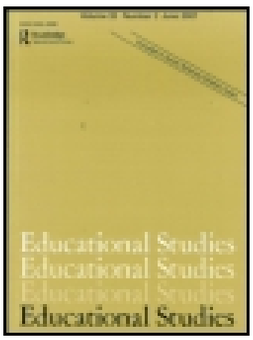

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Data use by teachers: the impact of motivation, decision-making style, supportive relationships and reflective capacity

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ABSTRACT

There is a growing expectation that schools should systematically collect and analyse data as a point of departure for decisions. However, research shows that teachers themselves are less convinced that they need to base their decisions on data, as they mainly rely on their intuition and experience. This article examines the extent to which teachers use data as a source of information for decisions at classroom level and what motivates them to use these data. We will also look at what impact the teacher's decision-making style, supportive relationships and the reflective capacity of the school team have on teachers' motivation for using data. Our research data was collected by means of an online survey of 408 teachers in 52 primary schools in Flanders. The results demonstrate that the quality of teachers' motivation for using data is a key element in promoting data use in schools. Teachers who feel autonomously motivated will make greater use of data than teachers with a controlled motivation. We found that the use of a rational decision-making style by teachers, supportive relationships within the school and the reflective capacity of the school team all lead to an increase in teachers' autonomous motivation for using data.

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Data use; decision making; decision-making style; reflective capacity; supportive relationships

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, and Freeman 2004; Earl and Katz 2006; Schildkamp and Ehren 2013). 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 and 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

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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 standardised 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 standardised tests, or do so only to a limited extent, given that this is a rich source of information about their pupils (Timperley and Phillips 2003; Lai and Schildkamp 2013). 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 and 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 and 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, Krzystofiak, and Meindl 1989). We should remember that the implicit knowledge base of teachers has long been recognised as the principal source of information (Darling-Hammond and 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 (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 scare (Thoonen et al. 2011). The results of the few studies available show that the impact of different structural and cultural dimensions of the school organisation on teaching practices are mediated by psychological factors (Smylie 1992; Kwakman 2003; Geijsel et al. 2009). 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 and 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 familiarise 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 (Prick 1989; Esteve 1992; Neves de Jesus and Lens 2005). SDT assumes that people have a natural desire to continue to develop and to take on new responsibilities (Deci and Vansteenkiste 2004). However, SDT recognises 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 and 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 (Bryk and Schneider 2003; Hoy and Tschannen-Moran 2003; Schildkamp, Karbautzki, and Vanhoof 2013). Motivation is also influenced by the personal characteristics of the individual (Bandura 1997; Deci and Ryan 2002). 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.

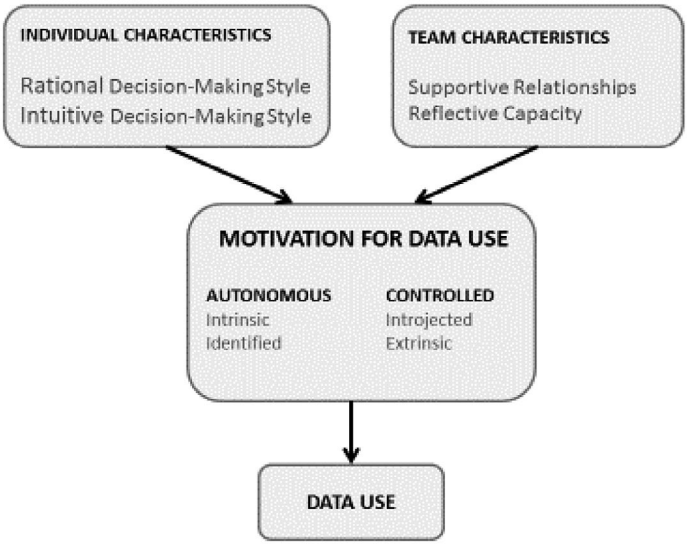

Figure 1. Conceptual model.

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 the literature, "data" and "data use" are often intentionally conceptualised 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 organised in order to examine particular aspects of the school (Robinson and 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 standardised tests provide us a valuable case; first, because they are standardised 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 standardised tests and are intended to provide schools with a reliable resource that they can use to assess their teaching practice (Duerloo 2014). 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 (Wayman and Stringfield 2006; Kowalski and Lasley II 2009; Barrezeele 2012; Levin and

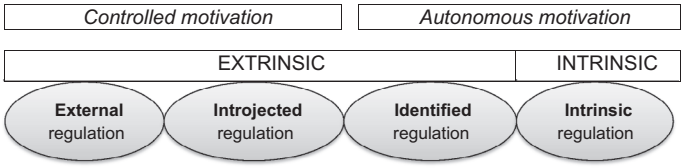

Figure 2. The self-determination continuum (Ryan & Connel 1989).

Datnow 2012; Schildkamp et al. 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. 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 and 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. SDT differs from other theories in that it emphasises the quality of the individual's motivation rather than the quantity of motivation (Vansteenkiste, Lens, and 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, and Deci 2006).

2.2.1. Controlled motivation for data use

SDT refers to "controlled motivation" when the behaviour in question, in this case, data use is regulated by pressure, obligation and control (Deci and 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 internalisation, 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 and 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 and 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 and 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 and 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 and Datnow 2012; Schildkamp, Ehren, and Lai 2012; Deci and 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, and 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 (Bryk and Schneider 2003; Vanhoof and Van Petegem 2011). *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 and 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 (Earl and Katz 2002; Vanhoof and Van Petegem 2011). 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 (Kerr et al. 2006; Wohlstetter, Datnow, and Park 2008).

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 organise standardised 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 standardised 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 standardised 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

Table 1. 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 *The feedback reports have contributed to the introduction of other teaching methods in the classroom*	8	0.93	306
Autonomous motivation: Intrinsic *We work with the feedback reports because we find them very interesting*	3	0.89	287
Autonomous motivation: Identifie *We work with the feedback reports because we want to understand our pupils better*	6	0.95	287
Controlled motivation: External *We work with the feedback reports because the school management/inspectorate forces us to do so*	3	0.86	285
Controlled motivation: Introjected *We work with the feedback reports because we would feel guilty if we didn't*	3	0.84	282
Decision-making Style: Rational *I think carefully before I make a decision*	3	0.95	398
Decision-making Style: Intuitive *For most decisions it is a good idea to trust your instincts*	4	0.89	392
Reflective capacity *In our school we firmly believe in the importance of reflection based on the feedback reports*	5	0.90	272
Supportive relationships *In our school we work together as a close-knit team to use the feedback reports*	5	0.92	255

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 1411 primary schools from a single school network within the Flemish educational system which participated in the same standardised tests. These standardised 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 standardised 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 and 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.

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

On the basis of the findings set out in Table 2 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 recognise 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

Table 2. Descriptive statistics – answer categories: 1 = entirely disagree; 2 = disagree; 3 = neither disagree/nor agree; 4 = agree; 5 = entirely agree.

Scale	ave.	SD	Min	Max
Data use	3.18	0.81	1.00	5.00
Autonomous motivation				
Intrinsic	2.97	0.70	1.00	5.00
Identified	3.72	0.73	1.00	5.00
Controlled motivation				
External	3.03	1.09	1.00	5.00
Introjected	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

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 and Muthén 2003). Figure 3 shows the results of this path model in terms of standardised 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 and Bentler 1999). Finally, the 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 initial model is included as appendix.

The path model shows that we can conceptualise 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

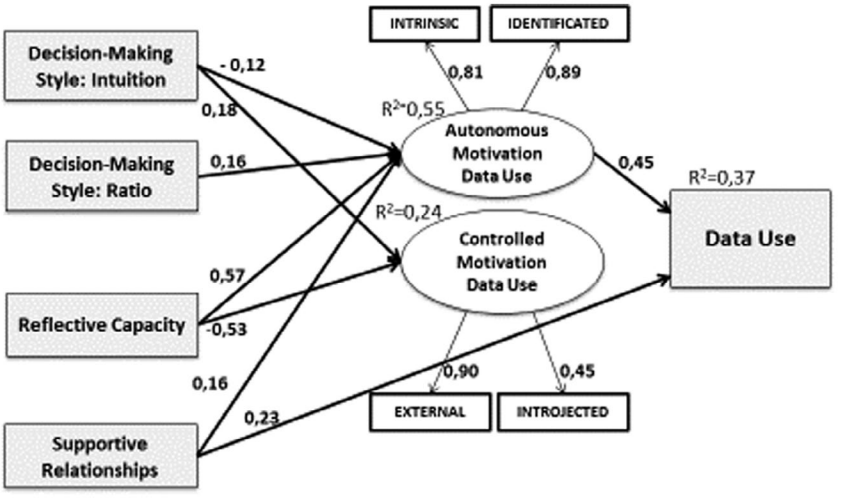

Figure 3. Path model.

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).

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 standardised 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 (Marsh et al. 2006. 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 (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. When the results of standardised 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 self-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 realise 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 centre 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 organisational 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.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Appendix 1. Correlation matrix

Correlation matrix (n = 176)

	DI	DR	RC	SR	IM	IdM	InM	EM
Decision-making style: Intution (DI)	1.00							
Decision-making style: Ratio (DR)	0.02	1.00						
Reflective capacity (RC)	0.05	0.28	1.00					
Supportive relationships (SR)	0.09	0.14	0.68	1.00				
Intrinsic motivation (IM)	−0,05	0.19	0.58	0.42	1.00			
Identified motivation (IdM)	−0,08	0,34	0,66	0,53	0,71	1,00		
Introjected motivation (InM)	0.01	−0.19	−0.21	−0.05	−0,20	−0,29	1,00	
Extrinsic motivation (EM)	0.14	−0.17	−0.42	−0.24	−0,58	−0.52	0,39	1,00

Appendix 2. Initial Structural Model