katz, S. (2006). *Leading schools in a data-rich world*. Thousand Oaks, CA: Corwin Press.
- Earl, L., & Louis, K. S. (2013). Data use: Where to from here? In K. Schildkamp, M. K. Lai, & L. Earl (Eds.), *Data-based decision making in education* (pp. 193-207). Dordrecht: Springer.
- Ehren, M. C., & Swanborn, M. S. (2012). Strategic data use of schools in accountability systems. *School Effectiveness and School Improvement*, 23(2), 257-280.
- Elbaz, F. (1983). *Teacher thinking. A study of practical knowledge*. London: Croom Helm.
- Epstein, S. (2002). *Comprehensive handbook of psychology* (Vol. 5). Hoboken, NJ: Wiley.
- Epstein, S. (2008). *Intuition from the perspective of cognitive experiential self-theory*. New York: Erlbaum.
- Epstein, S. (2010). Demystifying intuition: What it is, what it does, and how it does it. *Psychological Inquiry*, 21(4), 295-312.
- Eurydice. (2011). *Grade retention during compulsory education in Europe: regulations and statistics*. Brussels: OECD
- Evans, J. (2008). Dual-processing accounts of reasoning, judgment, and social cognition. *Annual Review of Psychology*, 59, 255-278.
- Evans, J., & Feeney, A. (2004). The role of prior belief in reasoning. In J. P. Leighton & R. J. Sternberg (Eds.), *The nature of reasoning* (pp. 78-102). New York: Cambridge University Press.
- Evans, J. S. B. (2006). The heuristic-analytic theory of reasoning: Extension and evaluation. *Psychonomic Bulletin & Review*, 13(3), 378-395.
- Evans, J. S. B. (2008). Dual-processing accounts of reasoning, judgment, and social cognition. *Annual Review of Psychology*, 59, 255-278.
- Feinberg, A. B., & Shapiro, E. S. (2009). Teacher accuracy: An examination of teacher-based judgments of students' reading with differing achievement levels. *The Journal of Educational Research*, 102(6), 453-462.
- Ferreira, M. B., Garcia-Marques, L., Garrido, M., & Sherman, S. J. (2006). *Automatic and controlled components of judgment under uncertainty*. Paper presented at the Proceedings of the Cognitive Science Society.
- Gardner, R. (1995). Onservice teacher education. In L. W. Anderson (Ed.), *International encyclopedia of teaching and teacher education* (2nd ed., pp. 628-632). London: Pergamon Press.
- Geijsel, F. P., Slegers, P. J., Stoel, R. D., & Krüger, M. L. (2009). The effect of teacher psychological and school organizational and leadership factors on teachers' professional learning in Dutch schools. *The Elementary School Journal*, 109(4), 406-427.
- Goldstein, W. M., & Hogarth, R. M. (1997). Judgment and decision research: Some historical context. In W. M. Goldstein & R. M. Hogarth (Eds.), *Research on judgment and decision making: Currents, connections, and controversies* (pp. 3-65). Cambridge: Cambridge University Press.
- Goos, M., Van Damme, J., Onghena, P., Petry, K., & de Bilde, J. (2013). First-grade retention in the Flemish educational context: Effects on children's academic growth, psychosocial growth, and school career throughout primary education. *Journal of School Psychology*, 51(3), 323-347.
- Hall, G., & Hord, S. M. (2006). *Implementing change: patterns, principles and potholes* (2nd ed.). Boston: Pearson Education Inc.
- Hammond, K. R. (1996). *Human judgement and social policy: Irreducible uncertainty, inevitable error, unavoidable injustice*. New York: Oxford University Press.
- Hammond, K. R., Hamm, R. M., Grassia, J., & Pearson, T. (1987). Direct comparison of the efficacy of intuitive and analytical cognition in expert judgment. *IEEE Transactions on Systems, Man, and Cybernetics*, 17(5), 753-770.
- Hargreaves, A., & Fullan, M. (1992). *Understanding teacher development*. New York: Teachers College Press.

- Harlen, W., & Crick, R. D. (2002). A systematic review of the impact of summative assessment and tests on students' motivation for learning (EPPI Centre Review). London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.
- Harteis, C., Koch, T., & Morgenthaler, B. (2008). How intuition contributes to high performance: an educational perspective. *Education Review*, 5(1), 68-80.
- Hegarty, M. (1991). Knowledge and processes in mechanical problem solving. In R. J. Sternberg & P. A. Frensch (Eds.), *Complex problem solving: Principles and mechanisms* (pp. 253-285). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Hinnant, J. B., O'Brien, M., & Ghazarian, S. R. (2009). The longitudinal relations of teacher expectations to achievement in the early school years. *Journal of Educational Psychology*, 101(3), 662-670.
- Hitchcock, D. (2017). Do the fallacies have a place in the teaching of reasoning skills or critical thinking? In *On reasoning and argument* (pp. 401-408). Cham, Switzerland: Springer International.
- Hogarth, R. M. (2001). *Educating intuition*. Chicago: University of Chicago Press.
- Hoge, R. D., & Coladarci, T. (1989). Teacher-based judgments of academic achievement: A review of literature. *Review of Educational Research*, 59(3), 297-313.
- Hoy, W., & Miskel, C. (2001). *Educational administration: Theory, research and practice*. Boston: McGraw-Hill.
- Hubbard, L., Datnow, A., & Prunty, L. (2014). Multiple initiatives, multiple challenges: The promise and pitfalls of implementing data. *Studies In Educational Evaluation*, 42, 54-62.
- Hulpia, H. (2004). *The use of performance indicators in a school improvement policy. What do experts say about it?* Paper presented at the AERA Annual conference, San Diego.
- Hunt, R. G., Krystofiak, F. J., & Meindl, J. R. (1989). Cognitive style and decision making. *Organizational Behavior and Human Decision Processes*, 44, 436-453.
- Ikemoto, G. S., & Marsh, J. A. (2007). Cutting through the "data driven" mantra: Different conceptions of data-driven decision making. In P. A. Moss (Ed.), *Evidence and decision making*. Chicago: National Society for the Study of Education.
- Jimerson, J. B., Cho, V., & Wayman, J. C. (2016). Student-involved data use: Teacher practices and considerations for professional learning. *Teaching and Teacher Education*, 60, 413-424.
- Johnson, J. (1997). Data-driven school improvement. *Emergency Librarian*, 24(4), 30-31.
- Jussim, L., & Harber, K. D. (2005). Teacher expectations and self-fulfilling prophecies: Knowns and unknowns, resolved and unresolved controversies. *Personality & Social Psychology Review*, 9, 131-155.
- Kahneman, D. (2003). A perspective on judgment and choice: Mapping bounded rationality. *American Psychologist*, 58(9), 697-720.
- Kahneman, D., & Frederick, S. (2005). A model of heuristic judgment. In K. J. Holyoke & R. G. Morrison (Eds.), *Cambridge handbook of thinking and reasoning* (pp. 267-293). Cambridge: Cambridge University Press.
- Kahneman, D., & Klein, B. M. (2009). Conditions for intuitive expertise. A failure to disagree. *American Psychologist*, 64, 515-526.
- Kahneman, D., & Tversky, A. (1972). Subjective probability: A judgment of representativeness. *Cognitive Psychology*, 3(3), 430-454.
- Kaiser, J., Retelsdorf, J., Südkamp, A., & Möller, J. (2013). Achievement and engagement: How student characteristics influence teacher judgments. *Learning and Instruction*, 28, 73-84.
- Kane, M. (2013). The argument-based approach to validation. *School Psychology Review*, 42(4), 448-457.
- Kaufmann, E., Reips, U.-D., & Merki, K. M. (2016). Avoiding methodological biases in meta-analysis. *Zeitschrift für Psychologie*, 224, 157-167.
- Keating, D. (1996). *Habits of mind for a learning society: Education for human development*. Cambridge, MA: Blackwell.
- Kelchtermans, G. (2009). Who I am in how I teach is the message: self-understanding, vulnerability and reflection. *Teacher and Teaching*, 15(2), 257-272.
- Kellaghan, T., & Stufflebeam, D. (Eds.). (2003). *International handbook of educational evaluation*. Boston: Kluwer Academic Publishers.

- Kellaghan, T., & Stufflebeam, D. L. (2003). Program evaluation in Europe: between democratic and new public management evaluation. In T. Kellaghan & D. L. Stufflebeam (Eds.), *International handbook of educational evaluation* (pp. 429-439). Dordrecht: Kluwer Academic Publishers.
- Kelly, F. J. (1914). *Teachers' marks: Their variability and standardization*. New York: Teachers College, Columbia University.
- Kember, D., & Gow, L. (1994). Orientations to teaching and their effect on the quality of student learning. *The Journal of Higher Education*, 65(1), 58-74.
- Kerr, K. A., Marsh, J. A., Ikemoto, G. S., Darilek, H., & Barney, H. (2006). Strategies to promote data use for instructional improvement: Actions, outcomes, and lessons from three urban districts. *American Journal of Education*, 112, 496-520.
- Klayman, J. (1995). Varieties of confirmation bias. *Psychology of Learning and Motivation*, 32, 385-418.
- Klein, G. (1997). The recognition-primed decision (RPD) model: Looking back, looking forward. In C. E. Zsombok & G. Klein (Eds.), *Naturalistic decision making* (pp. 285-292). Mahwah, NJ: Lawrence Erlbaum Associates.
- Klein, G. (2008). Naturalistic decision making. *Human Factors*, 50(3), 456-460.
- Klein, G. A., Calderwood, R., & Clinton-Cirocco, A. (1986). *Rapid decision making on the fireground*. Paper presented at the Proceedings of the Human Factors Society Annual Meeting.
- Knapp, M. S., Copland, M. A., & Swinnerton, J. A. (2007). chapter 4 Understanding the Promise and Dynamics of Data-Informed Leadership. *Yearbook of the National Society for the Study of Education*, 106(1), 74-104.
- Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Delhi: New Age International.
- Kwakman, K. (2003). Factors affecting teachers' participation in professional learning activities. *Teaching and Teacher Education*, 19(2), 149-170.
- Langan-Fox, J., & Shirley, D. A. (2003). The nature and measurement of intuition: Cognitive and behavioral interests, personality, and experiences. *Creativity Research Journal*, 15, 207-222.
- Lavigne, A. L. (2014). Exploring the intended and unintended consequences of high-stakes teacher evaluation on schools, teachers, and students. *Teachers College Record*, 116(1), 1-29.
- Leonard, N. H., Scholl, R. W., & Kowalski, K. B. (1999). Information processing style and decision making. *Journal of Organizational Behavior*, 20, 407-420.
- LeTendre, G. K., Hofer, B. K., & Shimizu, H. (2003). What is tracking? Cultural expectations in the United States, Germany, and Japan. *American Educational Research Journal*, 40(1), 43-89.
- Levin, J., & Datnow, A. (2012). The principal role in data driven decision making: Using case study data to develop multi-mediator models of educational reform. *School Effectiveness & School Improvement*, 23(2), 179-201.
- Lindblom-Ylänne, S., Trigwell, K., Nevgi, A., & Ashwin, P. (2006). How approaches to teaching are affected by discipline and teaching context. *Studies in Higher Education*, 31(3), 285-298.
- Little, J. W. (2012). Understanding data use practice among teachers: The contribution of micro-process studies. *American Journal of Education*, 118(2), 143-166.
- Louws, M. L., Meirink, J. A., van Veen, K., & van Driel, J. H. (2017). Teachers' self-directed learning and teaching experience: What, how, and why teachers want to learn. *Teaching and Teacher Education*, 66, 171-183.
- Lyles, M. A., & Mitroff, I. I. (1980). Organizational problem formulation: An empirical study. *Administrative Science Quarterly*, 102-119.
- Mahieu, P., & Vanhoof, J. (2010). Data driven development for schools and educational policy: the case of the Antwerp primary education. In P. Mahieu (Ed.) *Ways to professionalise school leadership in times of turbulence and complexity* (pp. 99-110). Antwerp: Garant.
- Mandinach, E. B., & Gummer, E. S. (2013). A systemic view of implementing data literacy in educator preparation. *Educational Researcher*, 42(1), 30-37.
- Mandinach, E. B., & Gummer, E. S. (2016). What does it mean for teachers to be data literate: Laying out the skills, knowledge, and dispositions. *Teaching and Teacher Education*, 60, 366-376.
- Mandinach, E. B., Honey, M., & Light, D. (2006). *A theoretical framework for data-driven decision making*. Paper presented at the AERA conference, San Francisco.

- Mandinach, E. B., Honey, M., Light, D., & Brunner, C. (2008). A conceptual framework for data-driven decision making. In E. B. Mandinach & M. Honey (Eds.), *Data-driven school improvement: Linking data and learning* (pp. 13–31). New York, NY: Teachers College Press.
- Mandinach, E. B., & Jimerson, J. B. (2016). Teachers learning how to use data: A synthesis of the issues and what is known. *Teaching and Teacher Education, 60*, 452-457.
- March, J. G. (1978). Bounded rationality, ambiguity, and the engineering of choice. *The Bell Journal of Economics, 9*(2), 587-608.
- March, J. G. (1994). *A primer on decision-making*. New York: The Free Press.
- Marks, G. N., Creswell, J., & Ainley, J. (2006). Explaining socioeconomic inequalities in student achievement: The role of home and school factors. *Educational Research and Evaluation, 12*(2), 105-128.
- Marsh, J. A. (2012). Interventions promoting educators' use of data: Research insights and gaps. *Teacher College Record, 19*(9), 11-16.
- Marsh, J. A., Pane, J. F., & Hamilton, L. S. (2006). *Making sense of data-driven decision making in education. Evidence from recent RAND research*. Santa Monica, CA: RAND Corporation.
- Maso, I., & Smaling, A. (1998). *Kwalitatief onderzoek: praktijk en theorie*. (Qualitative research: practice and theory) Amsterdam: Boom.
- McCarty, C. (2002). Stereotype formation as category formation. In C. McCarty, V. Y. Yzerbyt, & R. Spears (Eds.), *Stereotypes as explanations: The formation of meaningful beliefs about social groups* (pp. 16-37). Cambridge, UK: Cambridge University Press.
- Meirink, J. A., Meijer, P. C., Verloop, N., & Bergen, T. C. (2009). Understanding teacher learning in secondary education: The relations of teacher activities to changed beliefs about teaching and learning. *Teaching and Teacher Education, 25*(1), 89-100.
- Miles, M., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: a methods sourcebook* (3rd ed.). Thousand Oaks, CA: Sage.
- Miles, M., & Huberman, M. (1994). *Qualitative data analysis*. London: Sage.
- Mintzberg, H., Raisinghani, D., & Theoret, A. (1976). The structure of "unstructured" decision processes. *Administrative Science Quarterly, 21*(2), 246-275.
- Mintzberg, H., & Westley, F. (2001). Decision making: It's not what you think. *MIT Sloan Management Review, 42*(3), 89-93.
- Myers, D. G. (2002). *Intuition. Its powers and perils*. New Haven: Yale University Press.
- Nutt, P. C. (1990). Strategic decisions made by top executives and middle managers with data and process dominant style. *Journal of Management Studies, 27*, 173-194.
- OECD. (1998). *Overcoming failure at school*. Retrieved from: <http://www.oecd.org/education/school/45171670.pdf>
- Oláh, L. N., Lawrence, N. R., & Riggan, M. (2010). Learning to learn from benchmark assessment data: How teachers analyze results. *Peabody Journal of Education, 85*(2), 226-245.
- Onwuegbuzie, A. J., & Leech, N. L. (2007). Validity and qualitative research: An oxymoron? *Quality & Quantity, 41*(2), 233-249.
- Pajares, F. (2003). Self-efficacy beliefs, motivation, and achievement in writing: A review of the literature. *Reading and Writing Quarterly, 2*, 139-158.
- Pajares, M. F. (1992). Teachers' beliefs and educational research. Cleaning up a messy construct. *Review of Educational Research, 62*, 307-332.
- Park, V., & Datnow, A. (2017). Ability grouping and differentiated instruction in an era of data-driven decision making. *American Journal of Education, 123*(2), 281-306.
- Pelletier, L. G., & Sharp, E. C. (2009). Administrative pressures and teachers' interpersonal behavior in the classroom. *Theory and Research in Education, 7*(2), 174-183.
- Penninckx, M., Vanhoof, J., & Van Petegem, P. (2011). *Evaluatie in het Vlaamse onderwijs. Beleid en praktijk van leerling tot overheid* [Evaluation in Flemish education. Policy and practice from pupil to government.]. Antwerp: Garant.
- Postareff, L., & Lindblom-Ylänne, S. (2008). Variation in teachers' descriptions of teaching: Broadening the understanding of teaching in higher education. *Learning and Instruction, 18*(2), 109-120.
- Pratt, D. D. (2002). Good teaching: One size fits all? *New Directions for Adult and Continuing Education, 93*, 5-16.

- Randall, J., & Engelhard, G. (2010). Examining the grading practices of teachers. *Teaching and Teacher Education, 26*(7), 1372-1380.
- Reeves, D. J., Boyle, W. F., & Christie, T. (2001). The relationship between teacher assessments and pupil attainments in standard test tasks at Key Stage 2, 1996–98. *British Educational Research Journal, 27*(2), 141-160.
- Rossi, P. H., Lipsey, M. W., & Freeman, H. E. (2004). *Evaluation: A systematic approach*. Thousand Oaks: Sage Publications.
- Rubie-Davies, C., Hattie, J., & Hamilton, R. (2006). Expecting the best for students: Teacher expectations and academic outcomes. *British Journal of Educational Psychology, 76*(3), 429-444.
- Rubie-Davies, C. M. (2010). Teacher expectations and perceptions of student attributes: Is there a relationship? *British Journal of Educational Psychology, 80*(1), 121-135.
- Rugg, H. O. (1918). Teachers' marks and the reconstruction of the marking system. *The Elementary School Journal, 18*(9), 701-719.
- Scheerens, J. (1990). School effectiveness research and the development of process indicators of school functioning. *School Effectiveness and School Improvement, 1*, 61-80.
- Scheerens, J. (2013). The use of theory in school effectiveness research revisited. *School Effectiveness and School Improvement, 24*(1), 1-38.
- Schildkamp, K., & Ehren, M. (2013). From "Intuition"- to "Data"-based decision making in Dutch Secondary Schools? In K. Schildkamp, M. K. Lai, & L. Earl (Eds.), *Data-based decision making in education: challenges and opportunities* (pp. 49–67). Dordrecht: Springer.
- Schildkamp, K., & Lai, M. K. (2013). *Data-based decision making: conclusions and theoretical framework*. In K. Schildkamp, M. K. Lai, & L. Earl (Eds.), *Data-based decision making in education: challenges and opportunities* (pp. 177-191). Dordrecht: Springer.
- Schildkamp, K., Lai, M. K., & Earl, L. (Eds.). (2013). *Data-based decision making in education: challenges and opportunities*. Dordrecht: Springer.
- Schildkamp, K., Poortman, C., Luyten, H., & Ebbeler, J. (2017). Factors promoting and hindering data-based decision making in schools. *School Effectiveness and School Improvement, 28*(2), 242-258.
- Schildkamp, K., Poortman, C. L., & Handelzalts, A. (2016). Data teams for school improvement. *School Effectiveness and School Improvement, 27*(2), 228-254.
- Schildkamp, K., & Teddlie, C. (2008). School performance feedback systems in the USA and in The Netherlands: a comparison. *Educational Research & Evaluation, 14*(3), 255-282.
- Schilling, J. (2006). On the pragmatics of qualitative assesment: Designing the process for content analysis. *European Journal of Psychological Assesment, 22*(1), 28-37.
- Schneider, A., & Ingram, H. (1993). Social construction of target populations: Implications for politics and policy. *The American Political Science Review, 87*(2), 334-347. doi:10.2307/2939044
- Senge, P. (2001). *Lerende scholen: een vijfde discipline-handboek voor onderwijzers, ouders en iedereen die betrokken is bij scholing*. (Learning schools: a fifth discipline handbook for teachers, parents and other stakeholders). Schoonhoven: Academic Press.
- Shafir, E. (1994). Uncertainty and the difficulty of thinking through disjunctions. *Cognition and Instruction, 50*, 403-430.
- Shapiro, S., & Spence, M. T. (1997). Managerial intuition: A conceptual and operational framework. *Business Horizons, 40*(1), 63-68.
- Sharma, N., & Sharma, K. (2015). 'Self-fulfilling prophecy': A literature review. *International Journal of Interdisciplinary and Multidisciplinary Studies (IJIMS), 2*(3), 41-42.
- Shavelson, R. J., & Stern, P. (1981). Research on teachers' pedagogical thoughts, judgments, decisions, and behavior. *Review of Educational Research, 51*(4), 455-498.
- Shepard, L. (2001). The role of classroom assessment in teaching and learning. In V. K. Richardson (Ed.), *Handbook of research on teaching* (4th ed., pp. 1066–1101). Washington, DC: American Educational Research Association.
- Shepard, L. A., & Smith, M. L. (1989). *Flunking grades: Research and policies on retention*. London: The Falmer Press.

- Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4-14.
- Simon, H. A. (1987). Making management decisions: The role of intuition and emotion. *The Academy of Management Executive*, 1(1), 57-64.
- Sloman, S. A. (2002). Two systems of reasoning. In T. Gilovich, D. Griffin, & D. Kahneman (Eds.), *Heuristics and biases: The psychology of intuitive judgment* (pp. 379-396). New York, NY: Cambridge University Press.
- Slovic, P., Finucane, M., Peters, E., & MacGregor, D. G. (2002). Rational actors or rational fools: Implications of the affect heuristic for behavioral economics. *The Journal of Socio-Economics*, 31(4), 329-342.
- Smith, A. E., Jussim, L., & Eccles, J. (1999). Do self-fulfilling prophecies accumulate, dissipate, or remain stable over time? *Journal of Personality & Social Psychology*, 77, 548-565.
- Smylie, M. (1992). Teacher participation in school decision making: Assessing willingness to participate. *Educational Evaluation and Policy Analysis*, 14(1), 53-67.
- Spencer, T. D., Detrich, R., & Slocum, T. A. (2012). Evidence-based practice: A framework for making effective decisions. *Education And Treatment of Children*, 35(2), 127-151.
- Spillane, J. P. (2012). Data in practice: Conceptualizing the data-based decision-making phenomena. *American Journal of Education*, 118(2), 113-141.
- Spillane, J. P., & Miele, D. B. (2007). Evidence in practice: A framing of the terrain. *Yearbook of the National Society for the Study of Education*, 106(1), 46-73.
- Spillane, J. P., Reiser, B. J., & Reimer, T. (2002). Policy implementation and cognition: Reframing and refocusing implementation research. *Review of Educational Research*, 72(3), 387-431.
- Starch, D., & Elliott, E. C. (1912). Reliability of the grading of high-school work in English. *The School Review*, 20(7), 442-457.
- Stiggins, R. J. (2005). *Student-involved assessment for learning*. Columbus, OH: Prentice Hall.
- Strayhorn, T. L. (2009). Accessing and analyzing national databases. In T. Kowalski & T. Lasley (Eds.), *Handbook of data-based decision making in education* (pp. 105-122). New York: Routledge.
- Taylor, R. N. (1984). *Behavioral decision making*. Glenview, IL: Scott Foresman & Co.
- Terwel, J. (2006). Is de school een sorteermachine? Schoolkeuze en schoolloopbaan van leerlingen van 10-16 jaar. (Is school a sorting machine. School choice and educational tracks of pupils from 10 - 16). Amsterdam: Vrije Universiteit Amsterdam.
- Thomas, L., & Beauchamp, C. (2011). Understanding new teachers' professional identities through metaphor. *Teaching and Teacher Education*, 27(4), 762-769.
- Thoonen, E. J., Sleegers, P., Oort, F. J., Peetsma, T. D., & Geijsel, F. (2011). How to improve teaching practices: The role of teacher motivation, organizational factors, and leadership practices. *Educational Administration Quarterly*, 47(3), 496-536.
- Timperley, H., & Parr, J. (2010). *Evidence, inquiry and standards*. Wellington: NZCER.
- Timperley, H. S., & Phillips, G. (2003). Changing and sustaining teachers' expectations through professional development in literacy. *Teaching and Teacher Education*, 19(6), 627-641.
- Trigwell, K., & Prosser, M. (1996). Changing approaches to teaching: A relational perspective. *Studies in Higher Education*, 21(3), 275-284.
- Trigwell, K., Prosser, M., & Taylor, P. (1994). Qualitative differences in approaches to teaching first year university science. *Higher Education*, 27(1), 75-84.
- Trigwell, K., Prosser, M., & Waterhouse, F. (1999). Relations between teachers' approaches to teaching and students' approaches to learning. *Higher Education*, 37(1), 57-70.
- Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education*, 17(7), 783-805.
- Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, 211, 453-458.
- Urhahne, D. (2015). Teacher behavior as a mediator of the relationship between teacher judgment and students' motivation and emotion. *Teaching and Teacher Education*, 45, 73-82.
- Van der Kleij, F. M., Vermeulen, J. A., Schildkamp, K., & Eggen, T. J. (2015). Integrating data-based decision making, Assessment for Learning and diagnostic testing in formative assessment. *Assessment in Education: Principles, Policy & Practice*, 22(3), 324-343.

- Van Gasse, R., Vanlommel, K., Vanhoof, J., & Van Petegem, P. (2016). Teacher collaboration on the use of pupil learning outcome data: A rich environment for professional learning? *Teaching and Teacher Education*, *60*, 387-397.
- Van Gasse, R., Vanlommel, K., Vanhoof, J., & Van Petegem, P. (2017). The impact of collaboration on teachers' individual data use. *School Effectiveness and School Improvement*, *28*(3), 489-504 .
- Van Petegem, P. (2005). *Vormgeving aan schoolbeleid: effectieve-scholenonderzoek als inspiratiebron voor de zelfevaluatie van scholen*. (Building school policy: school-effectiveness research as inspiration for self evaluation). Leuven: Acco.
- Van Veen, K., Slegers, P., & Van de Ven, P.-H. (2005). One teacher's identity, emotions, and commitment to change: A case study into the cognitive–affective processes of a secondary school teacher in the context of reforms. *Teaching and Teacher Education*, *21*(8), 917-934.
- Vanhoof, J., Mahieu, P., & Van Petegem, P. (2009). Geïnformeerde schoolontwikkeling: van een nieuw gegeven naar een beleidsinstrument. (*Informed school development: a policy instrument*). *Kwaliteitszorg in het onderwijs* (22), 17-51.
- Vanhoof, J., Vanlommel, K., Thijs, S., & Vanderlocht, H. (2014). Data use by Flemish School Principals: Impact of Attitude, Self-efficacy and External Expectations *Educational Studies*, *40*(1), 48-62.
- Vanlommel, K., Van Gasse, R., Vanhoof, J., & Van Petegem, P. (2017). How approaches to teaching influence the way teachers collect data to inform their judgement. *Submitted for review*.
- Vanlommel, K., Van Gasse, R., Vanhoof, J., & Van Petegem, P. (2017). Teachers' decision-making: Data based or intuition driven? *International Journal of Educational Research*, *83*, 75-83.
- Vanlommel, K., Vanhoof, J., & Van Petegem, P. (2016). Data use by teachers: the impact of motivation, decision-making style, supportive relationships and reflective capacity. *Educational Studies*, *42*(1), 36-53.
- Verhaeghe, G., Vanhoof, J., Van Petegem, P., Verhaeghe, J. P., & Van Damme, J. (2010). Het gebruik van outputgegevens in basisscholen: concretisering en illustraties uit het schoolfeedbackproject. (Using output data in primary education: lessons from the school feedback project). *Kwaliteitszorg in het onderwijs*, 29-57.
- Verloop, N., Van Driel, J., & Meijer, P. C. (2001). Teacher knowledge and the knowledge base of teaching. *International Journal of Educational Research*, *35*, 441-461.
- Wayman, J. C., Spring, S. D., Lemke, M. A., & Lehr, M. D. (2012). *Using data to inform practice: Effective principal leadership strategies*. Paper presented at the American Educational Research Association conference, Vancouver, Canada.
- Weick, K. E. (1995). *Sensemaking in organizations*. Thousand Oaks, CA: Sage.
- Whitehurst, G. J. (2002). *Evidence-based education*. Paper presented at the Student Achievement and School Accountability Conference, U.S.
- Williams, D., & Coles, L. (2007). Teachers' approaches to finding and using research evidence: an information literacy perspective. *Educational Research and Evaluation*, *49*(2), 185-206.
- Wohlstetter, P., Datnow, A., & Park, V. (2008). Creating a system for data-driven decision-making: Applying the principal-agent framework. *School Effectiveness and School Improvement*, *19*(3), 239-259.
- Woolfolk, A. E., & Hoy, W. K. (1990). Prospective teachers' sense of efficacy and beliefs about control. *Journal of Educational Psychology*, *82*(1), 81.
- Yan, Z., & Cheng, E. C. K. (2015). Primary teachers' attitudes, intentions and practices regarding formative assessment. *Teaching and Teacher Education*, *45*, 128-136.
- Yin, R. (1994). *Case study research: Design and methods*. Beverly Hills, CA: Sage Publishing.
- Young, V. M. (2006). Teachers' use of data: Loose coupling, agenda setting, and team norms. *American Journal of Education*, *112*(4), 521-548.
- Zanting, A., Verloop, N., & Vermunt, J. D. (2001). Student teachers' beliefs about mentoring and learning to teach during teaching practice. *British Journal of Educational Psychology*, *71*(1), 57-80.
- Zembylas, M. (2003). Emotions and teacher identity: A poststructural perspective. *Teachers and Teaching*, *9*(3), 213-238.

Teacher judgement is an important issue, given the great impact of high-stakes decisions such as placement and promotion on pupils' educational trajectories. For many years, teachers' experiential knowledge was considered to be a solid base for teacher judgment; it is only recently that teachers have been expected more and more to use data to inform their decision making. This expectation is based on critiques questioning the accuracy of intuitive teacher judgment. Research has shown that intuitive teacher judgment can be inaccurate when prompted for example by expectancy effects or different sorts of bias.

While frameworks have been developed to guide data use, other scholars argue that these maximizing rational procedures do not coincide with decision making in complex contexts such as education. They argue that contextualized experiential knowledge is needed to make wise decisions in ambiguous circumstances with uncertainty about the outcomes. In the field of naturalistic decision-making, the recognition-primed decision model, based on earlier theories of intuition as expertise, describes how experts develop patterns and mental models that allow them to recognize relevant cues automatically without deliberate attention.

Although the question whether to trust in intuitive or rational approaches to judgement is a controversial topic in education, many researchers in the field of decision making agree that it seems appropriate to assume that both rational and intuitive processes are needed for wise and professional decision making in a contextualised fashion. Since there was little insight into how rational and intuitive processes mutually influence teacher judgment this dissertation makes a valuable contribution to the theoretical evidence base by describing and explaining the interplay of both processes of teacher judgment throughout the different steps of decision making. We developed and tested a theoretical framework that proved to be a valuable lens to study professional teacher judgement as a combination of rational and intuitive processes. In this manner, this dissertation offers a valuable starting point for theory and practice to understand how teachers make decisions and provides recommendations to enhance both rational and intuitive processes of teacher judgement.