Increasing data-informed decision making in vocational education:

An exploratory case study at Groenhorst Emmeloord

A.J.H.M. (Jessy) Winkels
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Supervisors:
Dr. A. Handelzalts & Dr. C.L. Poortman

dateteams UNIVERSITY OF TWENTE. Groenhorst

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AUTHOR:
Jessy Winkels (s1002864)

EDUCATIONAL INSTITUTE:
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Dr. C.L. Poortman (second supervisor)

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Summary

This research describes an exploratory case study on data-informed decision making in vocational education. For this study, data-informed decision making is defined as a cyclic process for translating data, through information, to workable knowledge and using this knowledge in a systematical and goal-oriented way to inform decisions at the student-, classroom- and school level. High quality in schools is one of the priorities of the Dutch Ministry of Education and many primary- and secondary schools achieve this quality by attaining in data-informed decision making. This process does not only lead to high quality, but also improves student results.

Nevertheless, many vocational schools do not participate in data-informed decision making yet. Therefore, this research investigates how the use of data-informed decision making can be increased in vocational education, so this type of education can also benefit from high quality in their schools and increased student results. This study first focuses on defining the current state of data-informed decision making in one vocational school: Groenhorst Emmeloord. Second, as professional development of practitioners is crucial for the success of data-informed decision making, characteristics of a viable professional development program are explored in this context. A questionnaire, interviews and a workshop of Project Datateams, a promising program for secondary education, were carried out to answer these questions.

According to Schildkamp and Kuiper (2010) data can be used for accountability, school improvement and instructional purposes. These types of data use are influenced by: (1) data characteristics, like accessibility, usability and quality of the data, (2) school organizational characteristics, like school leadership, collaboration, visions, norms and goals and training and support and (3) data user characteristics, like knowledge and skills to use data and attitude towards data use. These elements were used to describe the current state of data-informed decision making in Groenhorst Emmeloord.

Regarding the current state of data-informed decision making use in Groenhorst Emmeloord, there is room for improvement. Respondents state to use data for accountability, school improvement and instructional purposes, but the results show that this data use level can still be increased. Therefore, Groenhorst Emmeloord could work on its data characteristics. These data are valued as sufficient for the purposes they are currently used for, but respondents question if these data fit all the data-informed decision making criteria. Second, Groenhorst Emmeloord could improve policy planning for data use. By this, school leaders can better guide the data-informed decision making process, there are clear objectives for data sharing, visions, norms and goals for data use become clear and training and support become available to improve the data use process. Finally, there are some mixed feelings regarding data-informed decision making; by creating a positive shared attitude towards this method, data use can also increase.

Data-informed decision making is stated to be a difficult process in primary- and secondary education and this study points out that this is also applicable to practitioners of Groenhorst Emmeloord. Therefore, professional development could be very valuable to assist practitioners in learning the data-informed decision making process. According to Timperley, (2008), there are ten characteristics of a successful professional development program: (1) focus on valued student outcomes, (2) worthwhile content, (3) integration of knowledge and skills, (4) assessment of professional inquiry, (5) multiple opportunities to learn and apply information, (6) approaches responsive to learning process, (7) opportunities to process new learning with others, (8) knowledgeable expertise, (9) active leadership and (10) maintaining momentum. All ten concepts were evaluated with practitioners of Groenhorst Emmeloord and they were all found important; especially focusing on valued student outcomes (and student contentment), assessment of professional inquiry and multiple opportunities to learn and apply information. Many professional development programs that Groenhorst Emmeloord has participated in in the past did not result in maintaining momentum; therefore, it is recommended to pay special attention to making the program sustainable.

The results indicate that Groenhorst Emmeloord could invest in improving their data characteristics, school organizational characteristics and data user characteristics. Because improvement is possible on different aspects, a professional development program could be very helpful to support practitioners of Groenhorst Emmeloord in this process. This can ultimately lead to an increased level of data-informed decision making in Groenhorst Emmeloord.

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1. Introduction

School quality has gained attention in the Netherlands in recent years (Krüger, 2010; Schildkamp & Ehren, 2013; Vanhoof, Verhaege, Verhaege, Valcke & Van Petegema, 2011). In 2012 only one third of the Dutch vocational schools appeared to meet the basic quality measures (Bontius, Van Bussel & Kamphuis, 2013) so quality improvement is needed. One of the ways to increase this quality is by making schools justify their decisions. It is assumed that they are then encouraged to think more carefully about their choices and that this will lead to more deliberate decisions. Because the school can make better choices, researchers believe that also the quality of the school will increase (Carlson, Borman & Robinson, 2011; Ingram, Seashore-Lois & Schroeder, 2004; Lai & Schildkamp, 2013).

To assist schools in making more deliberate decisions, the Dutch Ministry of Education has started to encourage schools to make use of their available data; for example, inspection reports, test results and classroom observations (Schildkamp, Poortman, Ebbeler & Luyten, 2013). According to the Dutch Ministry of Education, using these data for decision making should be part of the regular school process (Botta, Van Drunen, Potiek & Veltkamp, 2012; Visscher & Ehren, 2011). Data-informed decision making (DIDM) is:

- A cyclic process (Mandinach & Gummer, 2013),
- that informs decisions in schools (Ikemoto & Marsh, 2007; Mandinach & Gummer, 2013; Marsh, Pane & Hamilton, 2006),
- by testing whether goals are met (Van der Kleij & Eggen, 2013), and
- can take place at the student-, classroom-, and school level (Mandinach, 2012; Van der Kleij & Eggen, 2013).

When they use data successfully, schools can make deliberate decisions which do not only increase their school's quality (Bolhuis & Kools, 2012; Botta et al., 2012; Rijksoverheid, 2013a), but improve their student results too (e.g. McNaughton, Lai & Hsiao, 2012; Moss, 2013; Willis & Haymore Sandholtz, 2009). Primary- and secondary schools have already started using DIDM, but many vocational schools do not attain in this process yet. However, school quality is seen as very important by the Dutch Ministry of Education, also in vocational education (Krüger, 2010; Schildkamp & Ehren, 2013; Vanhoof et al., 2011). Therefore, there is need for exploration of the opportunities for DIDM in vocational education.

According to Schildkamp and Kuiper (2010) an important reason that schools do not use data, is because the main focus of schools is on the teaching practice. Additionally, teachers are not trained to work with data. DIDM is seen as a difficult process; in primary- and secondary education, practitioners lack knowledge and skills to successfully implement DIDM (Ledoux, Blok, Boogaard & Krüger, 2009; Noordink, 2011; Schildkamp & Ehren, 2013). Therefore, while studying DIDM in vocational education, attention must also be put on professional development (PD).

1.1 Motivation and relevance

From a scientific perspective there is a lack of studies on DIDM in vocational education. This lack of research is unfortunate, because DIDM has a positive influence on student outcomes (e.g. McNaughton et al., 2012; Moss, 2013; Willis & Haymore Sandholtz, 2009) and school quality (Bolhuis & Kools, 2012; Botta et al., 2012; Rijksoverheid, 2013a). Increasing the quality of vocational education is seen as very important by the Dutch Ministry of Education (Rijksoverheid, 2013a), so more research on this subject is needed. Additionally, because DIDM is a difficult process (e.g. Ledoux et al., 2009; Schildkamp & Ehren, 2013; Schildkamp & Kuiper, 2010) a PD-program on DIDM for vocational practitioners will be needed. This study also sheds light on what such a PD-program should look like.

The study takes place at Groenhorst, a Dutch vocational school. The practical relevance of this study for them is the insights they get about DIDM for their school. It will show them their current data use and resources that are needed to expand this data use. With their new knowledge of what DIDM entails and what a corresponding PD-program looks like, they can discuss how they would like to proceed with this method.

1.2 Research question

As mentioned before, quality improvement of vocational education is high on the agenda of the Dutch Ministry of Education (Rijksoverheid, 2013a). In primary- and secondary education, quality improvement can take place by means of DIDM; therefore, it is important to study this method in vocational education. This will be studied at Groenhorst, but mostly at one of its vocational schools: Groenhorst Emmeloord. This leads to the research question of this study: *How can the level of data-informed decision making at Groenhorst Emmeloord be increased?*

To increase DIDM, one should start by looking at present DIDM; how are data currently used? This will give insight into all opportunities and limitations for using DIDM in Groenhorst Emmeloord. Furthermore, because teachers currently lack knowledge and skills to successfully implement and use DIDM (e.g. Ledoux et al., 2009; Noordink, 2011; Schildkamp & Ehren, 2013), PD is probably needed (Inspectie van het onderwijs, 2013a). Therefore, it is important to study which characteristics such a PD-program should contain so increasing DIDM in Groenhorst Emmeloord can become a successful process. This leads to the following sub questions:

1. *What is the current state of data use at Groenhorst Emmeloord?*
2. *What are characteristics of a viable professional development program for data-informed decision making at Groenhorst Emmeloord?*

1.3 Context description of Groenhorst

This study focuses on vocational education, which is defined as a type of education that prepares students for a specific profession (Rijksoverheid, 2013b). According to the Dutch law of education and vocational education (Wet Educatie en Beroepsonderwijs) there are three aspects that vocational education should qualify for. To prepare students: (1) to practice a profession, or 'workmanship', (2) to participate in society, or 'citizenship', and (3) to progress to a higher level of education (Verheijen, 2012). To accomplish these qualifications, vocational schools keep a close relationship with the industry (Rijksoverheid, 2013c).

Groenhorst, an agricultural training center (in Dutch: 'agrarisch opleidingscentrum' or 'AOC') selected for this study, is such a vocational school and teaches agricultural professions in the Netherlands. It provides education for lower secondary education, vocational education and practical education (in Dutch: vmbo, mbo en praktijkonderwijs). Groenhorst has ten schools throughout the provinces Gelderland, Utrecht and Flevoland; seven of them provide vocational education. Because of their enthusiasm for data use, Groenhorst Emmeloord was selected for this case study. Emmeloord's department of vocational education consists of 25 teachers leaded by a team leader and a location director. Groenhorst Emmeloord provides the following subjects for their vocational students: arable farming, dairy farm management, horticulture, contractor, horse husbandry and applied biology.

1.4 Reading guide

This first chapter provided insight into the need for research on DIDM in vocational education and the research questions and context this study will focus on. Chapter 2 describes the theoretical framework, which elaborates on DIDM and PD. These concepts will first be explained and later be linked to the vocational context. Because this study is a case study, only a small amount of respondents have been asked to participate (Yin, 2003). By providing an extensive literature review on DIDM and PD in vocational education, the results of this study can be compared to the findings in literature, which will give an indication of the generalizability of the results.

Chapter 3 gives an overview of all the research methods and instruments that were used in this study. First, the respondents were asked to complete a questionnaire on data use. Second, vocational practitioners of Groenhorst Emmeloord have been interviewed to elaborate on data use and to indicate what kind of PD is appropriate to learn DIDM. Finally, they took part in a workshop for a PD-program for DIDM for secondary education to study with a group interview how this method fits vocational education. The results of these research instruments are presented in chapter 4.

Based on these results, chapter 5 provides a conclusion and discussion. It presents the answers to the research questions and discusses the research materials. Finally, the implications for practice and implication for further research are discussed, which derive from the answers to the research question and the discussion of the research materials.

2. Theoretical framework

To increase DIDM in vocational education, it is important to first understand what DIDM is and how it can be effective. Moreover, because DIDM is a difficult process and external help is needed to teach practitioners this method (Ledoux et al., 2009; Noordink, 2011; Schildkamp & Ehren, 2013), making PD successful is also an important topic to study. Finally, because the context of this research relates to vocational education, in addition DIDM and PD will be related to this context. Consequently, this chapter describes three different subjects: DIDM (2.1), PD-programs (2.2) and DIDM and PD-programs in vocational education (2.3). This leads to conclusions based on the literature review (2.4).

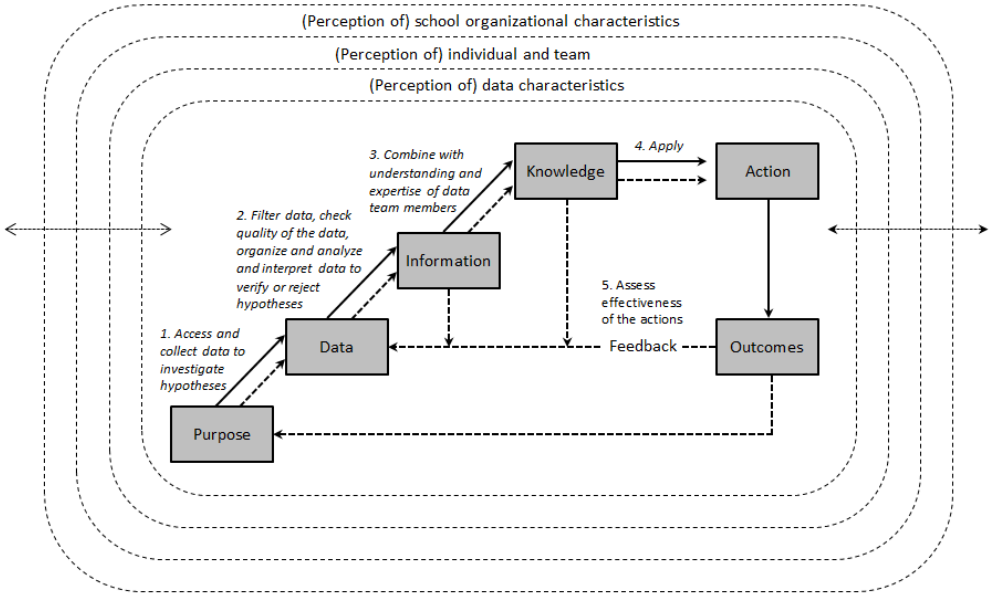
2.1 Data-informed decision making

This section formulates the most important aspects to consider for using DIDM. First a definition of DIDM is given (2.1.1). Furthermore, different types of data use are presented and concepts that influence data use are discussed (2.1.2).

2.1.1 Defining data-informed decision making

According to Schildkamp, Poortman and Handelzalts (2012), DIDM can be described based on the following concepts: purpose, data, information, knowledge, actions and outcomes. DIDM starts with a *purpose*; a problem definition or a goal for which data are collected. *Data* can be defined as all information that a school has on their education, organization, students and teachers (Schildkamp, Poortman et al., 2013). Data refers to the functioning of a school (Van der Kleij, Vermuelen, Schildkamp & Eggen, 2013; Schildkamp & Kuiper, 2010). Examples of data are for instance inspection reports, test results, demographic information, results of questionnaires and classroom observations (Schildkamp, Poortman et al., 2013). Data alone do not have any meaning (Mandinach, 2012; Mandinach, Margaret & Light, 2006), it must be organized, analyzed (Marsch, 2012) and interpreted to become *information* (Mandinach 2012; Mandinach et al., 2006; Schildkamp, Poortman et al., 2012). Combining the information with stakeholders' expertise, the information becomes *knowledge* (Marsh, 2012), which means it can have implications for further *actions* (Mandinach et al., 2006; Schildkamp, Poortman et al., 2012). With this knowledge two possible actions can take place: (1) the hypothesis is incorrect and new hypotheses need to be formulated or (2) the hypothesis is correct and actions can be taken based on the data. These actions are evaluated to test if they have led to the desired *outcomes*. The steps above are visualized in a framework which is shown in figure 1. The figure also shows that data use is influenced by (perception of) data characteristics, individual and team characteristics and school organizational characteristics.

Figure 1. Data use theory of action and factors influencing data use.



Source: Schildkamp, Poortman et al., 2012, p. 6.

When data are translated to knowledge, the data can be used in action. *Data use* in schools means that information is used to improve the teaching and learning process (Coburn & Turner, 2012; Jennings, 2012; Van der Kleij & Eggen, 2013) and evaluate it (Van der Kleij & Eggen, 2013). Data use is one of the common terms for this method. Other terms are for instance 'evidence-based decision making' (Honig & Venkateswaren, 2012) or 'data-informed teaching' (Krüger, 2010; Visscher & Ehren, 2011). The Dutch Ministry of Education uses the term 'opbrengstgericht werken' which means, loosely translated, working result-oriented (Ministerie van Onderwijs, Cultuur en Wetenschap, 2010). Thus, schools work towards higher student performances (Ballemans, 2011; Ministerie van Onderwijs, Cultuur en Wetenschap, 2010; Noordink, 2011) in a systematically and goal-oriented way (Ministerie van Onderwijs, Cultuur en Wetenschap, 2010; Visscher & Ehren, 2011).

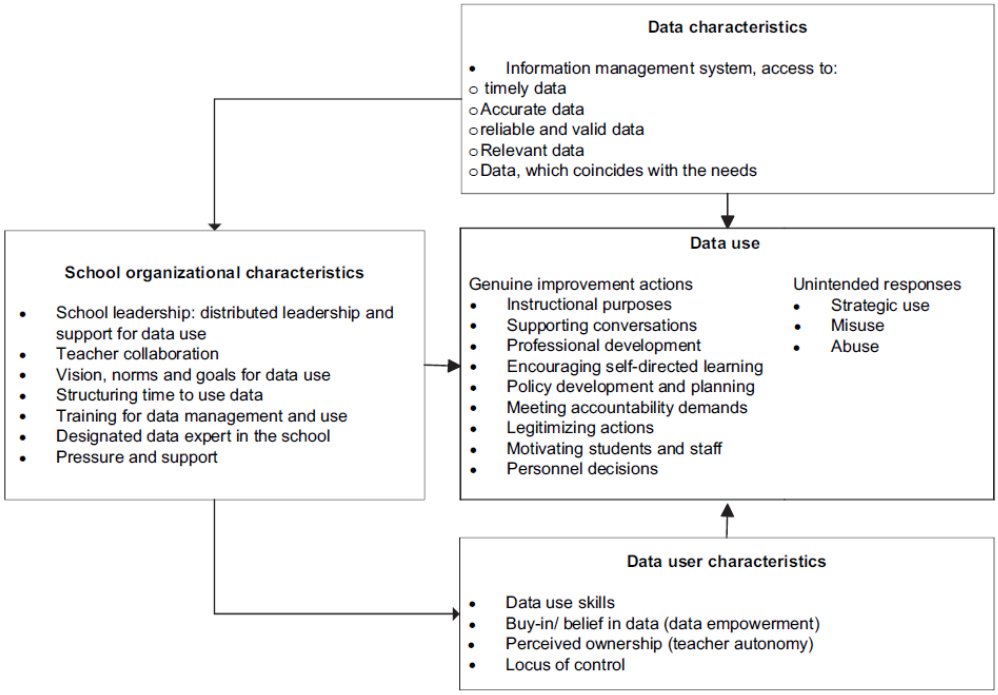
However, data use can go beyond increasing student performance by using data to inform decisions throughout the whole school; terms for this phenomenon are for instance 'data-based decision making' (Schildkamp, Lai & Earl, 2013), 'data-driven decision making' (Marsh et al., 2006) and 'data-informed reform' (Carlson et al., 2011). However, for this study the term *data-informed decision making* was chosen, because it shows that the decision making process is not lead by data, but informed by it. For this study, DIDM is defined as a cyclic process for translating data, through information, to workable knowledge and using this knowledge in a systematical and goal-oriented way to inform decisions at the student-, classroom- and school level.

2.1.2 Factors that influence data-informed decision making

Data need to be used in a helpful way (Datnow, Park, & Wohlstetter, 2007; Marsh et al., 2006), but there are different opinions about how this is done. Marsh et al. (2006) for instance believe that lots of attention needs to be paid to analyzing data and taking action based on these data; these steps do not always receive enough attention. According to Datnow et al. (2007) teachers should be provided with structured protocols for data discussion and create a process to monitor if they keep working towards a set goal. However, they believe the key of using data effectively, lies in selecting the right data. Therefore, practitioners first need system-wide standards for assessment, as input for DIDM. Furthermore, teachers need to look into different kinds of practices when they gather data and use multiple sources of data (Datnow et al., 2007). Collecting multiple types of data for DIDM is viewed as important by other researchers as well (e.g. Mandinach, 2012; Marsch et al., 2006; McNaugton, Lai & Hsiao, 2012). Only using data from state tests is not enough, because it does not cover all the content; there are not many test results available during the year, there is a lot of time between taking the test and getting the results and concerns exists about validity. Furthermore, looking at multiple types of data creates triangulation which makes the decisions more reliable (Marsh et al., 2006).

The findings above show some of the factors that influence the success of DIDM or data use. As was presented in figure 1, all these factors can be summarized into data characteristics, school organizational characteristics and the characteristics of the individual or team using the data (Schildkamp, Poortman et al., 2012). Schildkamp and Kuiper (2010) elaborate on these characteristics which are shown in figure 2. The model shows that there are multiple types of data use, which are influenced by the three different aspects. Additionally, the characteristics of the data available at a school influence the school organizational characteristics related to those data. In their turn, school organizational characteristics influence how practitioners, the data users, use these data. This section will elaborate on the different types of data use and on the data-, school organizational- and data user characteristics.

Figure 2. Factors that influence data use.



Source: Schildkamp & Kuiper, 2010, p. 485.

Types of data use

The model in figure 2 shows that there are two types of data use: genuine improvement actions and unintended responses (Schildkamp & Kuiper, 2010). Genuine improvement actions relate to all the possible data purposes that support improvement. The unintended responses show negative effects of data use, which are, as their title suggests, accidental. This section elaborates on both.

Genuine improvement actions

The model of Schildkamp and Kuiper (2010) shows many improvement actions based on data. However, these can be summarized into three categories: (1) accountability, (2) instructional purposes and (3) school improvement (Schildkamp, Poortman et al., 2013).

School leaders have a great interest in accountability with the help of data (Schildkamp & Kuiper, 2010). The data show to what extent goals are met (Ballemans, 2011), help to justify their decision to higher management and guide the organization (Mariën, Vink, Vloet & Willemse, 2012). School leaders try to meet accountability demands, follow regulations or legitimize programs and policies with the help of data (Schildkamp & Kuiper, 2010).

Instructional purposes are more of teachers' interest, because they are directed to the classroom level. Data are used to move students between groups, to create strategies for individual students (Schildkamp & Kuiper, 2010) or for curriculum planning (Ballemans, 2011; Means, Padilla & Gallagher, 2010). Data use for instructional purposes are directed to enhance student performance (Krüger & Geijsel, 2011).

Finally, data can be used for school improvement. Data are used to evaluate teachers (Schildkamp & Kuiper, 2010; Schildkamp, Poortman et al., 2013), to determine if set goals are met (Schildkamp, Poortman et al., 2013) and to shape PD activities for teachers (Schildkamp & Kuiper, 2010). Identifying areas of needs and target resources, also called 'policy development and planning', make it possible to identify grade-, class-, and school wide strengths and weaknesses. These strengths and weaknesses can be used for planning and PD (Ebbeler, 2012; Means et al., 2010; Schildkamp & Kuiper, 2010).

Looking at the purposes data are used for, Schildkamp (2012) states that teachers mostly use DIDM to solve problems that concern the whole school or that concern grade levels. Schools for instance try to decrease the amount of students that repeat a grade, increase the number of students that move to higher levels of education, improve grades on subjects that turn out to be difficult every year

(Schildkamp, 2012), or study the difference between the grades of the national exams and the exams the school takes (Schildkamp, Rekers-Mombarg & Harms, 2011). Notice that these examples show that schools use data for problems at both school level and classroom level. Schools are interested in working on problems that concern the daily practice and school policy (Schildkamp, 2012). Forming the right problem statement is seen by schools as the most important point of discussion (Scholten, 2013); an interesting problem seems to motivate data users.

Unintended responses

Besides positive types of DIDM, data can also be used in a negative way (Schildkamp, Ehren & Lai, 2012; Schildkamp & Kuiper, 2010). These responses, which are mostly unintended by the data user, can be divided into three groups: (1) strategic use, (2) misuse and (3) abuse of data (Schildkamp & Kuiper, 2010).

Strategic use can for instance occur if schools select certain data for change and ignore other types of data (Schildkamp & Kuiper, 2010). The data that are ignored can for instance be related to complicated long term improvement (Schildkamp & Kuiper, 2010), such as developing teaching strategies for specific groups of students (Schildkamp, Ehren et al., 2012).

Misuse of data is viewed as another unintended response on data use. Misuse of data occurs when the school staff lacks knowledge and skills for using data (Schildkamp & Lai, 2013). They can incorrectly interpret data, which makes them 'improve' wrong aspects of education (Lai & Schildkamp, 2013) or aspects that do not need improvement (Schildkamp & Kuiper, 2010).

Finally, data can be abused. Data are for instance used politically which leads to mistrust of data and data avoidance (Ingram et al., 2004). Data can be used to blame teachers based on the performance of their students (Ledoux et al., 2009; Schildkamp, Poortman et al., 2012). This is why it is very important that a school leader builds a culture of trust where teachers feel comfortable asking questions about data without negative consequences (Schildkamp & Poortman, accepted). Finally, not only school leaders abuse data, teachers can use it by manipulating test scores (Jennings, 2012; Schildkamp & Kuiper, 2010). Teachers divide their students into three groups from high performing to low performing students. Then, they focus their teaching completely on the so called 'bubble kids'; students that are on the edge of passing or failing a test. They provide targeted resources for the high performing students and try to decrease the amount of low performing students by sending them to special education (Schildkamp & Kuiper, 2010; Schildkamp & Lai, 2013).

Data characteristics

One of the prerequisites for DIDM is an effective school monitoring system (Mandinach et al., 2006; Schildkamp & Kuiper, 2010). This kind of system can provide an overview of all the available data so schools can easily use it for their decision making process (Mandinach et al., 2006). A valuable school monitoring system can lead to timely-, accurate-, reliable-, valid- and relevant data and data that coincide with the needs (Schildkamp & Kuiper, 2010). All five of these characteristics of Schildkamp and Kuiper (2010) are explained below.

Timely data

Timely data show at-risk students and the immediate support and interventions they need to improve their performance (Schildkamp & Kuiper, 2010). An important issue, is the time it takes for data to become available. Many organizations that provide standardized tests take a long time to grade these tests (Marsch et al., 2006). When schools finally receive the results, some teachers believe the data are not up-to-date anymore. Kimball (2003) concludes that, regardless of the monitoring system, data feedback should be provided timely and frequently.

Accurate data

Clarity of data, or accurate data, influences how data are perceived and used (Kimball, 2003). Within the study of Sharkey and Murane (2006), teachers point out that they often have a general idea of how students are doing, but it helps to know where they are specifically. Accurate data are more trustworthy (Sharkey & Murane, 2006), because they show exactly how a student is doing.

Reliable and valid data

It is important to use data of sufficient quality (Marsh et al., 2006; Schildkamp & Kuiper, 2010; Van der Kleij et al., 2013). Data should therefore be reliable and valid, because this can influence teachers' beliefs in data and thereby the motivation to use them (Kerr, Marsh, Ikemoto, Darilek & Barney, 2006). How teachers view the reliability and validity of the data depends on the evaluation method that is used to gather the data (Honig & Coburn, 2008; Kimball, 2003). Teachers view classroom assessment as the most reliable and valid form of data (Kerr et al., 2006).

Relevant data

The perceived relevance of specific kinds of data may be viewed differently by different teachers (Visscher, 2002). The study of Cohen-Vogel and Harrison (2013) shows that most schools have access to the relevant data they need. However, a lack of access to these data is considered as a problem (Marsh et al., 2006; Schildkamp & Kuiper, 2010), because when teachers believe they lack relevant data they feel less able to make deliberate decisions (Honig & Coburn, 2008).

Data, which coincide with the needs

The final data characteristic, the extent to which the data match the needs of the user, influences the use of those data (Schildkamp, 2007; Visscher, 2002) and the amount of staff involvement in this school innovation (Schildkamp, 2007). When the data output fit the needs of the school or the user, this influences teachers' data use for improvement (Schildkamp, 2007).

Note that the different data characteristics are closely related. For instance, data should be *accurate* because this makes them more trustworthy (Sharkey & Murane, 2006); or in other words, more *reliable and valid*. This could imply that data that are not reliable or valid can never be accurate. Moreover, it could be questioned if data are still *relevant* or if it *coincides with the needs* of the user when it is not reliable or valid. Can invalid and unreliable data be relevant and coincide with the needs of the data user? Finally, it is stated that practitioners should have access to relevant data (Marsh et al., 2006; Schildkamp & Kuiper, 2010). One of the reasons for data to not be accessible, is because it is not *timely available*. This could imply that when data are not timely available, they are also not relevant. The overlap and interaction between these different characteristics are important to consider for this study.

School organizational characteristics

The school organizational characteristics that influence data use consist of seven aspects: (1) school leadership, (2) teacher collaboration, (3) vision, norms and goals for data use, (4) structuring time to use data, (5) training for data management and use, (6) designated data expert in the school and (7) pressure and support (Schildkamp & Kuiper, 2010). All seven aspects are explained below.

School leadership: distribute leadership and support for data use

School leadership is mentioned by Schildkamp and Kuiper (2010) as the first organizational characteristic that influences data use. This is probably not coincidental, as good school leadership is seen by many researchers as an important tool to support DIDM (e.g. Archer, Scherman & Howie, 2013; Noordink, 2011; Shaw, Wayman & Svinicki, 2011); some even believe it is a prerequisite for DIDM (Means et al., 2010; Spillane, Halverson & Diamond, 2004; Visscher & Ehren, 2011).

School leader involvement will ultimately lead to a successful implementation and a sustainable program (Schildkamp & Poortman, accepted). First and foremost, school leaders should provide teachers with access to the proper data (Coburn & Turner, 2011). Furthermore, school leaders should also be enthusiastic for data use (Botta et al., 2012; Noordink, 2011; Schildkamp & Kuiper, 2010) and set the right example for using it (Means et al., 2010; Murray, 2013; Schildkamp & Lai, 2013) with his own data skills (Daly, 2012; Mandinach, Gummer & Muller, 2011; Schildkamp & Poortman, accepted). Moreover, one could imagine that if a teacher has a good relationship with the leader, he/she is more willing to listen to the ideas of the school leader and therefore is more likely to engage in DIDM (Daly, 2012; Moolenar, Daly & Sleegers, 2010; Schildkamp & Kuiper, 2010).

Moreover, school leaders should create a safe culture in their school (Ledoux et al., 2009; Marsh et al., 2006) by establishing clear vision and goals for data use (Ikemoto & Marsh, 2007;

Krüger, 2010; Schildkamp & Kuiper, 2010). With a data culture, teachers feel more comfortable sharing data with each other and taking risks to improve their education (Coburn & Turner, 2011). An important first step in this is providing time for these learning opportunities (Daly, 2012; Honig & Venkateswaran, 2012; Schildkamp & Poortman, accepted). Time is needed to gather and analyze data (Means et al., 2010; Noordink, 2011) in a collaborative way (Cosner, 2012; Noordink, 2011). Finally, school leaders should create opportunities to test these new skills in a supportive environment (Moolenaar, Daly & Sleegers, 2010).

Teacher collaboration

One of the reasons for creating a culture of data use is because it can stimulate collaboration. Teachers often work alone and do not share their data; collaboration can break this pattern (Huffman & Kalnin, 2003; Schildkamp & Kuiper, 2010) and strengthen the collegial band (Bolhuis & Kools, 2012; Huffman & Kalnin, 2003). Teachers' individual knowledge increases by working with others (Huffman & Kalnin, 2003), which can lead to more knowledge of the teaching profession (Huffman & Kalnin, 2003) and finally to higher quality instruction (Henry, 2010; Henry, 2012; Schildkamp, Ehren, et al., 2012). It is also believed that DIDM in collaborative teams can lead to sustainable school improvement (Henry, 2012; Schildkamp & Lai, 2013; Schildkamp & Kuiper, 2010).

Vision, norms and goals for data use

Formulating visions and norms for data use, or sometimes called 'forming a culture of data use', is seen as one of the most important prerequisites for DIDM in schools (e.g. Archer et al., 2013; Datnow et al., 2007; Visscher & Ehren, 2011). Without a cultural switch it is easy for teachers to fall back into their old routines (Datnow et al., 2007); new norms and expectations should be set (Coburn & Turner, 2011; Cohen-Vogel & Harrison, 2013; Schildkamp & Kuiper, 2010).

However, some other cultural aspects need to change before DIDM can be implemented; teachers need a new mindset for particular aspects like sharing data. Sharing data can make teachers feel vulnerable; they should learn that data are not used to blame them, but to improve their lessons (Ikemoto & Marsch, 2007; Schildkamp & Kuiper, 2010; Schildkamp & Lai, 2013).

Moreover, setting clear goals is an important step for DIDM because it will guide the whole data-process (e.g. Cosner, 2012; Datnow et al., 2007; Murray, 2013). These goals should be measurable to evaluate historical-, current- and future plans (Datnow et al., 2007; Honig & Coburn, 2008). Schildkamp and Poortman (accepted) believe that one of the most important aspects of setting goals is making these goals shared. Without a clear agreed-upon goal, it is very difficult to effectively use data (Schildkamp & Poortman, accepted) or find the right data to answer questions (Datnow et al., 2007; Murray, 2013).

Structuring time to use data

Gathering and analyzing data and making a collective decision based on these data, takes time (e.g. Ikkemoto & Marsh, 2007; Ingram et al., 2010; Seashore-Louis & Schroeder, 2004). Even if teachers possess the right skills to use data (Bennet, 2011), time should be scheduled for the DIDM-process (Datnow et al., 2007). This makes it possible for teachers to analyze, interpret and discuss data (Schildkamp, 2012). The study of Coburn, Tourne and Yamashita (2009) points out that schools have had less money available the last couple of years. This has led to fewer resources and quick decision making or even unresolved problems. Unfortunately, the use of data in the decision making process has decreased (Coburn et al., 2009). This shows that not only time but also money is needed for DIDM.

Training for data management and use

Research shows that DIDM can be improved in schools (Noordink, 2011), but not all teachers are able to collect, analyse (Schildkamp & Ehren, 2013), interpret (Ledoux et al., 2009; Schildkamp & Ehren, 2013) and usefully present data (Ledoux et al., 2009). It cannot be expected that teachers and school leaders possess these types of skills without being trained (Schildkamp & Ehren, 2013); therefore, external support is needed (Downey & Kelly, 2013; Noordink, 2011; Schildkamp & Ehren, 2013). Ledoux et al. (2009) predicts that external training will be needed for the following years, because teacher training programs are not investing in DIDM. Training enlarges confidence and willingness of teachers to engage in DIDM (Downey & Kelly, 2013) and make them owner of the DIDM-process

(Nelson & Slavit, 2007). According to Ikemoto and Marsh (2007) this engagement in DIDM can be explained by the time that is scheduled for DIDM by following a training.

Designated data expert in the school

Data collection and data analysis are difficult processes; therefore, besides PD, extra support might be necessary (Kerr et al., 2006; Schildkamp & Kuiper, 2010). As part of this support, it is important that someone within the school is selected to be the 'data expert' (Schildkamp & Kuiper, 2010). Schools select one or two teachers to whom they specifically turn to with questions about data. These teachers take the initiative to learn, collect, analyze and interpret data with the goal to share this knowledge with their colleagues (Wohlstetter, Datnow & Park, 2008).

Pressure and support

Finally, there should be a balance between pressure and support towards DIDM within schools (Schildkamp & Kuiper, 2010). A study of Diamond and Spillane (2004) shows that external pressure encourages schools to increase their (student) results. However, without emotionally supporting teachers in this process it is difficult to make a change. Schildkamp and Kuiper (2010) conclude that a combination is needed from governmental pressure towards data use and support within schools.

Note that again the different characteristics overlap or influence each other. For instance, it was stated that in order to create a data culture, *visions norms and goals* should be set for data use (Ikemoto & Marsh, 2007; Krüger, 2010; Schildkamp & Kuiper, 2010). This data culture makes practitioners feel safe to use data and promotes teacher *collaboration* (Ikemoto & Marsch, 2007; Schildkamp & Kuiper, 2010; Schildkamp & Lai, 2013). Creating this data culture should be facilitated by the *school leader* (Ledoux et al., 2009; Marsh et al., 2006). Moreover, the school leader should also provide time for DIDM (Daly, 2012; Honig & Venkateswaran, 2012; Schildkamp & Poortman, accepted); in this, he is *structuring time for data use*. However, one of the reasons of the success of *training* for data management is that a training structures time for data use (Ikemoto & Marsh, 2007). This seems to imply that when a team leader provides a training for DIDM, he indirectly also provides time for data use.

Finally, the characteristics show all kinds of support for data use: the school leader should create a supportive environment (Ledoux et al., 2009; Marsh et al., 2006), the designated data expert supports the staff (Schildkamp & Kuiper, 2010) and the characteristic *pressure and support* shows that the school need to emotionally support teachers in the change process (Diamond & Spillane, 2004). The literature does not show the specific differences between these types of support, but it is safe to say that supporting practitioners in the DIDM process is very important. The overlap and interaction between these characteristics are important to consider for this study.

Data user characteristics

DIDM is influenced by data user characteristics. These characteristics entail four aspects: (1) data use skills, (2) buy-in or belief in data, (3) perceived ownership and (4) locus of control (Schildkamp & Kuiper, 2010). These four aspects are explained below.

Data use skills

To work with data, teachers and school leaders need to possess data use- and data analysis skills (Datnow et al., 2007; Schildkamp & Kuiper, 2010). Schools already have a lot of data available, but the school staff needs to know how to select the right data, determine the quality of the data and should be able to analyze and interpret these data in the correct way (Schildkamp & Kuiper, 2010). It is also believed that to use data, a teacher needs to be able to work with numbers (Chahine, 2011; Ledoux et al., 2009) or have 'statistical literacy' (Chahine, 2011).

Besides having the knowledge of good DIDM, a teacher also needs to have content knowledge. This means he or she needs to know the impact that specific decisions have on their classroom education. Therefore, they need to have subject knowledge and also have a clear view of their students (Ledoux et al., 2009).

Buy-in / belief in data (data empowerment)

It is important that all practitioners see the importance of DIDM (Botta et al., 2012; Ledoux et al., 2009; Noordink, 2011). Resistance against DIDM, or not enough buy-in, is seen as one of the biggest barriers for DIDM (Ballemans, 2011; Schildkamp & Kuiper, 2010). School staffs often do not see the need to look critically at data and/or reflect on their own functioning; it is important that these teachers become interested and engaged in DIDM (Ballemans, 2011).

Perceived ownership (teacher autonomy)

It is not only important to teach teachers about the DIDM-process; they also need to perceive ownership of the issues (e.g. Botta et al., 2012; Noordink, 2011; Schildkamp & Kuiper, 2010). Teachers should for instance gather their own data instead of analyzing data of someone else (Schildkamp & Kuiper, 2010). According to Bolhuis and Kools (2012), it is not only important to involve teachers in the DIDM-process, but all stakeholders of a project; students and parents for instance. It is not always possible to include them in the data research, but it is important to keep them posted during all steps of the research (Bolhuis & Kools, 2012).

Locus of control

Tokar, Fischer and Mezydlo Subich (1998, in Schildkamp & Kuiper, 2010) believe that teachers with a higher internal locus of control, or in other words teachers who attribute failure and success to themselves, are more successful in a change process. Schildkamp and Kuiper (2010) conclude from this that schools with a lot of staff with an internal locus of control are more likely to use data and improve the quality of their education opposed to schools with staff with a high external locus of control.

Again, these characteristics influence each other. For starters, *buy-in or belief in data* aims to create a positive attitude towards data use and *teacher autonomy* tries to involve teachers in the data use process. It is imaginable that when someone is more engaged in a process, this process becomes more pleasurable which creates a more positive attitude towards this process. The same goes for the characteristics *locus of control* and *data use skills*. It seems possible that when someone has a high locus of control, this person looks critically at his own skills or learning process, which could make him a better learner of data use skills.

2.2 Designing professional development programs

This section looks for the most important characteristics a PD-program should contain in order to be successful. Therefore, first a definition of PD-programs is formulated (2.2.1), followed by a description of important PD characteristics (2.2.2).

2.2.1 Defining professional development programs

Literature points out that practitioners lack knowledge and skills to successfully implement DIDM (e.g. Ledoux et al., 2009; Noordink, 2011; Schildkamp & Ehren, 2013), therefore, schools need external help: for instance, by means of a *professional development program* (Inspectie van het onderwijs, 2013a). For this study, the definition for PD of Guskey (2000) is used: *"professional development is defined as those processes and activities designed to enhance the professional knowledge, skills and attitudes of educators so that they might, in turn, improve the learning of students".* (p. 16).

PD has several possible goals. First and foremost, a PD-program aims to help practitioners develop specific knowledge and skills (Hoyle & John, 1995 in Evers, Kreijns, Van der Heijden & Gerrichhauzen, 2011). Subsequently, a PD-program tries to let organizations internalize these methods and skills (Cheetham & Chives, 2005). This will lead to an improvement of the work performance (Cheetham & Chives, 2005; Holyle & John, 1995 in Evers et al., 2011; Ledoux et al., 2009) and ultimately to an improved organization (Caldwell, 2005; Ingram et al., 2004).

2.2.2 Characteristics of a successful professional development program

It should be considered that a school staff is not always committed to change their practice and does not always see the need to use data and reflect on their own functioning (Schildkamp & Ehren, 2013); they do not always feel a need to learn. A will to learn: (1) lets teachers look critically at their own practice, (2) makes them test and validate ideas and (3) makes them explore and evaluate new ideas; therefore, these three implications are important for PD (Van Eekelen, Vermunt & Boshuizen, 2006). Krüger & Geijsel (2011) add that commitment of teachers is positively related to *"increase effort, performance, and professionalism"* (p. 6). But according to Chahine (2011) not only commitment is important for data use, but enthusiasm too; teachers get more motivated when they work in a culture where the school staff is enthusiastic about learning (Chahine, 2011).

In order to make teachers more motivated during a PD-program, Visscher and Ehren (2011) mention that teachers should be given challenging but achievable goals and that these goals should be focused on teachers' interests. Others think that motivation is created by rewards (Coburn & Turner, 2011; Datnow et al., 2007) or punishment (Coburn & Turner, 2011). Feeling a big pressure from the school board (Coburn & Turner, 2011) or from the government (Asen, Gurke, Connes, Solomon & Gumm, 2013; Marsh et al., 2006) can also motivate to participate in DIDM.

According to Timperley (2008) not only teacher commitment and enthusiasm are important, but other concepts influence the success of a PD-program too. She defined ten concepts that have a positive, sustainable impact on education; some of these steps indeed contribute to teacher motivation and others focus on other aspects of a successful PD-program. The ten concepts are: (1) focus on valued student outcomes, (2) worthwhile content, (3) integration of knowledge and skills, (4) assessment of professional inquiry, (5) multiple opportunities to learn and apply information, (6) approaches responsive to learning process, (7) opportunities to process new learning with others, (8) knowledgeable expertise, (9) active leadership and (10) maintaining momentum (Timperley, 2008). All ten aspects are elaborated below.

Focus on valued student outcomes

According to Timperley, Wilson, Barrar & Fung (2007) PD-programs that focus on valued student outcomes have a positive impact on the outcomes of that program. Teachers are primarily interested in how a certain type of change influences their work (Dalin, 2005; Lee, Zhang & Yin, 2011) and that of their students (Dalin, 2005; Garet, Porter, Desimore, Birman & Yoon, 2001; Van Veen, Zwart & Meierink, unpubl.). Because teachers work in different contexts, there is no guarantee that a PD-program will lead to the desired outcomes; constantly reviewing student outcomes is therefore very important (Timperley et al., 2007). To increase student outcomes further (Timperley et al., 2007) teachers should be engaged in the PD-program (Botta et al., 2012; Dalin, 2005; Noordink, 2011). Teachers take more responsibility for student learning when they discover that new practices have a positive influence on their student outcomes; they feel more effective as a teacher (Timperley et al., 2007).

Worthwhile content

Mostly, PD-programs are based on research on student learning, but are designed without the teachers who participate in it. This is unfortunate, because a context-specific approach has a positive influence on the teaching practice; teachers learn to solve and identify issues in their own teaching practice (Timperley, 2008). To create this kind of content, the concepts of the program should be job-related; the training is related to daily problems but does not take place during classroom hours (Dalin, 2005). Using this kind of worthwhile content makes teachers more interested and more motivated. Interest and motivation have a positive influence on the will to learn, because it makes participants more alert, more responsive and makes them exert greater effort (Van Eekelen et al., 2006). The above does not imply that a general PD content is worthless. However, when a PD-program is shaped together with the participants to make it job-related, this type of program is seen as more worthwhile and creates more interest and more motivation.

Integration of knowledge and skills

In order to improve their activities, teachers need to have knowledge about curriculum and instruction for good education, and knowledge of assessment to identify student needs (Timperley, 2008).

Because the use of knowledge and skills is so important, there should also be a focus on integrating that knowledge and those skills in practice when learning them in a PD-program (Timperley, 2008). According to Hammerness et al. (2005) this can be done by means of a case-based or problem-based approach. In these approaches the instruction is designed around real-life situations that teachers are likely to encounter or perhaps already have experienced (Hammerness et al., 2005).

Assessment of professional inquiry

The previous section already mentioned the importance of student assessment to identify student needs. The identification of what students need to learn also shows what teachers need to include in their instruction (Black & Wiliam, 1998; Timperley, 2008). With regard to PD, after assessing students, a teacher should ask him/herself what he/she needs to learn to promote student learning. Therefore it is very important that teachers can successfully assess students and have self-regulation skills (Timperley, 2008). Assessment can include observation, classroom discussion and reading students' written work (Black & William, 1998).

Multiple opportunities to learn and apply information

The concept 'integration of knowledge and skills' already pointed out that knowledge and skills need to be translated into practice. Therefore, it is important to learn DIDM in practice (Gerrichhauzen, 2007; Kenedy, 1998; Maninach & Grummer, 2013); this can be done best in the school, because this is an important place to gain experience for both students and teachers (Mandinach & Gummer, 2013). This job embedded training consists of gaining practical experience in working with pupils (Dalin, 2005). Because teachers get to practice their new skills (Committee on Development in the Science Learning, 2000), they understand the implications for practice (Timperley, 2008) and they feel more ready to use their new skills (Bolhuis & Kools, 2012). Moreover, because teachers directly use their new skills in their working practice, it feels like it is less time consuming; however, specific time to learn should be reserved (Bolhuis & Kools, 2012).

Approaches responsive to learning process

As stated earlier, it is important that a PD-program focuses on building knowledge and skills. However, when this new knowledge and these new skills do not match teachers' ideas of education, it is difficult to engage teachers in the PD-program. When these two do not match, a different PD approach is needed where teachers learn to understand the importance of the new knowledge and skills, and the limitation of the current method (Timperley, 2008). Furthermore, new knowledge and skills need to match teachers' prior knowledge; they may be more willing to try a new method when implementing this method requires skills they already possess (Shaw et al., 2011).

Opportunities to process new learning with others

According to the social interaction theory, the network an individual teacher is in, influences how this individual responses to a change process. This network has a major influence on an individuals' attitude towards change, the willingness to adopt the new method and the speed of acceptance and adoption of the new method. Furthermore, the relationships within the network influence the communication around change and the network determines which aspects are prerequisites for the new method (Dalin, 2005).

The social interaction theory shows how much influence a group of teachers has on an individual in that group. However, being able to collaborate and process new knowledge with colleagues can also have a positive influence on the outcomes of a PD-program (Geijsel, Krüger & Sleegers, 2011; Lee et al., 2011; Marsh, Sloan, McCombs & Martorell, 2010). According to Lee et al. (2011), good collaboration takes place when teachers *"exchange their instructional practices in an ongoing, reflective, inclusive, learning-oriented and growth-promoting way to support innovation and knowledge sharing"* (p. 820). Collaborative PD increases the pedagogical professionalism, stimulates commitment (Lee et al., 2011) and helps to integrate new learning into practice (Timperley, 2008).

Knowledgeable expertise

Knowledgeable expertise refers to asking an external expert for help during the PD-process. External expertise is necessary for teachers to learn new knowledge and skills and think about practice in a new way. This external expert needs to show teachers these new possibilities, challenge them and their

colleagues and focus primarily on student learning (Timperley, 2008). However, just having an external expert in the PD-program does not necessarily make the program will be a success (Timperley et al., 2007). The external expert needs to integrate new knowledge and skills into the teaching practice for it to be successful (Timperley, 2008; Timperley et al., 2007).

Active leadership

Not only in the DIDM process but also in PD active school leadership is important (Timperley, 2008; Van Veen et al., unpubl.). According to Timperley (2008), during PD a school leader should (1) develop a realistic vision to engage teachers in PD and to help them formulate individual learning goals, (2) lead learning by managing teachers' engagement (Timperley, 2008), (3) organize learning opportunities (Timperley, 2008; Timperley et al., 2007) and (4) provide enough time to participate in PD (Spillane et al., 2004; Timperley et al., 2007). However, according to Earl and Katz (2002, in Geijsel et al., 2011) a school leader should be able to use data himself. He has to establish an inquiry habit of mind, become data literate to act according to data and create a culture of inquiry where the whole school is engaged in data analysis (Earl & Katz, 2002 in Geijsel et al., 2011). This means that the team leader should participate in the PD-program as well. This will show his/her loyalty to the goals and norms and that he is experimental regarding the new methods and solutions (Dalin, 2005).

Maintaining momentum

Most programs are only labeled as 'successful' when they are implemented and the process is running smoothly (Marsh, 2012). Therefore, after putting much time and effort in PD, it is very important that the change that is made during this process is sustainable; maintain momentum (Timperley, 2008). According to Timperley (2008) sustainability depends on what happened during the PD-process and what happens in the organization when there is no more external support. To create sustainability, it is important that the new knowledge and skills of the PD-program are transferred to practice. So if a certain situation occurs, teachers know what they need to do (Timperley, 2008). Moreover, an intensive and lengthier program is more likely to have a sustainable impact than a short PD-program (Garet et al., 2001). Finally, it is important that the school leader keeps stimulating the teachers to use their new knowledge and skills after the program has finished (Levin, 2013; Timperley, 2008).

2.3 Vocational Education

Now that DIDM and PD have been discussed, this section makes a connection between these concepts and vocational education. Therefore, it discusses the relation between DIDM and vocational education (2.3.1) and PD-programs and vocational education (2.3.2).

2.3.1 Data-informed decision making in vocational education

Van Zenderen (2012) studied the use of electronic information systems, were data can be stored, in primary-, secondary- and vocational education (Van Zenderen, 2012). According to Van Zenderen (2012) the amount of data use in schools is very limited. The Dutch Ministry of Education has set goals for DIDM, but less than one fourth of primary- and secondary schools meet these goals (Van Zenderen, 2012). It is striking however that when he speaks about DIDM, he does not even mention vocational education; it seems like DIDM is not even on the agenda in vocational education.

In 2011, the Dutch Ministry of Education presented their 'action plan: focus on workmanship' (in Dutch: 'actieplan: focus op vakmanschap'), which shows the Ministry's plans for improving the quality of vocational education from 2011 till 2015 (Onderwijsraad, 2011). The Educational council (Onderwijsraad, 2011) is a council which provides advice to the Dutch Ministry whether solicited or unsolicited. This council has also provided feedback on the Ministries 'action plan: focus on workmanship'. In this feedback they stated that one of the most important ways to improve the quality of vocational education is DIDM, which they think should be added to the action plan. First, data should be systematically collected and analyzed to adjust the educational process. Additionally, forming clear guidelines and developing national exams are already on the to-do list of the Ministry of Education for the courses Dutch, math and English, but should be expanded to vocational courses (Onderwijsraad, 2011). Guidelines and goals will make the educational improvement more result oriented and standardized exams makes it possible for schools to compare their results with other

schools. However, this advice from the Educational council (Onderwijsraad, 2011) is not included in the action plan of the Ministry of Education.

Additionally, the study of Mariën et al. (2012) shows the need for DIDM in vocational education. According to them, many Dutch vocational schools are implementing a structure where teacher-teams are responsible for their results (in Dutch: 'resultaatverantwoordelijke teams'). In these teams, the top of the school organization determines specific goals for the school and the teachers are responsible for how these goals are accomplished (Mariën et al., 2012). To make these decisions in a valid way, DIDM might be very helpful for teachers in these teams (Kennisnet, 2011).

From the information above, one could conclude that there is a growing need for DIDM in vocational education. The follow-up question is of course: is this possible? For this question the model of Schildkamp and Kuiper (2010) (see figure 2) is used again, where it is stated that data can be used for different purposes and is influenced by data-, school organizational- and data user characteristics. It is explained below how this model fits vocational education according to available literature. Note that only a small amount of articles was used for this section due to the lack of literature on this subject.

Purpose for data use

According to a study of Mariën et al. (2012), team leaders of vocational schools use data for three purposes: (1) guidance, where they direct the everyday process of teachers, (2) improvement, where data are used to optimize the primary process and (3) accountability, in which data are used to justify decisions to the inspectorate, the higher management and to all parties who are concerned with the decisions (Mariën et al., 2012). Kennisnet (2011) also found that team leaders see the purpose of data in *accountability* and *school improvement*, but add *instructional purposes* as an important goal. However, data are mostly used for accountability and strategically planning, but not so much for instructional purposes (Kennisnet, 2011). Note that both the study of Mariën et al. (2012) and Kennisnet (2011) concerns employees with a management position in vocational schools. No studies have been found on vocational teachers using data.

Data characteristics

Looking at the concept of *timely data*, vocational teachers point out that data are not always timely available (Kennisnet, 2011) or teachers do not have access to them (Onderwijsraad, 2011). A study of Kennisnet (2011) points out that vocational schools have a lot of data available and that most of the available data *meet their data needs*. However, this does not mean that a school knows how to use these data. Besides the fact that data are not always timely available, it sometimes is not *accurate* enough and even though a lot of data fit their needs, they cannot always find data that are *relevant* for them (Kennisnet, 2011). There was no literature found on the *validity of the data* in vocational education. Finally, Gabelica, Van den Bossche, Segers and Gijselaer (2012) point out that most of the available data are obtained from summative evaluation, which shows the performance of the students. There is a relatively small amount of formative data available, which provides information on how a process is executed (Gabelica et al., 2012).

School organizational characteristics

Kennisnet (2011) points out that school organizations have started formulating *visions, norms and goals for data use* and also started monitoring the progress. However, team leaders still find it difficult to formulate valuable, data-based goals (Kennisnet, 2011). Looking at the available literature on school organizational characteristics regarding DIDM in vocational education, it looks like school organizations are just starting to think about DIDM. They started formulating goals for data use which could lead to *pressure and support*. However, pressure and support still need to be implemented and it looks like schools are waiting for that moment to start thinking about *school leadership, teacher collaboration, structuring time for data use, training* and *a designated data expert in the school.*

Data-user characteristics

A study of Van Zenderen (2012) points out that vocational practitioners use a school monitoring system, which shows a great deal of the available data, with a mean of two times a week. Their results show that 61% of the vocational practitioners find themselves *capable of using this system* (Van Zenderen, 2012), however, not all team leaders think they can interpret these systems sufficiently

(Kennisnet, 2011). School leaders are starting to perceive *ownership of data* and point out to see much value in data use and therefore have much *buy-in* (Kennisnet, 2011). Teachers' point of view on this concept is unknown; the same goes for their *locus of control*.

2.3.2 Professional development programs in vocational education

The Dutch Ministry of Education stated that the quality of Dutch vocational education needs to be increased, especially by guaranteeing good teachers (Sauer, 2013). To reach this goal, PD of vocational practitioners is needed. According to a study of the Dutch inspectorate (Inspectie van het onderwijs, 2013b), vocational teachers state to have sufficient time and resources for development and half of the schools even has an internal academy that offers professional development on general educational improvement (like competence-based teaching). Furthermore, 48% of the vocational teachers take part in PD on the initiative of their supervisor, 26% on their own and the last 26% base their participation in PD on a combination of an initiative of their supervisors and their own. It turns out that vocational schools base their PD on the needs of an individual teacher, but only one third takes the needs of the students and the teaching team into account (Inspectie van het onderwijs, 2013b).

After these general remarks above on PD in vocational education, it is important to find out how PD-programs in vocational education differ from the ones in other types of education. Therefore, PD is studied in vocational education by means of Timperley's (2008) characteristics of a successful PD-program, which are usable for all types of education. However, only a little research has been conducted on PD specifically for vocational practitioners. Based on a small amount of literature, it is shown below how Timperley's (2008) concepts fit vocational education. Timperley's (2008) last concept, *maintaining momentum*, was not found in the literature at all. However, one can imagine that vocational teachers still find a sustainable approach very important, why else should they participate in PD?

According to Moesker, Hulshof and Broekkamp (2010) teachers want their PD-program to *focus on valued student outcomes*. However, when a school plans for PD, the management mostly looks at the individual teacher needs and not at the needs of students (Inspectie van het onderwijs, 2013b). Looking at the *content* and *knowledge and skills*, not much can be found in literature; only Gerrichhauzen (2007) mentions that the content and the knowledge and skills it includes should match the school policy.

Within vocational schools, some *assessment for professional inquiry* can be seen. Gerrichhauzen (2007) points out the importance of frequently analyzing teachers and their practices to undertake measures. But the Dutch Inspectorate (Inspectie van het onderwijs, 2013b) found that this systematic analysis is only done on a small amount of the vocational schools in the Netherlands. In most schools, there are almost no classroom observations or systematical evaluation of teachers. However, schools do possess a lot of data on student satisfaction to evaluate teachers with (Inspectie van het onderwijs, 2013b).

Moreover, vocational teachers point out that they would like to *learn with others* (Sauer, 2013; Moesker et al., 2010). According to Brouwer, Hermanussen, Hoeve, Thomsen and Van de Venne (2013) there are no rules for how teachers should collaborate, every team should find their own collaboration preferences. However, it is important to look at the structure of collaboration, task dependency and collaboration culture. This could lead to the creation of new ideas, reflection on practice or finding strengths in the work of a colleague (Brouwer et al., 2013).

Furthermore, the study of Moesker et al. (2010) mentions the need for teachers to *apply information* in practice and that different approaches should be included in a PD-program to make it *responsive to the learning process* of all participants. Finally, Gerichhauzen (2007) advises that a *knowledgeable expert* should be present within a PD-program and that *active leadership* is needed to create commitment.

2.4 Conclusions based on literature

Based on the theoretical framework the following conclusions are drawn. These are structured by means of the sub questions of this study. Note that this study investigates one case instead of vocational education in general. The current state of data use is in vocational education (2.4.1) and

what characteristics of a viable PD-program are in vocational education (2.4.2) are discussed based on literature. Notice that on both DIDM in vocational education and PD in vocational education little literature is available. Therefore, the presented conclusions will only be based on this small amount of literature; these conclusions can however, give an indication on current state of data use in vocational education and PD-programs for vocational education.

2.4.1 Current state of data use in vocational education

Data in primary- and secondary schools are used for accountability, school improvement and instructional purposes (Schildkamp, Poortman, et al., 2013). Looking at vocational education, Kennisnet (2011) and Mariën et al. (2012) point out that these three goals of data use can all be seen in a vocational school leaders' work. There is however no information found that shows if teachers are using data too. Furthermore, the available data meet the needs of the users, but these data are not always relevant, accurate or timely available. These aspects of data characteristics influence the school organizational characteristics (Schildkamp & Kuiper, 2010). Because the data are not always sufficient, it is not surprising that the way data use is organized within schools is not sufficient either. Schools have started formulating visions, norms and goals for data use, but they still experience difficulties (Kennisnet, 2011). No further actions have taken place within vocational schools to enable data use. Even though only some visions, norms and goals are formulated for data use, their influence can already be seen in the data-user characteristics. More than half of the vocational teachers feel capable to use data (Van Zenderen, 2012), but the school leaders feel less confident. They however feel ownership of the data and have much buy-in (Kennisnet, 2011); this is unknown for vocational teachers.

Conclusion. The available literature on DIDM in vocational education shows that currently most data use is conducted by school leaders; however, this level of data use seems small. Furthermore, the available data seem sufficient, however, they are not always timely available, accessible, accurate or relevant. Moreover, there are some visions, norms and goals for data use, but it seems like the vocational schools provide no other resources to support data use. Finally, concerning data user characteristics, teachers believe to have sufficient knowledge and skills to use data but school leaders do not. On the other hand, school leaders' attitude towards data seems positive; teachers' attitude towards data use is unknown.

2.4.2 Characteristics of a viable PD-program for DIDM in vocational education

Literature shows that vocational practitioners want their PD-program to focus on student outcomes (Moesker et al., 2010) and that worthwhile content, knowledge and skills should match school policy (Gerichhauzen, 2007). Additionally, vocational practitioners would like to apply new information in practice, would like the program to be responsive to the learning process (Moesker et al., 2010) and want to learn with others (Brouwer et al., 2013; Sauer, 2013; Moesker et al., 2010). Furthermore, having an active leader and a knowledgeable expert contributes to the learning process (Gerichhauzen, 2007). Assessment of professional inquiry is also found very important (Gerrichhauzen, 2007), but is not used enough yet (Inspectie van het onderwijs, 2013b). All these aspects match Timperley's (2008) concepts of a successful PD-program.

Conclusion. Timperley's (2008) ten concepts of a successful PD-program are also applicable for PD-programs in vocational education. Not only because all literature on PD in vocational education supports Timperley (2008), but also because Timperley (2008) did not write her concepts for one specific type of education; therefore, these concepts are probably also applicable to vocational education.

3. Method

This chapter provides an overview of the research methodology of this study. A description of the overall study methods is given in 3.1, which includes an exploratory case study. Moreover, 3.2 focuses on three different instruments that were used in this study: (1) a questionnaire, (2) a set of interviews and (3) a workshop of Project Datateams, a promising PD-program for DIDM in secondary education, followed by a group interview. These instruments and corresponding respondents, procedures and data analysis are discussed in this second section.

3.1 Research description

This research applied an exploratory case study. When a topic has not been researched yet, similar to DIDM in vocational education, exploratory research is very helpful (Yin, 2003). With an exploratory study hypotheses can be developed (Baarda, de Goede & Teunissen, 2009) on how DIDM fits vocational education. Because DIDM was not yet studied in vocational education and because this concept cannot be isolated from its context, a case study approach was applied (Yin, 2003). Combining exploratory research and a case study makes it possible to establish a framework of discussion on DIDM in vocational education (Yin, 2003). This exploratory case study uses partly mixed-methods; with both qualitative and quantitative methods it developed insights for further research.

A case study can be generalized into theoretical propositions, not into populations; the goal is to expand theory (Yin, 2003). To contribute to sketching a generalizable view on DIDM in vocational education (Yin, 2003), the context of this study, Groenhorst Emmeloord, was compared with other schools for vocational education. Therefore, first an extensive literature review was conducted on DIDM and PD-programs and their relation to vocational education (see chapter 2). Additionally, the current state of data use (the first sub question) was studied extensively at Groenhorst Emmeloord and at other vocational schools of Groenhorst as well.

3.2 Instruments, respondents, procedures and data analysis

At Groenhorst Emmeloord a questionnaire, individual interviews and a workshop followed by a group interview were conducted. The questionnaire provided insight into current data use at Groenhorst. The interview investigated the opportunities for DIDM further and studied a corresponding PD-program. Finally, the workshop provided a casus for what a PD-program for DIDM could look like; with a group interview it was studied if and how this concept fits vocational education.

Notice that all research materials contribute to answering one or both of the research questions, concerning (1) the current state of data use and (2) characteristics of a PD-program for DIDM in Groenhorst Emmeloord. Table 1 shows an overview of the sub questions and the instruments that were used to answer these questions. When an instrument contributes to answering a sub question, this is indicated with an ‘x’. Table 1 shows that at least two instruments contribute to answering each sub question; this means method- and data-triangulation is applicable for both sub questions.

Note that the contribution of the workshop to the first sub question is indicated with an “(x)”. The workshop was only supposed to focus on providing results for the second sub question. However, during the group interview that followed after the workshop, respondents also talked about their current data use and how they would like to change this use; thereby providing extra insights into the first sub question.

Table 1
The contribution of the instruments to answering the sub questions

	Questionnaire	Interviews	Workshop with group interviews
1: Current data use	x	x	(x)
2: Characteristics of a PD-program for DIDM		x	x

3.2.1 Questionnaire

The first instrument, the questionnaire, was used to analyse present data use and the available resources at Groenhorst. This section gives a description of this instrument, the respondents that were asked to participate in the questionnaire, the procedure for the questionnaire and the data analysis method.

Instrument

In a study of Schildkamp, Poortman et al. (2013) a questionnaire, based on the model of Schildkamp and Kuiper (2010) (see figure 2), was used to analyze current data use in secondary education. This questionnaire was used for this study and can be found in Appendix A. All elements of this questionnaire have a Cronbachs alpha between 0.75 and 0.92 (Schildkamp, Poortman et al., 2013), and therefore can be viewed as reliable (Reynaldo & Santos, 1999).

The questionnaire covered three subjects: (1) personal information, (2) possibilities and obstacles for data use and (3) current data use. Personal information asked participants to fill in their gender, the subject they teach and the level they teach. These questions were converted to vocational educators by including subjects of their school and by making them choose between levels they teach instead of lower- and higher secondary education. Furthermore, the questions about possibilities and obstacles for data use covered the elements of the data-, school organizational- and data user characteristics (Schildkamp & Kuiper, 2010). Finally, current data use asked participants about different types of data use (Schildkamp & Kuiper, 2010). Not all the elements of the model of Schildkamp and Kuiper (2010) were used in the questionnaire. Schildkamp, Poortman et al. (2013) summarized these aspects into 13 elements which were used in the questionnaire.

Respondents

To contribute to generalizing this study, teachers of all vocational schools of Groenhorst were requested to participate in the questionnaire. Including school leaders in the DIDM process is important (Schildkamp, 2012; Schildkamp & Kuiper, 2010), but for this questionnaire it was viewed more valuable to ask teachers about their view on the leadership of their supervisors, than to include school leaders in the questionnaire (Schildkamp, Poortman et al., 2013). In Groenhorst Emmeloord the response percentage was 60%, in all vocational schools of Groenhorst this was a response of 18%.

Procedure

All vocational team leaders of Groenhorst received an e-mail which explained the goal of the study and contained a link to the questionnaire. They were asked to send this link to their vocational teachers. The teachers had two weeks to fill in this questionnaire. When after these weeks the minimal response of 10% and/or ten respondents per school was not obtained, the participants received a reminder and had another week to fill in the questionnaire. The response criteria are derived from Schildkamp, Poortman et al. (2013).

Data analysis

To show the results of each question and each subject of the questionnaire, the means and the standard deviation were calculated. First, the results of Groenhorst Emmeloord were analyzed apart from the other schools, because Groenhorst Emmeloord is the case of this case study. Second, the results of all schools of Groenhorst were analyzed in order to compare Emmeloord with the whole school. Because of the small amount of respondents, it was not possible to statistically analyze the results to find out the significant differences between Groenhorst Emmeloord and all schools of Groenhorst. However, the analysis gave insights into (1) how much Groenhorst is able to grow in purposes of data use, (2) what kind of data teachers use, (3) support of the school to use data, (4) the ability of teachers to use data and (5) if and how Emmeloord differs from the other schools of Groenhorst.

3.2.2 Interviews

In addition to elaborating on current data use, the interview explored opportunities and obstacles for data use and characteristics of a possible PD-program for DIDM. The instrument, respondents, procedure and data analysis of the interviews are explained below.

Instrument

The interviews were semi-structured and explored two elements: (1) current data use at Groenhorst Emmeloord and (2) the possibilities for PD-programs. Current data use was explored with elements of the model of Schildkamp and Kuiper (2010). These aspects are addressed in the questionnaire as well, but the interviews made it possible to elaborate and validated the results. To make sure there was enough time for discussing PD-programs, not all elements of Schildkamp and Kuiper (2010) were discussed. Schildkamp, Poortman et al. (2013) have made a selection of the most important concepts of the model of Schildkamp and Kuiper (2010) which are also used in the questionnaire. However, the questionnaire divided the concept 'vision, norms and goals' of Schildkamp and Kuiper (2010) into two different concepts: 'vision' and 'norms'. For the interviews, these two concepts were put together again into 'vision, norms and goal'. Therefore, the questions in the interviews that focus on current data use were not divided into 13 elements as in the questionnaire, but only 12 concepts were used.

Furthermore, insights into a PD-program on DIDM in vocational education were gathered by asking which types of PD are currently used at Groenhorst Emmeloord and how they are appreciated. Participants were asked which characteristics a PD-program for DIDM should contain and if all prerequisites for such a program (for instance collaboration, time, etc.) are present. These questions were based on Timperley's (2008) characteristics of a successful PD-program.

Before answering any of the questions above, respondents were asked to define 'data' and 'DIDM' in their own words. This way the interviewer could make sure that she was talking about the same concepts as the respondents were. The interview guide as designed for participating teachers is given in Appendix B. School leaders were given slightly different questions. For instance, where a teacher was asked how he felt encouraged to use data, the school leaders were asked how they encouraged their teachers to use data. The interview questions for the school leaders are presented in Appendix C.

Respondents

Besides teachers, both the team leader and the location director were asked to participate in the interviews, because of their important role in the DIDM process (Schildkamp & Kuiper, 2010). In creating a purposefully selected sample of participating teachers, first teachers with a special educational task that relates to DIDM were included in the interviews; tasks are for instance 'quality care' and 'ICT'. Furthermore, because it is important to gather all opinions, especially in case studies (Yin, 2003), the sample contained a maximum variation of teachers' attitudes towards DIDM. Finally, teachers of all subjects were included in the interviews. In consultation with the team leader of Groenhorst Emmeloord, the sample was developed. Eight of the participating teachers were male and two teachers were female. Including the team leader and location director, a total of 12 respondents participated in the interviews.

Procedure

During brief acquaintances of about 20 minutes with each teacher at the beginning of the research period, teachers were asked to participate in an interview. A selection was made from the teachers who had agreed to participate. One teacher, who had agreed to participate in the interviews but was not selected, was asked for a test interview. This way the quality of the questions could be checked before the actual research started.

During the semi-structured interview, with a list of topics and no fixed questions (Yin, 2003), the respondents were recorded. They were asked to answer questions on which an answer could be given from the model of Schildkamp and Kuiper (2010) or Timperley (2008). For instance, the question *"to which purposes do you use data?"* elicits answers from the box 'data use' of the model of Schildkamp and Kuiper (2010). This way it was checked if all factors of Schildkamp and Kuiper (2010) and Timperley (2008) are also applicable for vocational education. When aspects of the models were not mentioned by the participant themselves, the researcher mentioned these elements to check if that element was indeed not applicable to the participant or if he or she just forgot to mention it. Because of these open questions, participants were also able to name factors that are not in the models.

Data analysis

The interviews were analysed with the program Atlas ti. All interviews were recorded, transcribed and inserted into this program. By using the 'code-by-list'-function of Atlas ti, all elements of the model of Schildkamp and Kuiper (2010) and Timperley (2008) were used to code the statements of the respondents. Codes included for instance 'data use for instructional purposes' and 'collaboration in using and sharing data' (from the model of Schildkamp and Kuiper (2010)) or 'integration of knowledge and skills' and 'active school leadership' (from the model of Timperley (2008)). However, the interviews were also conducted to find new characteristics; with the 'open coding'-function of Atlas ti, these characteristics could be added to the list of codes. When all text was coded, the analysis could start. All statements that belonged to one code were compared to each other, so patterns could be detected. The computed inter-rater reliability of the interviews showed a Kappa of 0.71 which means that the coding of the interviews was of substantial reliability (Viera & Garrett, 2005).

3.2.3 Workshop with group interviews

To elicit a more specific reaction of practitioners on a PD-program for DIDM, they attained a workshop for DIDM in secondary education. For this study the workshop of Project Datateams was selected because of its success in secondary education. This project works according to eight steps that lead participants from the problem definition, through the data gathering to implementing and evaluating their solution. The workshop explains these steps and also gives a short exercise. Attaining the workshop made respondents able to point out their preferences for a PD-program for DIDM. The reactions on the workshop were gathered with a group interview; this instrument, the respondents, the procedure and the data analysis are explained below.

Instrument

After the workshop, a group interview was conducted. In this semi-structured interview the participants were able to indicate their first impression of the workshop. Second, the program presented in the workshop should not only fit practitioners' general needs for PD, but should especially be helpful for learning DIDM. Therefore, the respondents were asked how the presented PD-program fits their ideas on DIDM. Finally, the workshop showed a method to solve problems that are present in schools. Respondents were asked which problems they would like to address with the Datateam method if they would attain this program. The questions of this interview can be found in Appendix D.

As was mentioned earlier, this instrument unexpectedly also provided insights into the first research question which studies the current state of data use at Groenhorst Emmeloord. This was discussed mostly during the first part of the group interview where respondents were able to give their first impression of the workshop. Instead of discussing the PD-method they just saw, they discussed the DIDM-method the workshop used. The respondents reviewed the presented method and compared this to their own current data use.

Respondents

All teachers of Groenhorst Emmeloord and their team leader and location director were asked to join the workshop and the group interview. A total of 14 respondents participated in this research activity: 12 teachers, the team leader and the location director. This way all practitioners were able to express their opinion and because it is a group interview, participants were able to complement each other's statements. For the group interview, the respondents were divided into two focus groups so every respondent could be heard and the results were more reliable.

Procedure

The workshop took place on a Friday afternoon. Teaches got free time from their lessons to participate, but could not be obligated to join the workshop. The standardized workshop was provided by two experts of Project Datateams, because of their extensive knowledge of this project. The respondents watched the presentation of Project Datateams, actively participated in an assignment and asked questions during the presentation. After the presentation of approximately 45 minutes, the respondents were divided into two groups for a group interview which took about 30 minutes. During the group interview the participants were recorded.

Data analysis

The group interviews were transcribed into Atlas ti to label the findings. The same labels were used as in the interviews to compare the answers of the interviews and the group interviews with each other; this was done with the 'code-by-list'-function of Atlas ti. Additionally, this instrument tried to look for new characteristics so new labels could be added with the 'open coding'-method. Again, statements with the same codes were compared to detect patterns during the data analysis.

4. Results

This chapter provides all the results for this study and is structured by means of the sub questions. Therefore, insight into the first research question will be provided regarding the current state of data use at Groenhorst Emmeloord (4.1). These results are based on the questionnaire, the interviews and, as it turned out that this subject was also discussed in this research activity, the group interviews after the workshop. Additionally, the results on the second sub question of this study will be provided and give insight into a viable PD-program for DIDM in Groenhorst Emmeloord (4.2). These results were derived from the interviews and the workshop.

4.1 Current state of data use at Groenhorst Emmeloord

The first sub question was studied with the questionnaire and the interviews. Therefore, this chapter provides results of these two research activities (4.1.1 and 4.1.2). However, current data use in Groenhorst Emmeloord was also discussed in the group interviews after the workshop. Therefore, some of the results of this research activity are also discussed in this section (4.1.3).

4.1.1 Questionnaire

As was mentioned in the method of this report, the questionnaire was not only administered at Groenhorst Emmeloord, but in the other vocational schools of Groenhorst as well. In Groenhorst Emmeloord 25% of the respondents were female, 75% were male. The mean teaching experience of the participants was 20 years. For all vocational schools of Groenhorst together, 45% of the respondents were female, 55% were male and the mean teaching experience was 15 years.

The results of the questionnaire are discussed with regard to the containing topics: (1) purpose of data use (2) data characteristics, (3) school organizational characteristics and (4) data user characteristics. Before elaborating on these topics, the mean and standard deviation of each of these topics are presented in table 2. Note that apart from the concept 'instructional purposes', all concepts were measured with a four-point scale (ranging from 1 = totally disagree to 4 = totally agree); 'instructional purposes' was measured in a six-point scale (rating from 1 = barley/never to 6 = few times a week). All answers to the individual questions of Groenhorst Emmeloord are shown in Appendix E; the answers of all Groenhorst's schools together to the individual questions are presented in Appendix F. Because of the small amount of respondents that participated in the questionnaire it was not possible to do a statistical analysis to discover significant differences between the answers of Groenhorst Emmeloord and all schools of Groenhorst. Differences between the means of at least 0.20 were further explored by considering the percentages of answers on items within the scale.

Table 2
Mean and standard deviation of all concepts of the questionnaire

		Groenhorst Emmeloord[1]	**Groenhorst[2]**
Elements of Schildkamp & Kuiper (2010)		Mean (SD)	Mean (SD)
Purpose of data use	Accountability*	2.89 (.17)	2.88 (.28)
	School improvement*	2.55 (.32)	2.33 (.40)
	Instructional purposes**	3.11 (.68)	2.86 (.96)
Data characteristics	Accessibility of data*	3.01 (.42)	3.03 (.58)
	Usability of data*	2.76 (.30)	2.71 (.51)
	Data quality*	3.10 (.55)	2.91 (.48)
School organizational characteristics	School leadership*	2.38 (.48)	2.44 (.58)
	Collaboration*	3.09 (.32)	3.03 (.39)
	Vision*	2.15 (.49)	2.41 (.67)
	Norms*	1.93 (.46)	2.09 (.59)
	Training and support*	2.26 (.44)	2.35 (.47)
Data user characteristics	Knowledge and skills*	2.95 (.38)	2.97 (.58)
	Attitude*	2.76 (.37)	2.78 (.42)

* four-point scale, rating from 1 = 'totally disagree' to 4 = 'totally agree' [1]N=15
** six-point scale, rating from 1 = 'barley/never' to 6 = 'few times a week' [2] N=40

Purpose of data use

The purpose of data use was divided into three topics in the questionnaire: (1) accountability, (2) school improvement and (3) instructional purposes. With a four-point scale teachers were asked if they use data for accountability and school improvement. For data use for instructional purposes, teachers were shown a certain way of data use and were asked how often they use this method. Instead of a four-point scale, as in all the other questions, teachers here had six possible options for their answer; from 'barely/never' till 'a few times a week'.

Data use for *accountability* received a mean score of 2.89 in Groenhorst Emmeloord, which is similar to the score of 2.88 in all Groenhorst's schools. In both Groenhorst Emmeloord and all Groenhorst's schools, more than 60% (totally) agreed that data are used for accountability and 45% agreed that internal evaluations are shown in external reports.

Moreover, it is noteworthy that data use for *school improvement* received a mean score of 2.55 in Groenhorst Emmeloord, which is higher than the score of 2.33 in all schools of Groenhorst. All the individual mean scores of the questions were for Groenhorst Emmeloord between 2.17 and 2.93, but between 2.00 and 2.81 in all schools of Groenhorst. Concerning school improvement, in Groenhorst Emmeloord 73.3% of the respondents pointed out to use student results to evaluate teachers, while only 42.5% of the teachers in all of Groenhorst's schools stated that this is done in their school. Also note that in both Groenhorst Emmeloord and all schools of Groenhorst, these questions were answered by many respondents with 'I don't know'. In Groenhorst Emmeloord between 6.7% and 26.7% answered questions with 'I don't know'; in all schools of Groenhorst this percentages was between 12.5% and 20%.

Finally there is a noteworthy difference between the answers of Groenhorst Emmeloord and all schools of Groenhorst concerning the concept *instructional purposes*. This concept received a mean score of 3.11 out of 6 in Groenhorst Emmeloord while this was 2.86 out of 6 in all schools of Groenhorst. Concerning instructional purposes, data were used most frequent for determining the pace of instruction (a mean score of 3.67 in Groenhorst Emmeloord and a score of 3.44 in all of Groenhorst's schools) and for student feedback (a mean score of 3.93 in Groenhorst Emmeloord and 3.56 in all of Groenhorst's schools). Data were used the least frequent for identify learning needs and to adapt instruction to highly gifted students (a mean score of 1.78 in Groenhorst Emmeloord and 1.85 in all of Groenhorst's schools). The data use activities that were most frequent in Groenhorst Emmeloord were similar to the activities in all of Groenhorst's schools just as the activities they did the least frequent. However, on eight out of eleven activities to use data for instructional purposes Groenhorst Emmeloord stated to do this more frequent than all of Groenhorst's schools; the means differed at least 0.23.

Data characteristics

The questions on data characteristics were divided into three topics: (1) accessibility of data, (2) usability of data and (3) data quality. The *accessibility of data* was given a mean score of 3.01 out of 4 in Emmeloord which is similar to the score of 3.03 in all of Groenhorst's schools. The respondents had a data information system at their school and had access to all relevant data. However, the data were not always timely available at the beginning of the school year and/or when a student transfers to this school; this influences the accessibility of the data.

The *usability* of the available data received a mean score of 2.76 in Emmeloord and 2.71 in all of Groenhorst's schools. Data were seen as most useful to show the learning curve of all students over a year and to show a learning curve of each individual student. Finally, the *data quality* was scored with a 2.97 in Groenhorst Emmeloord and with 2.91 in all of Groenhorst's schools; the data were perceived as up-to-date and correct.

School organizational characteristics

The school organizational characteristics were divided into five topics: (1) school leadership, (2) collaboration, (3) vision, (4) norms and (5) training and support. *School leadership* was scored with a mean of 2.38 in Groenhorst Emmeloord which is slightly lower than the score of 2.44 in all of Groenhorst's schools. Respondents stated in both Groenhorst Emmeloord and in all of Groenhorst's schools that their school encourages data use to support education and knows the importance of

developing data use skills in their teachers. Furthermore, team leaders mostly encourage data use to support education and he or she discusses data with their teachers.

The concept *collaboration* received in Groenhorst Emmeloord a mean score of 3.09 and a mean score of 3.03 in all of Groenhorst's schools. These high mean scores are probably due to the high amount of data sharing in Groenhorst. Almost all respondents (totally) agreed to share data with their students (100% in Groenhorst Emmeloord and 92.5% in all of Groenhorst's schools) and their colleagues (93.3% in Groenhorst Emmeloord and 92.5% in all of Groenhorst's schools).

The different scores for Groenhorst Emmeloord and all of Groenhorst's schools for the concept *vision* are noteworthy. Groenhorst Emmeloord received on this concept a mean score of 2.15, while this is 2.41 in all of Groenhorst's schools. In all of Groenhorst's schools, 72.5% of the teachers believed that their colleagues have the same vision on education as they do, while this was only 26.7% in Groenhorst Emmeloord. Moreover, 27.5% believed their colleagues have the same vision on student assessment while this was only 13.3% in Groenhorst Emmeloord. It is also noteworthy that 20% of the participating teachers of both Groenhorst Emmeloord and all of Groenhorst's schools did not know the vision of their colleagues on student assessment.

Moreover, on the concept *norms* Groenhorst Emmeloord scored a little lower than all of Groenhorst's schools: 1.93 compared to 2.09. Concerning these norms, only 6.7% of the teachers in Groenhorst Emmeloord believed data use is a priority at their school opposed to 22.5% in all of Groenhorst's schools. However, notice that both Groenhorst Emmeloord and all of Groenhorst's schools together scored low on the concept 'norms'.

Finally, *training and support* received a mean scored of 2.26 in Groenhorst Emmeloord which is again a little lower than the score of all of Groenhorst's schools: 2.35. However, the mean scores of the individual questions are relatable for both research groups. In both Groenhorst Emmeloord and all of Groenhorst's schools, respondents are sufficiently supported in data use and have someone in their school to reach out to for data question. However, there are few people at the school who can help respondents to change education based on data and the school does not schedule much time for data use.

Data user characteristics

In the questionnaire, data user characteristics were divided into two topics: (1) attitude and (2) knowledge and skills. Teachers judged their own data *knowledge and skills* in Emmeloord with a mean score of 2.95 and all of Groenhorst's schools with a relatable score of 2.97. It stands out that Groenhorst Emmeloord feels less confident on their knowledge and skills than all of Groenhorst's schools while interpreting score reports (a mean score of 2.86 opposed to 3.08 in all of Groenhorst's schools), but more competent while interpreting graphic displayed data (a mean score of 3.15 opposed to 3.05 in all of Groenhorst's schools).

Looking at teachers' *attitude* towards data use, a mean score of 2.76 was measured in Emmeloord which is similar to a score of 2.78 in all of Groenhorst's schools. Concerning teachers' attitude towards data use, the respondents (totally) agreed that data are important to point out student learning needs (93.3% in Groenhorst Emmeloord and 87.5% in all of Groenhorst's schools), but had a conflicting opinion on the importance of data use for educational change and if students benefit from instruction formed by data. Between 60% and 66.7% of the respondents of both Groenhorst Emmeloord and all of Groenhorst's schools (totally) agreed with both statements.

4.1.2 Interviews

A total of 12 respondents participated in the interviews, including ten teachers, the team leader and the location director. The questions of the interviews that were related to the first sub question concerned the topics (1) types of data use, (2) purpose of data use, (3) data characteristics, (4) school organizational characteristics and (5) data user characteristics. The results on all five topics are presented below.

Types of data use

At the beginning of the interview, participants were asked to give a definition and examples of 'data'. Many of the respondents pointed out to experience difficulties in defining 'data'. The terms that were used the most by teachers to describe this concept were 'test results' or 'grades'. It is striking that both

school leaders did not use these terms to define data. The team leader mentioned demographic information, which some teachers also did, but also talked about planning and absenteeism. The location director mentioned many different information sources like literature, e-mail, twitter and facebook as information to improve lessons.

In secondary education, the most commonly used types of data are inspection reports, demographic information, questionnaires and classroom observations. All of these types of data were named by at least three teachers of Groenhorst Emmeloord as a type of data they use. The type of data that is used the least by teachers is *inspection reports*. *Classroom observations* were very important to the participating teachers; however, these observations were almost never systematical. Besides the data use purposes that were named in literature, respondents also mentioned the importance of *student interviews* and *literature*. School leaders confirmed the importance of these data use purposes, but stated that *inspection reports* and *student results* were the most valuable for their work.

Purpose of data use

The purposes of data use that were studied were (1) data use for accountability, (2) data use for instructional purposes and (3) data use for school improvement. Looking at *accountability* first, only two teachers pointed out to pay attention to accountability of their courses. One of these two teachers taught English; this means that this teacher will be working with national exams soon[1]. To prepare for these exams, this teacher needed to prove to the inspectorate to use the right exams and the right lesson materials. Teachers from the math-department did not talk about accountability for their exams, even though they will start working with national exams before English will (no teachers who taught Dutch were interviewed). The other teacher who was concerned with accountability, was setting up a new educational program. This teacher used the standards from the aptitude test to build the curriculum. However, another interviewed teacher was also setting up a new educational program, but he did not feel the obligation to justify his decisions on this program. The rest of the teachers pointed out that they base many of their decisions on their gut feeling or on student results. A teacher stated: *"I am free in what I teach during my lessons; we do not have to work towards set national exams. I do however try to keep my lessons on a sufficient level"*. Another teacher pointed out that the vocational courses are very dynamic so he liked that he is free to change his lessons whenever necessary.

The school leaders paid more attention to accountability in their work than teachers. The location director even stated to spend one day a week on accountability. School leaders used inspection reports to look at the weaknesses of the school, to state where improvement is needed and report this in the school plans of each year. Moreover, they used student results and demographic information to divide students within classes. Additionally, the results of both questionnaires that Groenhorst Emmeloord uses (youth education for vocational education (in Dutch: Jeugd Onderwijs Beroepsonderwijs, 'JOB monitor') and the internal questionnaire) are also used as input for the school plans. Summing up, the school leaders stated to design school plans and use data to justify how and why these plans will be executed.

Concerning *instructional* purposes, all ten of the teachers who participated in the interviews pointed out to use data for this purpose. Different purposes for instructional data use were mentioned by the teachers, examples are: using the results of the internal questionnaire to adapt their lessons, observing students during class to immediately adapt instruction (these observations are however rarely systematically) and using test results to guide the learning process. Both school leaders did not directly use data for instructional purposes but stimulated teachers to do this. The location director stated: *"the whole team is responsible for the production: the service of good education"*.

Most of the participating teachers believed that using data for *school improvement* should gain priority in Groenhorst Emmeloord. Most teachers mentioned that they would like to improve their school quality; working collaboratively was seen as an important factor in this. Therefore, three teachers believed that it will be useful to start with the results of the internal questionnaire, because these results show where the most common weaknesses lie. A teacher confirmed the importance of school quality: *"students should be pleased; you can see in your data the biggest strengths and weaknesses of your school and the whole school should anticipate on this"*. The team leader agreed

[1] In the school year 2014-2015 vocational schools will start working with national exams for Dutch and a year later for math too. In 2017-2018 the Dutch government also wants to implement national exams for English (Rijksoverheid, 2014).

with the teachers that DIDM can be most helpful at the school level. In the near future there will be some changes at the school level of vocational education and data could support them during these changes.

Data characteristics

Characteristics of the data of Groenhorst Emmeloord were studied by means of the concepts (1) accessibility of data, (2) usability of data and (3) data quality. Looking at the *accessibility of data*, most of the participating teachers stated to have access to the data they think they need. Three teachers believed to have access to all data, the rest of them simply did not know if there is more data that could be useful for them; therefore, they were also not sure to have access to all types of data. The team leader responded similarly, but the location director stated to have all data in the school and tries to communicate important data to teachers or even students. Moreover, half of the teachers stated to lack data on personal views of colleagues on students. When they experience difficulties with a certain student, they would like to know if other teachers experience this too. Their colleagues were willing to share this type of data, but this process was perceived as time consuming, because some of these participants also liked that this type of data would be reported so they always have access to it.

The *usability of the data* is an aspect that was not discussed with all respondents, because it has a lot of overlap with the accessibility of the data, but mostly with the quality of the data. If the data are not of good quality, they were not preserved as usable. Three participating teachers and the team leader did mention aspects that related specifically to the usability of the data. One teacher mentioned that he does not pay much attention to the usability of data. When data did not seem to be usable at first sight, for instance when it does not concern his students, he did not look for parts that indeed are usable for him. A second teacher pointed out that he perceived his available data as usable; he defined the data as very accurate. The third and last teacher disagreed; he thought that the information on teachers' student observations are very useful (systimatically or unsystematically), but when this is not reported in the student monitoring system, he has to gather this information by asking his colleagues; the data becomes less accurate and therefore less usable. Finally, the team leader pointed out that external data, for instance the JOB monitor, are not always timely available so it cannot be used for the school plans of the next year.

When participating teachers were asked about the quality of the data they had access to in their school, the quality of the internal questionnaire and the information in the school monitoring system were discussed as types of data that were in need of improvement concerning their quality. Half of the teachers stated that the quality of the internal questionnaire is not sufficient. Most of them believed this is due to the moment the questionnaire is held; the team leader agreed. When students are asked to fill in the questionnaire after a test, the teachers believed that this has a negative influence on the results of the questionnaire. Finally, one teacher wondered about the quality of the information in the school monitoring system. Teachers should report comments on students or classes in this system, so their colleagues are able to anticipate on this information. Because this teacher did not think his colleagues use this system sufficiently, his data are incomplete and therefore of insufficient quality.

School organizational characteristics

The school organizational characteristics were studied according to four concepts: (1) school leadership, (2) teacher collaboration, (3) vision, norms and goals for data use and (4) training and support. *School leaders*, for starters, should support teachers to use data. Both teachers and school leaders agreed that this is done by the team leader, not the location director; teachers do not have enough contact with the director for this. The location director stated to provide teachers with data and only talked with them about their results when the results are insufficient. Furthermore, two teachers felt that their team leader directs them to report more information, but the other teachers did not feel directed to actually use these data. Looking at the answers of the team leader, this seems correct. However, he wanted teachers to report their test results and evaluate their tests and he used the results of the internal questionnaire in the performance reviews so teachers should feel pressure to use those results. Finally, half of the teachers mentioned 'time' as a concerning factor. They were able to make time for aspects that they view as important, but bigger issues, like school improvement and accountability, get left behind.

Some aspects of *teacher collaboration*, the second aspect of school organizational characteristics, can be seen in Groenhorst Emmeloord. Both school leaders share their data with teachers when they believe these data are useful for them. All ten participating teachers stated to share some form of data with their colleagues; however, only half of them believed this amount of data sharing is sufficient. A few times a year students are reviewed individually by the whole staff (in Dutch: rapportvergaderingen). Teachers who mentioned this found these meetings useful, but some of them would like to not only discuss performances, but discuss how to act on difficulties too. Furthermore, there was some discussion on sharing personal student information. Some teachers would have liked access to all student data to adjust their lessons to this information; others however, did not want to be influenced by these data, because they might wrongly treat students differently. School leaders were also not sure about this subject, so the question remains: *"who should have access to which information?"* (team leader).

The results on collaboration already showed that there is a lack of *visions and norms* on data sharing. But teachers did not only disagree on whether or not to share student information, there was also no sharing of results of teacher evaluations. This might be because teachers who get low results on the internal questionnaire from students are looked down upon by some colleagues. Looking at *goals for data use*, most teachers stated that there are goals for reporting data, but not for actually using these data. The location director however, pointed out that he stimulates data use by not telling the teachers to improve, but by letting them look at their own data to formulate change. Moreover, the team leader stated that he uses the results of the internal questionnaire to formulate improvement goals with teachers. Finally, when DIDM would be implemented in Groenhorst Emmeloord, some teachers mentioned that they first want to be convinced about the advantages of this data use method. When they all agree they want to participate in DIDM, creating shared visions, norms and goals should be the first step of this project.

As can be seen in previous results, there is not much *training and support* from the school management for teachers to use data. However, when teachers do decide to change their instruction or curriculum, respondents felt like they could always ask their team leader for help. Furthermore, there is a designated data expert in the school; an ICT employee helps teachers with their questions on the school monitoring system. However, there was no expert that helps them in actually using these data.

Data user characteristics

Finally, the characteristics of the data users of Groenhorst Emmeloord were studied. This was done by approaching the concepts (1) knowledge and skills to use data and (2) attitude towards data use. All participating teachers believed that they have sufficient *knowledge and skills* to find solutions to problems they have. Three teachers pointed out to have the right knowledge and skills to gather all the data, but two teachers stated to have difficulty in using the school monitoring system. Furthermore, one teacher felt competent to analyse the internal questionnaire and another teacher stated to be able to use data to improve his lessons. Three teachers pointed out that they would like to develop their knowledge and skills for data use further; their knowledge and skills are sufficient, but they would like to expand their data use. School leaders answered similarly; they too believed to have sufficient data use skills, but would like to expand their knowledge and skills.

Concerning the *attitude towards data use*, most participating teachers stated that they believe data use is important and that DIDM can be very helpful for Groenhorst Emmeloord. They also pointed out that they would like to receive PD on this topic. One teacher however, thought that when teachers start sharing more data, the most important issues will already be resolved. The attitudes of the school leaders can be labelled as 'positive', especially the attitude of the location director: *"I am hungry for data and I keep on wanting more"*. It was already presented that teachers think the most important types of data are classroom observations (even though not always systematically) and student interviews. The teachers who did not see the importance of DIDM explained that these types of data are so important for them that they do not need PD in DIDM and use other types of data too.

4.1.3 Workshop with group interviews

The workshop followed by a group interview, was originally conducted to answer the second sub question. However, after experiencing DIDM in practice by means of the workshop, much discussion arose on respondents' current data use and the importance of the presented method. This discussion

was coded with the same codes as were used for the interviews. Codes for the purpose of data use, data characteristics and data user characteristics were allocated to the responses and these topics will therefore be discussed.

Purpose of data use

The workshop gave respondents a clear view on what DIDM could look like in practice which made it possible for them to point out data use in their own practice. Respondents for instance looked at the results of the internal questionnaire and the location director compared these results to the results of the JOB monitor. Moreover, when exams point out knowledge gaps of students, the curriculum is adjusted and evaluated the next year. The need for Project Datateams, or another PD-program for DIDM, did not seem very high. However, one teacher stated: *"We talk about problems, sometimes in small groups, sometimes in staff meetings. This is neither systematic nor measurable; this can lead to creating a wrong picture".* Another teacher added that they often believe to know what the cause of the problem is and directly try to implement change; he stated to see the value of problem analysis before decision making. Finally, a respondent stated that: *"if we have influence on the results [...], than why shouldn't we do something to improve them?"*.

Data characteristics

One of the groups discussed the lack of national exams; from the school year 2014-2015 and the years that follow, standardized tests for Dutch will become available for vocational education and in following years for math and English too. However, this does not make it possible to compare the results of all subjects with the results of other schools, but one of the interviewed groups believed it is possible to compare results internally for the remaining subjects. This however requires teachers from the same subjects to use the same lesson materials and the same tests. They believed that this might be a problem for some of their colleagues. However, the school does possess many data on student contentment which can be compared to other schools; this type of data respondents also found very useful. Besides the availability and usability of the data, respondents also stated that if they would participate in DIDM they first need to take a look into the quality of all their data.

Data user characteristics

Looking at the knowledge and skills for data use, some respondents pointed out to need some help and therefore see the use of a PD-program. They stated to sometimes be unable to resolve their problems and that help is needed. Some respondents are positive that a PD-program, like Project Datateams, might be of help to finally tackle these problems. Looking at the DIDM process, they mentioned to see difficulties in analysing data, seeing trends and therefore problems because of the small amount of students, making their hypotheses measurable and coming up with the right hypothesis and therefore solution to the problem; help on these subjects is seen as appropriate.

4.2 Characteristics of a viable PD-program for DIDM in Groenhorst Emmeloord

Because DIDM is such a difficult process in primary- en secondary education, vocational practitioners will probably also experience difficulties in applying this method. Therefore, the second sub question tries to find characteristics of a viable PD-program for DIDM in Groenhorst Emmeloord. The interviews (4.2.1) and the workshop (4.2.2) gave insights into this sub question, so their results are presented below.

4.2.1 Interviews

Ten teachers, the team leader and the location director have participated in the interviews. After discussing current data use (see 4.1.2), they were asked about PD in their school and what they viewed as important aspects of a PD-program. This was done by means of the ten characteristics of a successful PD-program according to Timperley (2008).

First, respondents were asked how PD-programs have been organized in the past. As a response to this question, most respondents started to discuss school leadership concerning PD. In this, some discussed if the school takes initiative to organize PD activities and others talked about time they

receive for these activities. After this, some of the conversations were immediately directed to one of Timperley's (2008) aspects, but in approximately half of the interviews respondents were asked to describe which aspects they thought are the most important in a PD-program. As a response to this question, respondents named four different concepts of Timperley (2008): assessment of professional inquiry should take place (mentioned by four teachers), the program should have worthwhile content, but this mostly concerned subject matter PD (four teachers), integration of knowledge and skills (one teacher) and, maintaining momentum (one teacher).

With the first questions above, respondents were able to discuss PD aspects that are not in Timperley's (2008) list (however, they did not). In addition, all aspects of Timperley that had not been discussed yet were brought up to see how respondents valued those. The results of these questions are presented below; the aspects of Timperley (2008) are discussed one by one.

Focus on valued student outcomes

When signing up for a PD-program, all teachers look if students profit from what they will learn in that program. However, six of them did not believe that a PD-program should only focus on the results of the students, but also on other aspects as: improving student contentment, working with students in general and a nice working climate. The school leaders agreed with this statement. The team leader brought up 'student motivation' as an example of an important topic.

Worthwhile content

All teachers believed that the content of the PD-program should be relevant, but only five teachers named this characteristic of a PD-program specifically as one of the first things they look at before attaining a PD-program. According to teachers, the program should contain new, contributing knowledge and relate to the courses they teach or current points of interest. The school leaders pointed out that the goals of the PD-program should also be challenging to create interest and motivation.

Integration of knowledge and skills

It was already stated that a PD-program should present new knowledge. Two teachers specifically pointed out how important it is that they keep track of new developments around their subject or educational activities in general. Therefore, they looked for PD-programs that provide new knowledge and skills on subjects that are important for them. The new knowledge and skills should contribute to their current knowledge.

Assessment of professional inquiry

Looking at PD-programs that respondents have participated in earlier on, some trainers have adjusted their instructions to the needs of the participants and some of them have not. The latter just presented the information and let participants filter out what was important for them, which is preferred by one interviewed teacher. However, seven other responding teachers preferred that assessment of professional inquiry takes place so the program is adapted to their needs. The last two teachers mentioned that they like to start a program with much information on a new topic. Then, they sit down with their colleagues (and the trainer) and discuss which of the presented issues are important for them and what the training should focus on. After this, targeted instruction should follow. These two teachers both also teach to secondary students. This might indicate that this PD-aspect is more commonly used in secondary education than in vocational education. Finally, the answers of the school leaders confirmed the reactions of most of the teachers: a PD-program should focus on teachers' interests and on questions and problems that they have.

Multiple opportunities to learn and apply information

When the participating teachers were asked if a PD-program should contain practical elements they all responded *"yes!"*. They stated that they always try to make their own lessons practical and like to see this approach in PD too. When a program does not contain practical elements, their minds quickly wander of and they stop paying attention. The location director confirmed that learning to apply new information is very important, but also that learning by doing is something that his teachers are good at. Some teachers added that when they use new skills in practice, they are able to see what the use of those skills is. Another teacher also pointed out that practical elements show the strengths and weaknesses on a topic so he can ask for targeted instruction.

Approaches responsive to learning process

It was already mentioned that respondents wanted to learn new information during PD, something that contributes to their current knowledge and skills. One teacher stated the importance of having the right prior knowledge. Two others prefered a clear link between the subject of the program and the PD elements. They recalled a program on competency based teaching which is a method for interactive instruction; the trainer however only gave a theoretical presentation. According to these teachers this raised resistance to the method. Finally, one teacher stated that a program should be positive and stimulating. According to him, some trainers point out how wrong their current working method is and only talk about the advantages of the new method. This also raised resistance.

Opportunities to process new learning with others

Respondents stated to follow two types of PD-programs: programs to increase their subject knowledge and programs to increase their educational knowledge and skills. Following programs that increase subject knowledge is something teachers do with their faculty or, when there is not enough time, alone. Most teachers preferred to participate in subject-matter PD with their faculty, but also did not mind to process new learning alone.

During educational changes, like implementing DIDM, respondents believed that this should be done with the whole teaching staff: *"you are going to change collaboratively, so you should also follow a program together. That way, everyone has their say in the change process".* During collaborative PD, teachers pointed out the importance of discussion, resolving mutual problems together and learning from each other. The team leader pointed out that he too finds it very important to participate in collaborative PD. However, the school does not always have enough money to provide for this.

Knowledgeable expert

Respondents stated to learn form an external expert or sometimes from a colleague during PD. Most respondents prefered an external expert, because he/she can add new knowledge to the school. However, this expert should be able to relate to the teaching practice. Moreover, this expert should not only present new information, but should also help in guiding the PD-process. He or she knows what is important and what is possible within the presented method and can help to formulate strengths and weaknesses to receive targeted instruction.

Four teachers pointed out to also find the help of a colleague very helpful for PD. They believed that they not always have to participate in a PD-program in order to professionally develop themselves. *"As long as this person has the right knowledge"*, he/she is able to help.

Active leadership

Looking at school leadership during PD, most participating teachers pointed out that an educational training is mostly done on the initiative of the school management. Professionalization on subject matter however, is often based on teachers' own initiative. Even though subject matter training is mostly their own initiative, all teachers believed that this is always made possible by their team leader.

A school leader should also provide time for PD. Every teacher at Groenhorst Emmeloord gets a few hours a week for PD. This does not only concern actual PD-programs, but for instance also reading literature. However, almost all teachers believed that this scheduled time is never enough. Half of them did think that when you are a little more flexible, you can always make time for PD. Moreover, almost half of the teachers stated that during a collaborative PD-program the school should specifically schedule time so collaboration is supported. Furthermore, two teachers believed that their team leader and location director should lead the PD process and two others stated that their supervisors should formulate clear goals for PD.

Finally, when the team leaders were asked about their role in PD activities, they both agreed that this should be a supporting role. The location director stated that he should set an example in using data, should facilitate the learning process and should motivate and support his teachers. He believed that: *"the team leader should support the teaching staff for activities today and tomorrow, and the location director should look at what this means for the day after tomorrow and for over a year"*.

Maintaining momentum

Looking at respondents' experiences with PD-programs, these programs have not always led to a sustainable change in their work. Some teachers believed that one of the reasons for this is the lack of scheduled time for the improved actions. After following a PD-program on for instance DIDM, time should be scheduled to continue working with data, otherwise this time is used for something else and teachers start using this method less and less. Lacking the proper facilities to use the new method would lead to the same results. Teachers wanted to immediately try out the new methods and keep practicing their new knowledge and skills. But also during the PD-program, time and resources should be arranged for this program, because *"during the process you always come up with new questions so follow up is needed*". One teacher stated to rather spends years on PD than follow a short program that does not create sustainable change which means, in his eyes, that the program was a waste of time.

4.2.2 Workshop with group interviews

After the workshop of Project Datateams, respondents were asked by means of a group interview which aspects of this program they preferred. This was coded with the same codes as the interview: by means of Timperley's (2008) ten concepts of a successful PD-program. Therefore, the results are discussed based on these ten aspects. Additionally, respondents were asked which problems they would like to tackle first with the Datateam method or with the DIDM method in general; also the results of this question are presented below.

Characteristics of a successful PD-program.

Not all of Timperley's (2008) aspects came up during the group interviews, but several of them did. The biggest concern with Project Datateams was about the duration of it. *School leaders* should make time available for PD, but it was not sure if that much free time could be made available. Project Datateams takes two years; one of the groups would rather follow this project in one year or even less. One teacher elaborates: *"I wonder if the program should take two years. This will probably decrease our motivation, at least my own motivation".* Another remark on the duration was that the project contains many steps: *"you need to know and do a lot before you can actually start on the process"* and *"you need to gather a lot of data and analyze them before you can think about taking actions"*. Summing up, the respondents wanted to know if the amount of time they put in this project results in the same amount of profits at the end of that process.

Concerning *opportunities to process new information with others*, it was pointed out by one of the groups that there have been many changes within the teaching team and there will probably be more in the future. Not all teachers in this group believed to be able to create a stable Datateam.

Furthermore, it was not always easy for the respondents to imagine whether *students benefit* from the method, because they are only helped indirectly. However, after respondents saw the focus on valued student contentment, they became more enthusiastic about the program. Some respondents did not like that student contentment is mostly reported with numbers. Many respondents see how these numbers can give a clear insight into strengths and weaknesses of their school, but some believe that student interviews or student observations are more humane. Another concern with expressing student satisfaction in numbers is that this is mostly done by means of a questionnaire. Many respondents believed that their students are tired of filling in questionnaires which influences the reliability of the results.

Important problems to address with the DIDM method

Even though there is still some discussion about DIDM and the Datateam method, the participants were able to come up with many different problems of which they thought can be addressed with the DIDM method. Most of these problems had to do with student motivation. Examples are: motivation to do the homework, motivation to get their diploma or motivation for a specific course. Additionally, the contentment of the student was named as an important aspect for change, for instance by improving the scores on the JOB monitor and the rating in the national student guide (in Dutch: Keuzegids). Finally, one participant would like to look at the grades of the national exams and another respondent wanted to increase the graduation rate.

In one of the group interviews, it was concluded that if the Datateam method is used, this should be focused on resolving complex problems. This group of teachers believed that the eight-step

program of Project Datateams is too extensive when dealing with small problems. However, because there are some complex problems that they were not able to tackle over the years, the Datateam method can be of help. Furthermore, it was stated that the chosen problem should be relevant for all the participants. The other focus group stated that they would like to compare the performances of their school with other schools. They believed that this will point out the most important problems they would like to address. However, sometimes having a low appraisal is enough to improve performance, even when the rest of the nation receives a comparable appraisal. *[location director]: "Our appraisal only differs a tenth of a point with the other schools of Groenhorst. But do we believe that a score of 6.2 out of 10 is enough?" [all teachers respond]: "No!"*

5. Conclusion and discussion

Based on the results presented in chapter 4, this chapter first provides answers to the research questions (5.1). Additionally, it discusses the research materials and instruments (5.2). Based on the information of these first two sections, implications for practice (5.3) and implications for further research (5.4) are formulated.

5.1 Answer to the research questions

In this first section the results, as presented in chapter 4, are discussed which leads to answers to the sub questions and the main research question. The answers to the sub questions will be discussed first, concerning the current state of data use at Groenhorst Emmeloord (5.1.1) and characteristics of a viable PD-program for DIDM in Groenhorst Emmeloord (5.1.2). This provides insights into the answer of the main research question about increasing the level of DIDM in Groenhorst Emmeloord (5.1.3).

5.1.1 Current state of data use at Groenhorst Emmeloord

Throughout this study, determining the current state of data use at Groenhorst Emmeloord has been based on the elements of the model of Schildkamp and Kuiper (2010): data use purposes, data characteristics, school organizational characteristics and data user characteristics. Therefore, the answer to this first sub question is also given based on these four elements.

Purpose of data use

There are three main purposes of data use: (1) accountability, (2) instructional purposes and (3) school improvement (Schildkamp, Poortman et al., 2013). The different instruments that were used to investigate the purpose of data use show different results regarding which purpose data are mostly used for. The interviews for starters, showed that data are used by teachers mostly for instructional purposes and that school leaders use data mostly for accountability. School improvement is not a high priority for both parties. This is in line with literature on DIDM in primary- and secondary education (Schildkamp & Kuiper, 2010), but also with literature on vocational education (Kennisnet, 2011).

However, the questionnaire showed that data are mostly used for accountability, followed by school improvement and are used the least for instructional purposes. Project Datateams (2014) has used the same questionnaire in secondary education in which a total of 1031 teachers participated. Table 3 shows the results of this questionnaire for the topics of 'data use purposes' and is compared to the findings of this study in Groenhorst Emmeloord and all of Groenhorst's schools. Just as in Groenhorst (Emmeloord) data are used by secondary teachers mostly for accountability and the least for instructional purposes.

Table 3

Mean and standard deviation of the questionnaire on data use purpose in Groenhorst Emmeloord, Groenhorst and secondary education

	Groenhorst Emmeloord Mean (SD)	**Groenhorst** Mean (SD)	**Secondary education** Mean (SD)
Accountability*	2.89 (.17)	2.88 (.28)	2.94 (.41)
School improvement*	2.55 (.32)	2.33 (.40)	2.63 (.45)
Instructional purposes**	3.11 (.68)	2.86 (.96)	3.02 (1.11)

* four-point scale, rating from 1= 'totally disagree' to 4= 'totally agree'

** six-point scale, rating from 1 = 'barley/never' to 6 = 'few times a week'

Source fourth column: Project Datateams (2014).

Data characteristics

Data characteristics are defined by (1) the availability of the data, (2) the usability of the data and (3) the data quality (Schildkamp, Poortman et al., 2013). Results of all research instruments showed that practitioners of Groenhorst Emmeloord believed that they have access to the data they need, but they do not look for specific data to solve problems and only use available data for personal evaluation.

Furthermore, the usability and quality of the available data in Groenhorst Emmeloord is seen as sufficient. However, the data are not always timely available (and therefore not accessible) and the internal questionnaire, which is viewed as a very useful type of data, is in need of quality improvement.

Comparing these results to literature, vocational school leaders in these studies are a little less positive about their data characteristics. They also pointed out that data are not always timely available (Kennisnet, 2011). Additionally, they do not always have access to the data they need (Onderwijsraad, 2011) and data are not always relevant or accurate (Kennisnet, 2011). However, when comparing the results of the questionnaire, which show similar data characteristics as the other research instruments, to the results of the same questionnaire in vocational education (Project Datateams, 2014), secondary education scores relatable to Groenhorst (Emmeloord) (see Table 4).

Table 4
Mean and standard deviation of questionnaire on data characteristics in Groenhorst Emmeloord, Groenhorst and secondary education (on a four-point scale)*

	Groenhorst Emmeloord Mean (SD)	**Groenhorst** Mean (SD)	**Secondary education** Mean (SD)
Accessibility of data	3.01 (.42)	3.03 (.58)	3.17 (.52)
Usability of data	2.76 (.30)	2.71 (.51)	2.80 (.48)
Data quality	2.97 (.44)	2.91 (.48)	3.04 (.41)

Four-point scale, rating from 1= 'totally disagree' to 4= 'totally agree'
Source fourth column: Project Datateams (2014).

School organizational characteristics

School organizational characteristics have been studied with the concepts: (1) school leadership, (2) collaboration, (3) visions, norms and goals and (4) training and support (Schildkamp, Poortman et al., 2013). First, the questionnaire showed that there are few shared visions and norms on what good teaching looks like. The results of the interviews added to this that there are some goals for collecting data, but not for actually using these data. The school leaders manage and support teachers towards these goals. Additionally, teachers share a lot of data with each other according to the questionnaire, but the interviews pointed out that not all teachers find this amount of data sharing sufficient. There is no agreement on which data should be available for everyone and which data should be shared.

A study of Kennisnet (2011) shows that other vocational schools have started formulating visions, norms and goals for data use, but, like Groenhorst Emmeloord, are in need of more leadership, collaboration and training and support for data use. Comparing the results for school organizational characteristics to secondary education is possible by means of the questionnaire. Table 5 shows the results of the questionnaire for Groenhorst Emmeloord and all of Groenhorst's schools again and compares these to the results of the same questionnaire in secondary education (Project Datateams, 2014). The different scores for the concepts 'school leadership' and 'norms' are especially noteworthy, because these scores are much higher in secondary education than in Groenhorst (Emmeloord).

Table 5
Mean and standard deviation of questionnaire on school organizational characteristics in Groenhorst Emmeloord, Groenhorst and secondary education (on a four-point scale)*

	Groenhorst Emmeloord Mean (SD)	**Groenhorst** Mean (SD)	**Secondary education** Mean (SD)
School leadership	2.38 (.48)	2.44 (.58)	2.74 (.48)
Collaboration	3.09 (.32)	3.03 (.39)	3.20 (.48)
Vision	2.15 (.49)	2.41 (.67)	2.28 (.59)
Norms	1.93 (.46)	2.09 (.59)	2.36 (.61)
Training and support	2.26 (.44)	2.35 (.47)	2.34 (.52)

Four-point scale, rating from 1= 'totally disagree' to 4= 'totally agree'
Source fourth column: Project Datateams (2014).

Data user characteristics

Finally, data user characteristics have been measured by means of: (1) knowledge and skills for data use and (2) attitude towards data use (Schildkamp, Poortman et al., 2013). Looking at practitioners' knowledge and skills, different results can be seen throughout different research instruments. The questionnaire showed that practitioners feel confident in using data for the data use methods they are currently working with. The interviews showed similar results, but some respondents also pointed out to believe that there is more to learn for them. Finally, after seeing DIDM in practice in the workshop, respondents of Groenhorst Emmeloord believed that they do not possess the right knowledge and skills to use DIDM. The study in vocational education of Van Zenderen (2012) shows similar results as the questionnaire; he stated that in his study teachers believed to have the right knowledge and skills to use data. Additionally, the questionnaire of Project Datateams (2014) showed a similar level of knowledge and skills in secondary education as in Groenhorst (Emmeloord) (see Table 6). However, a study of Kennisnet (2011) shows that vocational school leaders, opposed to teachers, are less sure about their data use skills. In literature on DIDM in secondary education it is even stated that not only school leaders but mostly all practitioners lack knowledge and skills to successfully implement DIDM (Ledoux et al., 2009; Noordink, 2011; Schildkamp & Ehren, 2013).

Regarding practitioners' attitude towards data use most attitudes are positive, but mixed feelings were recognized throughout results of all research activities. During the questionnaire and the interviews respondents pointed out to see many advantages in DIDM. A comparable attitude towards data use in the questionnaire was measured for secondary teachers (see Table 6). However, after participating in the workshop practitioners of Groenhorst Emmeloord became more sceptical about DIDM; they wondered if the amount of effort DIDM takes pays off in the results of this data use method.

Table 6

Mean and standard deviation of questionnaire on data user characteristics in Groenhorst Emmeloord, Groenhorst and secondary education (on a four-point scale)*

	Groenhorst Emmeloord	**Groenhorst**	**Secondary education**
	Mean (SD)	Mean (SD)	Mean (SD)
Attitude	2.76 (.37)	2.78 (.42)	2.85 (.50)
Knowledge and skills	2.95 (.38)	2.97 (.58)	3.00 (.46)

Four-point scale, rating from 1= 'totally disagree' to 4= 'totally agree'

Source fourth column: Project Datateams (2014).

5.1.2 Characteristics of a viable PD-program for DIDM at Groenhorst Emmeloord

In defining which characteristics a PD-program for DIDM should contain for practitioners of Groenhorst Emmeloord, first Timperley's (2008) characteristics of a successful PD-program were evaluated with the practitioners. It was studied which characteristics previous PD-programs at their school have and which characteristics they prefer. In addition, practitioners were asked which problems they would like to address during a PD-program for DIDM. The results of this study are discussed based on these two topics.

Timperley's characteristics of a successful PD-program

Literature showed that primary- and secondary practitioners lack the right knowledge and skills to successfully use DIDM in practice (e.g. Ledoux et al., 2009; Noordink, 2011; Schildkamp & Ehren, 2013) and table 6 showed that the same level of knowledge and skills was detected in Groenhorst (Emmeloord). Because in secondary education this knowledge and skills level is seen as insufficient and practitioners are in need of a PD-program to successfully implement DIDM, this might also concern vocational practitioners. Therefore, Timperley's (2008) ten characteristics of a successful PD-program were evaluated with respondents. These characteristics are: (1) focus on valued student outcomes, (2) worthwhile content, (3) integration of knowledge and skills, (4) assessment of professional inquiry, (5) multiple opportunities to learn and apply information, (6) approaches

responsive to learning process, (7) opportunities to process new learning with others, (8) knowledgeable expertise, (9) active leadership and (10) maintaining momentum.

In literature on PD in vocational education, no information can be found on the concept 'maintaining momentum', but the other nine concepts of Timperley (2008) are all applicable to vocational education (e.g. Gerrichhauzen, 2007; Inspectie van het onderwijs, 2013b; Moesker et al., 2010). This study has confirmed that indeed all of Timperley's concepts (2008) are applicable to vocational education in Groenhorst Emmeloord, including 'maintaining momentum'. After being presented with Timperley's (2008) ten characteristics, practitioners of Groenhorst Emmeloord mostly preferred the characteristics 'assessment of professional inquiry', 'multiple opportunities to learn and apply information' and 'focus on student outcomes'. Regarding the latter, they did not only find it important to focus on student outcomes, but also on student contentment.

Looking at previous PD-programs that practitioners of Groenhorst Emmeloord have participated in, the interviews showed that the biggest concern with these programs is that they are not sustainable. Some programs are too short to create sustainable change and the school does not always provide enough time and resources to participate in a PD-program or to use the new method in practice after the program has finished. A PD-program that maintains momentum is therefore a very desirable characteristic a PD-program for DIDM should have compared to previous PD activities at Groenhorst Emmeloord. One teacher even stated to rather spend years on PD than participate in a short program that does not lead to sustainable change. However, after the workshop of Project Datateams some respondents stated that the duration of this program, two years, is too time consuming; a one-year program or even less was preferred. It can be concluded that a sustainable PD program is desirable, but that there is no consensus in Groenhorst Emmeloord yet about the duration of such a program.

Important problems to address with the DIDM method

After following the workshop of Project Datateams, respondents were asked which problems they would prefer to address with the DIDM method. They stated that the Datateam method was too extensive to use for solving small problems. Not all problems need a data analysis to be solved, according to the respondents. When using DIDM in their school, practitioners of Groenhorst Emmeloord would like to address complex problems that concern all practitioners; for instance increasing student motivation. The fact that practitioners of Groenhorst Emmeloord chose to focus on increasing student satisfaction, confirms their preference for Timperley's (2008) concept to focus on student outcomes and student contentment.

Studies in secondary education confirm that practitioners find it important to formulate a problem that they all find important (Scholten, 2013) and that many of these problems take place at the school level (Schildkamp, 2012; Schildkamp et al., 2011). However, secondary practitioners are also interested in problems that concern specific subjects, like increasing the grades on fractures in second grade math students (Schildkamp, 2012). Practitioners of Groenhorst Emmeloord also valued problems on instructional purposes, but believed that their school would benefit the most from tackling problems at the school level.

5.1.3 Increasing the level of DIDM in Groenhorst Emmeloord

Both sub questions together help to answer the main research question: *How can the level of data-informed decision making at Groenhorst Emmeloord be increased?* Regarding current data use, there is room for improvement concerning DIDM in Groenhorst Emmeloord. Respondents state to use data for accountability, school improvement and instructional purposes, but the results show that this data use level can still be increased. Therefore, first attention should be paid to the data that are available at Groenhorst Emmeloord. Those data are valued as sufficient for the purposes they are currently used for, but it is questioned by the respondents if these data fit all the DIDM criteria. Second, Groenhorst Emmeloord could use improvement regarding policy planning for DIDM. By this, school leaders can better guide the DIDM process, there are clear objectives for data sharing, clear visions, norms and goals for data use are formulated and training and support become available to improve the DIDM process. Finally, there are some mixed feelings regarding DIDM; by creating a positive, shared attitude towards this method, data use could also increase.

Because respondents of Groenhorst Emmeloord believed to need more knowledge and skills to be able to successfully work according to the DIDM method, it is recommended to participate in a PD-program. According to respondents, this program should address support to help solving complex problems that concern all practitioners of Groenhorst Emmeloord; for instance increasing student contentment. Such a PD-program should preferably provide targeted instruction, focus especially on using practical elements and showing participants how their students can benefit from that program in terms of increasing student results and/or student contentment. Additionally, the other seven of Timperley's (2008) characteristics are also viewed as important while designing a PD-program for DIDM for Groenhorst Emmeloord. However, respondents stated that some previous PD-programs that Groenhorst Emmeloord has participated in have failed to create a sustainable change. Therefore, it is recommended to pay special attention to maintaining momentum.

5.2 Discussion of research methods and instruments

In this section the research materials and research instruments are discussed based on noteworthy outcomes and remarks. Therefore, this section elaborates first on the response on the questionnaire (5.2.1), second on the execution of the workshop (5.2.2) and finally on the use of the terms 'data' and 'DIDM' throughout the whole study (5.2.3).

5.2.1 Response on the questionnaire

Looking at the questionnaire, there are some concerns about the number of respondents that have participated in this research activity. For this instrument, the procedure of Schildkamp, Poortman et al. (2013) was used. A response of 10% was the first criterion, at least ten respondents per school was the second criterion.

Groenhorst Emmeloord had a response percentage of 60% and all schools of Groenhorst had 18%, so the first criterion was met by both respondent groups. However, looking at the individual schools only Emmeloord, Almere, Ede and Velp met this criterion. Emmeloord and Barneveld were the only schools that had at least ten respondents participating in the questionnaire. Note however that it was difficult to obtain the precise numbers of vocational teachers per school, because many teachers teach both secondary- and vocational education.

Because both response criteria were met in Groenhorst Emmeloord the results are presumed as reliable. Because of the low response in other Groenhorst's schools, the results of this respondent group are questionable. Note however, that not all vocational schools of Groenhorst have ten teachers to respond to the questionnaire; they were never able to meet the criterion. It could be questioned whether it was wise to ask these schools to participate at all, but it has given some general insights into the generalizability of this study.

Finally, it could be noticed that the respondents have much teaching experience. Respondents in Groenhorst Emmeloord have a mean teaching experience of 20 years and respondents of all of Groenhorst's schools have an experience of 15 years. It might be possible that if more young teachers would have participated in the questionnaire, this would have had a (positive) influence on the results. Young teachers are seen as more motivated and more willing to try something new (Verloop, 2009); this could have influenced the results for the aspect 'attitude towards data use'. Furthermore, young teachers still need to gain teaching experience (Verloop, 2009) and might therefore use more data to justify decisions they make or evaluate their lessons for instructional purposes.

5.2.2 Execution of the workshop

The workshop was designed to fully focus on answering the second sub question of this study. It was expected that respondents would discuss the PD elements of Project Datateams. However, it turned out that most discussions within the group interviews where on DIMD in general or on DIDM in Project Datateams. This gave extra insights into answering the first sub question; unfortunately, this was at the expense of the results to answer the second sub question. The extensive focus on DIDM in general is probably due to the broad questions that were used in the group interviews. The questions were not based on the model of Timperley (2008) and the results were therefore also difficult to analyze.

Some other remarks with regard to the workshop concern time. First of all, there was only little time for the workshop and group interviews; approximately one hour and fifteen minutes. The standardized workshop normally takes at least one hour, but now had to be completed in 45 minutes.

Regarding the group interviews, it was possible to receive an answer to all questions within the 30 minutes that were available for this research activity. However, answers could have been elaborated further when more time would have been available. Secondly, the workshop was conducted on a Friday afternoon before spring break, which could have had an influence on the motivation and attention of the respondents. Additionally, a few respondents that were present during the group interview did not participate in the conversation at all. Possibly, because there was not enough time to ask all respondents to elaborately share their opinions.

5.2.3 Use of the terms 'data' and 'DIDM'

Throughout the different research activities the terms 'data' and the Dutch term for DIDM 'opbrengstgericht werken' (working result oriented) have been used. The questionnaire only used the term 'data' and teachers in Groenhorst Emmeloord mentioned after filling in this questionnaire to experience difficulty in understanding this term. On every page of the questionnaire a definition of 'data' was stated. Some teachers declared not to have seen this definition, but others, who did see the definition, still experienced difficulties while filling in the questionnaire.

Moreover, at the start of the interviews respondents were asked to give a definition for 'data' and 'DIDM'. This question showed that all respondents have different views on what these two concepts mean. During the group interviews after the workshop, it seemed like practitioners of Groenhorst Emmeloord finally understood the concepts 'DIDM' and 'data'. Because respondents were not clear on the concepts of this study from the beginning, this might have had a negative influence on the results of the questionnaire and the interviews.

5.3 Implications for practice

The presented answers to the research question have implications for practice; this section discusses how practice could be shaped based on these findings. This study does not only show implications for Groenhorst Emmeloord, but also for vocational education in general. Therefore, 5.3.1 discusses the implications for practice for vocational education and 5.3.2 will complement these implications by discussing implications that specifically concern Groenhorst Emmeloord.

5.3.1 Implications for vocational education

The implications for practice concerning vocational education are discussed based on the research questions. Therefore, the current state of data use in vocational education, characteristics of a viable PD-program for vocational education and increasing the level of DIDM in vocational education are discussed below.

Current state of data use in vocational education

The current state of data use has been discussed throughout this study by data use purposes, data characteristics, school organizational characteristics and data user characteristics (Schildkamp & Kuiper, 2010). Therefore, the implications for practice concerning the current state of data use will also be discussed based on these aspects.

Data use purpose. This study has shown that respondents of Groenhorst Emmeloord value all three data use purposes: data use for accountability, school improvement and instructional purposes (Schildkamp, Poortman, et al., 2013). The same goes for respondents of the questionnaire for all of Groenhorst's schools and relatable results are found in literature on primary-, secondary- (Schildkamp & Kuiper, 2010) and vocational education (Kennisnet, 2011). Therefore, it is safe to say that focusing attention to all three data use purposes will be valuable for all vocational schools.

Data characteristics. Groenhorst Emmeloord has stated that their available data seem sufficient, but that there is room for improvement; this is confirmed by Kennisnet (2011) and the Dutch Educational council (Onderwijsraad, 2011) for vocational education in general. When vocational schools want to improve their level of DIDM, it might be very valuable to first evaluate their data and possibly increase their accessibility, availability and quality. Moreover, vocational schools in the Netherlands will be using national exams for Dutch, math and English from the school year 2014-2015. However, the Dutch Educational council (Onderwijsraad, 2011) believes that more national exams are a prerequisite for DIDM. Practitioners of Groenhorst Emmeloord would like to be able to compare their results with other schools by means of national exams, but they have pointed out

that there are many other data available which makes them able to compare themselves with other schools; for instance on student contentment. It would be very interesting to see how the national exams for Dutch, math and English will influence DIDM in vocational education. However, it seems like the lack of national exams is no reason for DIDM to be unsuccessful in vocational education.

School organizational characteristics. It is interesting to see that most school leaders of vocational schools have started creating visions, norms and goals for data use, but have not addressed leadership, collaboration and training and support specifically regarding data use (Kennisnet, 2011). Especially on school leadership, but also on formulating norms for data use, Groenhorst is behind compared to secondary education. Even though there is probably a lot of difference between current school organizational characteristics of Dutch vocational schools concerning data use, it is safe to say that it might be recommended for all of them to take a look at their school organizational characteristics when focussing on DIDM.

Data user characteristics. The questionnaire shows that in Groenhorst (Emmeloord) teachers' knowledge and skills for data use is comparable to secondary teachers' (Project Datateams, 2014). In secondary education, this level of knowledge and skills is found insufficient to successfully make data-informed decisions; practitioners therefore need a PD-program (e.g. Ledoux et al., 2009; Noordink, 2011; Schildkamp & Ehren, 2013). Respondents stated to have sufficient knowledge and skills to use data for purposes they currently work with. However, when using data for DIDM, this knowledge and skills level might not be enough; a rather small amount of articles confirms this (Van Zenderen, 2012; Kennisnet, 2011). It can however be stated that when vocational schools want to increase DIDM in their school, they need to evaluate their knowledge and skills for data use, because when this level is insufficient they are in need of a PD-program.

Characteristics of a viable PD-program for vocational education

In determining the characteristics of a viable PD-program for DIDM, Timperley's (2008) ten characteristics of a successful PD-program were used. Except for the concept 'maintaining momentum', all concepts were confirmed by literature to be applicable specifically for vocational education (e.g. Brouwer et al., 2013; Gerichhauzen, 2007; Moesker et al., 2010). Groenhorst Emmeloord stated to value all ten of Timperley's (2008) concepts. Even though the responses of practitioners of Groenhorst Emmeloord indicate that some of Timperley's (2008) aspects deserve more attention than others, it can be stated that all ten characteristics are valuable in creating a viable PD-program for DIDM in vocational education.

Additionally, during a PD-program respondents stated to prefer working on complex problems that concern the whole teaching team; a study of Scholten (2013) shows that secondary practitioners have the same preferences. Even though it will be wise to monitor this choice because it is based on little research, it is recommended to start working on complex problems while learning DIDM. DIDM is a very extensive method, hence such a method seems too time consuming for small problems that can easily be resolved.

Increasing the level of DIDM in vocational education

The results of this study imply that vocational schools can take many different actions to increase their level of DIDM. Practitioners are able to invest in discussing the characteristics of their data, think about their school's organizational characteristics that support data use and evaluate their own performances concerning data use. Increasing only one of these aspects will probably already increase the level of DIDM in Groenhorst Emmeloord. Based on these aspects, a vocational school is able to determine its needs for a PD-program which is, based on studies in secondary education (e.g. Ledoux et al., 2009; Noordink, 2011; Schildkamp & Ehren, 2013), probably needed. This program should contain Timperley's (2008) ten characteristics of a successful PD-program and should focus on complex problems.

Additionally, these outcomes might have implications for teacher training in vocational education. In primary education studies have focused on how DIDM can be integrated in teacher education (Kennisnet, 2013; Keijzer & Van der Linden, 2012). This connects student research to methods that are used in the teaching practice and supports schools that already work according to the DIDM method (Keijzer & Van der Linden, 2012). No literature was found which confirms that similar initiatives are present in secondary- or vocational education. Because graduated primary teachers with

DIDM knowledge and skills are also very valuable in schools that do not work with the DIDM process yet (Keijzer & Van der Linden, 2012), this might also apply to secondary- and vocational education. Based on the findings of this study it is interesting to implement DIDM aspects in teacher training of vocational practitioners too. These young teachers will bring new insights into vocational schools and thereby might even inspire colleges and stimulate DIDM throughout the whole school.

5.3.2 Implications for Groenhorst Emmeloord

Besides the implications for practice this study has on vocational education, this study also provides implications specifically for Groenhorst Emmeloord; these implications are discussed in this section. A lot of implications for vocational education also concern Groenhorst Emmeloord. However, some implications specifically concern Groenhorst Emmeloord. These implications are discussed according to the current state of data use at Groenhorst Emmeloord and characteristics of a viable PD-program in Groenhorst Emmeloord.

Current state of data use at Groenhorst Emmeloord

It was already shown in 5.3.1 that most vocational schools could improve their data-, school organizational- and data user characteristics concerning data use; these implications are also valuable for Groenhorst Emmeloord specifically. It was also stated that all data use purposes are seen as valuable for vocational schools, but Groenhorst Emmeloord has stated a preference for one of the purposes. Even though preferences for different purposes were seen throughout all research activities, results of the interviews and workshop showed that respondents see increasing data use for school improvement as most beneficial and the questionnaire also shows that improvement is needed for this data use purpose. Because both teachers and school leaders see school improvement as an important part of their job, it is possible for them to work together on problems at the school level. However, it could be argued whether it is judicious not to focus on the other two data use purposes and only focus on school improvement. Therefore, it is recommended to start increasing data use in Groenhorst Emmeloord on school improvement and to monitor if teachers and school leaders will gradually start using data in their individual work for accountability and instructional purposes too; if not, special attention should be paid to these data use purposes as well.

Characteristics of a viable PD-program for Groenhorst Emmeloord

As was stated earlier, Timperley's (2008) ten characteristics of a successful PD-program are all important for PD-programs for vocational schools. However, when asked which aspects a PD-program should contain, most respondents of Groenhorst Emmeloord named 'assessment of professional inquiry'. Furthermore, when discussing all of Timperley's (2008) concepts, 'focus on student outcomes and student contentment' and 'opportunities to learn and apply information' seem the most important aspects according to respondents. This implies that these three characteristics are of the biggest importance for Groenhorst Emmeloord when choosing a PD-program for DIDM.

Additionally, respondents are concerned about the duration of the PD-program but have different opinions about this. During the interviews some of the respondents pointed out that some previous PD-programs they had participated in, failed to create a sustainable change due to a lack of time and resources. However, during the group interviews after the workshop, respondents pointed out that they found Project Datateams, which takes two years, too time consuming. Because of these conflicting opinions, it is recommended that practitioners of Groenhorst Emmeloord discuss the duration of a PD-program and come to an agreement so they are able to find a program that fits their needs.

Finally, it was already stated that vocational schools should focus on solving complex problems during a PD-program. Complex problems that are important to practitioners of Groenhorst Emmeloord have been discussed during this study. Examples are: motivation of students to do their homework, student motivation for specific courses, improving the scores on the JOB monitor and the rating in the national student guide (in Dutch: Keuzegids), increase the graduation rate and compare marks on the national exams with other schools. When participating in a PD-program for DIDM, it is recommended that Groenhorst Emmeloord focuses on tackling one of these problems first.

5.4 Implications for further research

Besides implications for practice, the results of this study also have implications for further research, which are presented in this section. The implications are discussed based on the research questions and therefore concern the current state of data use (5.4.1), characteristics of a viable PD-program for DIDM (5.4.2) and increasing the level DIDM (5.4.3). These implications all concern vocational education, including Groenhorst Emmeloord, but not Groenhorst Emmeloord specifically.

5.1.1 Current state of data use in vocational education

All three data use purposes of Schildkamp, Poortman et al. (2013) have proven to be important for vocational education. However, respondents stated to prefer working on problems at the school level: data use for school improvement. Secondary schools also work on school improvement during the DIDM process, but on instructional purposes too (Schildkamp, 2012). It would be interesting to study if other vocational schools also prefer working on school improvement above instructional purposes. If other vocational schools indeed prefer DIDM on school improvement, this can make PD-programs more personalized, but it is also interesting to study the cause of this preference. A possible explanation is for instance that Groenhorst (Emmeloord) has a small teaching team which makes it impossible to create a Datateam of teachers of one subject and more preferable to tackle a problem with the whole teaching team. To verify this idea, further research is needed to see if larger vocational schools also prefer working with data for school improvement or are also interested in instructional purposes. Another cause might be the lack of national exams, which make it more difficult to detect problems at the instructional level than in secondary education. From the school year 2014-2015 national exams for Dutch, math and English will be implemented in Dutch vocational education; it will be interesting to study how these exams influence the preferences for different data use purposes.

Moreover, respondents stated to prefer starting with formulating shared vision, norms and goals before thinking about other school organizational characteristics. This is an interesting idea, also because literature on DIDM in other vocational schools shows that these schools have started the DIDM process by formulated visions, norms and goals (Kennisnet, 2011). Further research should indicate if it is indeed valuable for vocational schools to start the DIDM process with formulating visions, norms and goals. If this idea turns out to be true, this might even have implications for the model of Schildkamp and Kuiper (2010).

Furthermore, only little research has been conducted on teachers' attitude towards data use. A study of Kennisnet (2011) shows that vocational team leaders are in general fairly positive about DIDM, but teachers' attitude is unknown. This study shows mixed results on respondents' attitude towards making data-informed decisions. Many advantages were recognized, but DIDM is also seen as a time consuming process. Further research might give a more clear view on vocational teachers' attitude towards data use which will make it possible to provide targeted support from within the school or from an external PD-program.

Finally, literature shows that in primary- and secondary education a balance is needed between external pressure from the government to encourage schools to increase DIDM (Diamond & Spillane, 2004) and support from the school to assist in this change process (Schildkamp & Kuiper, 2010). This study has shown how concepts of the model of Schildkamp and Kuiper (2010) assist schools in order to make data-informed decisions. An interesting follow-up question might be if this internal support is enough to increase the level of DIDM to, for instance, the level of DIDM in primary- and secondary schools. It might be possible that because there is not much external pressure for vocational schools to work according to the DIDM method, vocational schools might still not be as motivated to use this method compared to primary- and secondary education, who feel more pressure to use data. Further research should indicate the value of external pressure opposed to internal support to increase the level of DIDM in vocational education.

5.4.2 Characteristics of a viable PD-program for DIDM for vocational education

This study has evaluated Timperley's (2008) ten characteristics of a successful PD-program and results show that all characteristics are important. Because only very little research has been conducted on PD specifically for vocational practitioners, this might be an interesting topic for further research.

This study for instance pointed out the preference for the aspects 'focus on student results and student contentment', 'assessment of professional inquiry' and 'multiple opportunities to learn and apply information'; it would be interesting to see how these aspects fit other vocational schools. With such a study, possible new insights could occur which will personalize PD-programs for vocational practitioners. Additionally, results show mixed feelings on the duration of a PD-program for DIDM; further research is needed to determine the length of this program in vocational schools.

5.4.3 Increasing the level of DIDM in vocational education

This study has focused on increasing the level of DIDM in Groenhorst Emmeloord and has found that there are multiple possibilities to indeed increase this level and how a PD-program could facilitate this process. Most of the findings are also in line with literature on DIDM in vocational education; however, this is only a small amount of literature. Now that this case study has been completed, it will be very interesting to study how the findings fit other vocational schools. With these studies an overall view can be realized on which topics need improvement in order for vocational schools to use DIDM successfully. This way, national PD-programs for DIDM can be realized which will fit the wishes of vocational schools.

First, other agricultural training centers, like Groenhorst Emmeloord, should be studied to determine their resemblance with Groenhorst Emmeloord. Secondly, research at regional training centers (in Dutch: regionaal onderwijscentrum or 'ROC') should take place, which provide different subjects of education and are mostly more large-scaled than agricultural training centers. Extensive research could for instance be done by using the questionnaire of this study; the questions are reliable and a questionnaire is a valuable instrument to obtain much information simultaneously. Furthermore, it might be interesting to do a pilot of Project Datateams in vocational education. This will give further insights into the fit of this project into vocational education, provide PD preferences and may consequently support DIDM.

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Appendices

Appendix A: Questionnaire

Opbrengstgericht werken Groenhorst November 2013

Introductie

Beste docent,

Voor mijn afstudeeronderzoek aan Universiteit Twente onderzoek ik in hoeverre opbrengstgericht werken ingezet kan worden in het mbo. Opbrengstgericht werken is een systematische manier van werken waarbij informatie over onderwijs, de docenten, de leerlingen en de school als organisatie worden gebruikt om problemen op te lossen. Dit kunnen problemen zijn op leerling-, klas- of school niveau.
Om te kijken of opbrengstgericht werken ingezet kan worden in het mbo, is het belangrijk dat eerst het huidige opbrengstgericht werken in kaart wordt gebracht. Deze vragenlijst zal dit proberen. Ik hoop op uw medewerking aan mijn onderzoek.

Deze vragenlijst heeft de volgende onderdelen:
1. Informatie over jezelf
2. De mogelijkheden en barrières voor opbrengstgericht werken
3. Opbrengstgericht werken binnen Groenhorst

Het invullen van de vragen zal ongeveer 20 minuten duren. De antwoorden worden anoniem verwerkt.
Ik zal de gegevens van alle scholen samen verwerken tot een rapport waarvan u de resultaten zult ontvangen. Vervolg stappen van mijn onderzoek zullen plaatsvinden op Groenhorst Emmeloord dus zij zullen ook een rapport ontvangen dat alleen over hun locatie gaat. Verder zal iedere locatie waar een respons van minimaal 70% wordt gehaald ook een eigen rapport ontvangen.
Omdat deze vragenlijs onderdeel is van een groter onderzoek op Groenhorst Emmeloord, zullen de resultaten van deze vragenlijst pas bekend worden gemaakt wanneer het hele onderzoek is afgerond. Waarschijnlijk kunt u de resultaten in maart tegemoet zien.

Bij voorbaat dank voor het invullen van de vragenlijst!

Groeten,
Jessy Winkels

Opbrengstgericht werken Groenhorst November 2013

Sectie 1: Informatie over uzelf

==Anonimiteit==
In de vragenlijst worden een aantal persoonlijke achtergrondgegevens gevraagd. Deze gegevens dienen ertoe om groepen mensen over scholen heen met elkaar te kunnen vergelijken. De gegevens worden niet gebruikt voor analyses op individueel niveau en worden dan ook niet op individueel niveau naar de afzonderlijke scholen teruggekoppeld. Anonimiteit is dus gegarandeerd.

Wat is uw geslacht?

- Man
- Vrouw

* When a respondent answers that he/she has a management function, he/she will be notified that this questionnaire is only for teachers. The following questions are not shown to him/her.

Opbrengstgericht werken Groenhorst November 2013

Sectie 2 (a): Mogelijkheden & Barrières voor opbrengstgericht werken

Onder 'data' verstaan we de gegevens die op school beschikbaar zijn over het onderwijs, de organisatie, de leerlingen en de docenten. Voorbeelden van data zijn: inspectieverslagen, cijferlijsten, demografische gegevens, enquête-uitkomsten en observaties in de les.

Toegankelijkheid van data

	Zeer mee oneens	Mee oneens	Mee eens	Zeer mee eens	Weet ik niet
Ik heb toegang tot leerlinggegevens in een informatie systeem	○	○	○	○	○
Ik kan in één systeem alle gegevens over mijn leerlingen vinden	○	○	○	○	○
Ik heb toegang tot relevante informatie over mijn leerlingen	○	○	○	○	○
Gegevens over mijn huidige leerlingen zijn aan het begin (binnen 3 weken) van elk schooljaar beschikbaar	○	○	○	○	○
Wanneer leerlingen midden in het jaar op deze school beginnen, zijn de gegevens over hen snel beschikbaar	○	○	○	○	○

Bruikbaarheid van de data

	Zeer mee oneens	Mee oneens	Mee eens	Zeer mee eens	Weet ik niet
De gegevens waar ik toegang tot heb helpen mij bij het plannen van mijn lessen	○	○	○	○	○
Ik kan, met de gegevens die ik heb over mijn leerlingen, de groei in leerprestaties van jaar tot jaar bepalen	○	○	○	○	○
De gegevens waar ik toegang tot heb geven de vorderingen van mijn leerlingen weer	○	○	○	○	○
Ik heb te weinig gegevens over mijn leerlingen	○	○	○	○	○

Kwaliteit van de data

	Zeer mee oneens	Mee oneens	Mee eens	Zeer mee eens	Weet ik niet
Over het algemeen zijn de gegevens waar ik toegang tot heb up-to-date	○	○	○	○	○
Ik geloof dat de gegevens die ik heb over mijn leerlingen kloppen	○	○	○	○	○

Opbrengstgericht werken Groenhorst November 2013

Sectie 2 (b) : Mogelijkheden & Barrières voor opbrengstgericht werken

Onder 'data' verstaan we de gegevens die op school beschikbaar zijn over het onderwijs, de organisatie, de leerlingen en de docenten. Voorbeelden van data zijn: inspectieverslagen, cijferlijsten, demografische gegevens, enquête-uitkomsten en observaties in de les.

Attitude van de gebruiker

	Zeer mee oneens	Mee oneens	Mee eens	Zeer mee eens
Ik geloof dat het belangrijk is om data te gebruiken bij het vaststellen van individuele leerbehoeften van leerlingen	○	○	○	○
Ik geloof dat het gebruik van data belangrijk is bij het veranderen van mijn onderwijs	○	○	○	○
Ik geloof dat leerlingen profiteren wanneer de instructie van de docent is gevormd op basis van data	○	○	○	○

Kennis en vaardigheden van de gebruiker

	Zeer mee oneens	Mee oneens	Mee eens	Zeer mee eens	Weet ik niet
Ik heb de vaardigheden om, op basis van data, mijn onderwijs te veranderen	○	○	○	○	○
Ik ben in staat om met data de individuele leerbehoeften van mijn leerlingen vast te stellen	○	○	○	○	○
Ik begrijp de beoordelingscriteria en concepten voor het gebruik van data (bv. correlatie, validiteit, betrouwbaarheid)	○	○	○	○	○
Ik weet hoe ik de verslagen/rapporten (bijvoorbeeld examenresultaten of cijfers van voorgaande jaren) die ik wel eens krijg moet interpreteren	○	○	○	○	○
Ik voel me comfortabel bij het interpreteren van grafisch weergegeven data.	○	○	○	○	○

Opbrengstgericht werken Groenhorst November 2013

Sectie 2 (c): Mogelijkheden & Barrières voor opbrengstgericht werken

Onder 'data' verstaan we de gegevens die op school beschikbaar zijn over het onderwijs, de organisatie, de leerlingen en de docenten. Voorbeelden van data zijn: inspectieverslagen, cijferlijsten, demografische gegevens, enquête-uitkomsten en observaties in de les.

Schoolleiderschap

	Zeer mee oneens	Mee oneens	Mee eens	Zeer mee eens	Weet ik niet
Mijn directie moedigt het gebruik van data aan als effectieve ondersteuning van mijn onderwijs	○	○	○	○	○
Mijn leidinggevende moedigt het gebruik van data aan als effectieve ondersteuning van mijn onderwijs	○	○	○	○	○
Mijn leidinggevende maakt zelf op goede wijze gebruik van verschillende gegevens	○	○	○	○	○
Mijn leidinggevende biedt ons verschillende mogelijkheden (bv. tijd) om gebruik te maken van gegevens	○	○	○	○	○
Data analyses gedaan door leidinggevenden worden besproken met de docenten in mijn school	○	○	○	○	○
Mijn leidinggevende bespreekt data met mij	○	○	○	○	○
Mijn school is zich bewust van de noodzaak om de vaardigheden van docenten voor data-analyse te blijven ontwikkelen	○	○	○	○	○

Samenwerking

	Zeer mee oneens	Mee oneens	Mee eens	Zeer mee eens	Weet ik niet
Ik deel en bespreek resultaten van mijn leerlingen met leerlingen	○	○	○	○	○
Ik deel en bespreek resultaten van mijn leerlingen met ouders	○	○	○	○	○
Ik deel en bespreek resultaten van mijn leerlingen met andere docenten	○	○	○	○	○

Opbrengstgericht werken Groenhorst November 2013

Visie en normen

	Zeer mee oneens	Mee oneens	Mee eens	Zeer mee eens	Weet ik niet
Docenten in mijn school hebben allemaal vergelijkbare ideeën over wat goed onderwijs is	○	○	○	○	○
Docenten in mijn school hebben allemaal vergelijkbare ideeën over het leren van leerlingen	○	○	○	○	○
Docenten in mijn school hebben allemaal vergelijkbare ideeën over hoe we het leren van leerlingen effectief kunnen evalueren	○	○	○	○	○
Datagebruik is een duidelijke prioriteit in mijn school	○	○	○	○	○
Op mijn school gebruiken we een gestructureerde werkwijze voor het analyseren en interpreteren van data om actie te kunnen ondernemen	○	○	○	○	○

Scholing en ondersteuning

	Zeer mee oneens	Mee oneens	Mee eens	Zeer mee eens	Weet ik niet
Ik word voldoende ondersteund in het effectief gebruiken van data	○	○	○	○	○
Binnen de school is er iemand aanwezig die mijn vragen over datagebruik kan beantwoorden	○	○	○	○	○
Binnen de school is er iemand aanwezig die mij helpt mijn onderwijs te veranderen met behulp van data	○	○	○	○	○
Mijn school roostert specifiek tijd in voor datagebruik	○	○	○	○	○

Opbrengstgericht werken Groenhorst November 2013

Sectie 3: Data gebruiken

Datagebruik voor verantwoording

	Zeer mee oneens	Mee oneens	Mee eens	Zeer mee eens	Weet ik niet
De data die wij verstrekken voor verantwoording (bv. naar ouders, naar de inspectie) representeren de werkelijkheid van onze school nauwkeurig	○	○	○	○	○
Interne evaluaties worden ook voor andere doeleinden dan externe verantwoording (bv. de inspectie) gebruikt	○	○	○	○	○
Resultaten van onze interne evaluaties worden weergegeven in externe rapporten (bv. rapporten naar de inspectie)	○	○	○	○	○

Opbrengstgericht werken Groenhorst November 2013

Datagebruik voor schoolverbetering

	Zeer mee oneens	Mee oneens	Mee eens	Zeer mee eens	Weet ik niet
In mijn school gebruiken we externe evaluaties (bv. van de inspectie) voor ons eigen verbeterproces	○	○	○	○	○
Resultaten van leerlingen worden gebruikt voor het evalueren van de docentprestaties	○	○	○	○	○
Schoolleiders laten docenten op basis van data zien in welke mate de school haar doelen behaalt	○	○	○	○	○
Grondige data analyse is een essentieel deel van het verbeterproces van mijn school	○	○	○	○	○
De verdeling van onderwijstijd in mijn school wordt gedaan op basis van de geïdentificeerde leerlingbehoeften	○	○	○	○	○
In mijn school gebruiken we resultaten van leerlingen om jaarlijks doelen voor schoolverbetering op te stellen	○	○	○	○	○
Resultaten van leerlingen leiden tot beslissingen over professionele ontwikkeling in mijn school	○	○	○	○	○
Leerresultaten van leerlingen worden gebruikt om gaten in ons curriculum vast te stellen	○	○	○	○	○
In mijn school gebruiken we data als hulpmiddel om de beste manieren van onderwijs geven vast te stellen	○	○	○	○	○

Opbrengstgericht werken Groenhorst November 2013

Sectie 3: Data gebruiken

In deze sectie gaat het om data zoals resultaten van proefwerken, schoolonderzoeken (SE) en centraal eind examen (CE). Beantwoord onderstaande vragen vanuit deze betekenis.

Datagebruik voor instructie

Hoe vaak gebruikt u data voor:

	Nauwelijks tot nooit	Jaarlijks	Aantal keer per jaar	Maandelijks	Wekelijks	Aantal keer per week	N.v.t.
Het opstellen van leerdoelen voor de individuele leerlingen	○	○	○	○	○	○	○
Het bepalen van welke onderdelen of vaardigheden leerlingen wel of niet beheersen	○	○	○	○	○	○	○
Het bepalen van de vooruitgang/vorderingen van de leerlingen	○	○	○	○	○	○	○
Het aanpassen van instructie aan de behoefte van de leerlingen	○	○	○	○	○	○	○
Het bepalen van het tempo van mijn lessen	○	○	○	○	○	○	○
Het geven van feedback aan leerlingen over hun leerproces	○	○	○	○	○	○	○
Het verdelen van leerlingen in groepen om gerichte instructie te geven binnen de klas	○	○	○	○	○	○	○
Het selecteren van specifieke vaardigheden of onderwerpen die extra uitleg in de klas nodig hebben	○	○	○	○	○	○	○
Het onderzoeken waarom leerlingen bepaalde fouten maken	○	○	○	○	○	○	○
Het identificeren van behoeften en het plannen en aanpassen van instructie voor hoogbegaafde leerlingen	○	○	○	○	○	○	○
Het identificeren van behoeften en het plannen en aanpassen van instructie voor laagbegaafde leerlingen	○	○	○	○	○	○	○

Opbrengstgericht werken Groenhorst November 2013

Bedankt!

Bedankt voor het invullen van deze vragenlijst.

Het is belangrijk om de gegevens te versturen! Klikt u daarvoor s.v.p. op de knop "Verstuur mijn gegevens"!

Indien u nog vragen heeft kunt u een mail sturen naar Jessy Winkels: a.j.h.m.winkels@student.utwente.nl

Indien u nog op- of aanmerkingen heeft omtrent deze studie of deze vragenlijst, kunt u dat (anoniem) hieronder plaatsen.

Appendix B: Interview questions for teachers

Could you describe in your own words what 'data' means?

Data are all the information that a school has about their education, their organization, their students and their teachers. Examples of data are inspection reports, test results, demographic information, results of questionnaires and classroom observations.

Could you describe in your own words what 'data-informed decision making' means?

Data-informed decision making is a cyclic process for translating data, through information, to workable knowledge and using this knowledge in a systematically and goal-oriented way to inform decisions at the student-, classroom- and school level.

Purpose of data use

To which purposes do you use data?

At least the following subjects should be discussed:

- *Accountability*
- *Educational purposes*
- *School improvement*

Data characteristics

What kind of data are available to you?

At least the following subjects should be discussed:

- *Inspection reports*
- *Test results*
- *Demographic information*
- *Results of student questionnaires*
- *Results of parent questionnaire*
- *Classroom observations*

What is your opinion on the quality of these data?

At least the following subjects should be discussed:

- *Accessible data*
- *Usable data*
- *Data quality*

School organizational characteristics

How does your school encourage you and you colleagues to use data?

What does your school still need to do to encourage you and you colleagues to use data?

At least the following subjects should be discussed:

- *Distributed leadership*
- *Collaboration*
- *Vision, norms and goals for data use*
- *Training and support*

Data user characteristics

To what extend do you feel capable of using data?

At least the following subjects should be discussed:

- *Data use skills*
- *Attitude towards data*

Professional development program

Does your school attain in professional development? What does this look like? What do you like/dislike?

To what extend do you collaborate with your colleagues?

To what extend do you feel supported by your team leader during PD?

How much time do you have available for PD?

To what extend do you believe professional development is needed on data-informed decision making for you and/or you colleagues?

Which aspects do you think such a professional development program for data-informed decision making should have?

At least the following subjects should be discussed:

- *Focus on valued student outcomes*
- *Worthwhile content*
- *Integration of knowledge and skills*
- *Assessment for professional inquiry*
- *Multiple opportunities to learn an apply information*
- *Approaches responsive to the learning process*
- *Knowledgeable expertise*
- *Maintaining momentum*

Appendix C: Interview questions for school leaders

Could you describe in your own words what 'data' means?

Data are all the information that a school has about their education, their organization, their students and their teachers. Examples of data are inspection reports, test results, demographic information, results of questionnaires and classroom observations.

Could you describe in your own words what 'data-informed decision making' means?

Data-informed decision making is a cyclic process for translating data, through information, to workable knowledge and using this knowledge in a systematically and goal-oriented way to inform decisions at the student-, classroom- and school level.

Purpose of data use

To which purposes do you use data?

To what extend do you believe your teachers use data?

At least the following subjects should be discussed:

- *Accountability*
- *Educational purposes*
- *School improvement*

Data characteristics

What kind of data are available to you?

At least the following subjects should be discussed:

- *Inspection reports*
- *Test results*
- *Demographic information*
- *Results of student questionnaires*
- *Results of parent questionnaire*
- *Classroom observations*

What is your opinion on the quality of these data?

At least the following subjects should be discussed:

- *Accessible data*
- *Usable data*
- *Data quality*

School organizational characteristics

How do you and how does the school encourage your teachers to use data?

What do you / your school still need to do to encourage your teachers to use data?

At least the following subjects should be discussed:

- *Distributed leadership*
- *Collaboration*
- *Vision, norms and goals for data use*
- *Training and support*

Data user characteristics

To what extend do you feel capable of using data?

To what extend do you believe your teachers are capable of using data?

At least the following subjects should be discussed:

- *Data use skills*
- *Attitude towards data*

Professional development program

Does your school attain in professional development? What does this look like? What do you like/dislike?

To what extend do your teachers collaborate?

To what extend do you support your teachers during PD?

How much time do you have available for PD?

To what extend do you believe professional development is needed on data-informed decision making for you and/or your teachers?

Which aspects do you think such a professional development program for data-informed decision making should have?

At least the following subjects should be discussed:

- *Focus on valued student outcomes*
- *Worthwhile content*
- *Integration of knowledge and skills*
- *Assessment for professional inquiry*
- *Multiple opportunities to learn an apply information*
- *Approaches responsive to the learning process*
- *Knowledgeable expertise*
- *Maintaining moment*

Appendix D: Questions group interview after workshop

1. What is your first impression of the Datateam method?
   Would you like to work in a date team?

2. Which aspects of the Datateam method did you like?

3. Which aspects of the Datateam method can be improved?

   Ask the following questions when participants did not bring these subjects up themselves
   - *Which aspects of the Datateam method do you think are going to be easy and which will be difficult?*
   - *Which aspects of the learning process of the Datateam method do you prefer and which can be improved?*
   - *The process of the Datateam method will take 2 years, what is your opinion on that? Does this fit you time schedule?*

4. What is needed to make the Datateam method more suitable for you and your school (when looking at the points of improvement you just named)?

5. To what extent does the Datateam method fit your view on data-informed decision making?

6. Which problems would you like to tackle first with the Datateam method? Which data do you think you need to resolve this problem? Do you have access to all these types of data?

7. Do you have any questions on the Datateam method that have not been answered or do you have any other notes on the method?

Appendix E: Results of individual questions of the questionnaire at Groenhorst Emmeloord

Answers to the questions on data use for accountability and school improvement by Groenhorst Emmeloord (N=15)

Concept	Question	Totally disagree	Disagree	Agree	Totally agree	I don't know	Mean (SD)
Accountability	Data that are used for accountability is accurate	0%	26,7%	66,7%	0%	6,7%	2.71 (.47)
	Internal evaluation is used for other aspects than external accountability	0%	60%	40%	0%	0%	3.00 (.00)
	Intern evaluation is shown in external reports.	0%	0%	46,7%	0%	53,3%	3.00 (.00)
School improvement	External reports used for improvement	0%	13,3%	66,7%	0%	20%	2.83 (.39)
	Student results used to evaluate teachers	6,7%	13,3%	66,7%	6,7%	6,7%	2.79 (.70)
	School leader shows with data if goals are met	0%	6,7%	86,7%	0%	6,7%	2.93 (.27)
	Thorough data analysis is part of school improvement	0%	33,3%	46,7%	0%	20%	2.58 (.52)
	Distribution of time is based on learning needs	6,7%	53,3%	20%	0%	20%	2.17 (.58)
	Student results are used to formulate goals per year	0%	40%	46,7%	0%	13,3%	2.54 (.52)
	Student results lead to decisions on PD	0%	46,7%	26,7%	0%	26,7%	2.36 (.51)
	Student results used to identify holes in the curriculum	0%	40%	40%	0%	20%	2.50 (.52)
	Data used to set best way of teaching	13,35	33,3%	26,7%	0%	26,7%	2.18 (.75)

Answers to the questions on how often data are used for educational purpose by Groenhorst Emmeloord (N=15)

Question	Hardly/ never	Every year	Few times a year	Every month	Every week	Few times a week	n.a.	Mean (SD)
Formulating individual learning goals	46,7%	13,3%	26,7%	13,3%	0%	0%	0%	2.07 (1.16)
Determining students' knowledge and skills	0%	6,7%	46,7%	40%	6,7%	0%	0%	3.47 (.74)
Determining learning curve	0%	0%	46,7%	33,3%	20%	0%	0%	3.73 (.80)
Adjusting instruction to needs	0%	20%	33,3%	13,3%	26,7%	0%	6,7%	3.50 (.16)
Determining pace of instruction	0%	6,7%	53,3%	6,7%	33,3%	0%	0%	3.67 (1.05)
Student feedback	0%	0%	33,3%	40%	26,7%	0%	0%	3.93 (.80)
Dividing students into groups for adjusted instruction	33,3%	6,7%	26,7%	0%	6,7%	0%	0%	2.18 (1.33)
Selecting knowledge and skills that need extra attention	0%	0%	33,3%	33,3%	20%	0%	13,3%	3.85 (.80)
Study why student makes certain mistake	13,3%	0%	33,3%	40%	13,3%	0%	0%	3.40 (1.18)
Identify learning needs and adapt instruction to highly gifted students	40%	0%	13,3%	6,7%	0%	0%	40%	1.78 (.20)
Identify learning needs and adapt instruction to low gifted students	13,3%	6,7%	26,7%	20%	6,7%	0%	26,7%	3.00 (.27)

Answers to the questions on data characteristics by Groenhorst Emmeloord (N=15)

Concept	Question	Totally disagree	Disagree	Agree	Totally agree	I don't know	Mean (SD)
Accessible data	Access to student data in an information system	0%	0%	40%	60%	0%	3.60 (.51)
	One system with all data	0%	20%	66,7%	6,7%	6,7%	2.86 (.54)
	Access to relevant student data	0%	0%	80%	20%	0%	3.20 (.41)
	Student data are available at start of school year	6,7%	26,7%	53,3%	6,7%	6,7%	2.64 (.75)
	Student data are timely available when a student transfers to our school	13,3%	13,3%	26,7%	20%	26,7%	2.73 (1.10)
Useful data	Data help me to plan my lessons	13,3%	46,7%	40%	0%	0%	2.27 (.70)
	Data show me the learning curve of students of each year	0%	20%	60%	13,3%	6,7%	2.93 (.62)
	Data show learning curve of students	0%	13,3%	80%	6,7%	0%	2.93 (.46)
	Lack of student data	6,7%	80%	13,3%	0%	0%	2.93 (.46)
Data quality	Data are up-to-date	0%	20%	73,3%	6,7%	0%	2.87 (.52)
	Believe that data are correct	0%	6,7%	80%	13,3%	0%	3.07 (.46)

Answers to the questions on school organizational characteristics by Groenhorst Emmeloord (N=15)

Concept	Question	Totally disagree	Disagree	Agree	Totally agree	I don't know	Mean (SD)
Leadership	School encourage data use to support education	6,7%	40%	46,7%	0%	6,7%	2.43 (.65)
	Team leader encourages data use to support education	6,7%	26,7%	60%	0%	6,7%	2.57 (.65)
	Team leader sufficiently uses data	6,7%	13,3%	53,3%	0%	26,7%	2.64 (.68)
	Team leader offers resources for data use	13,3%	60%	20%	0%	6,7%	2.07 (.62)
	Data analysis of team leader is discussed with the teachers	6,7%	46,7%	46,7%	0%	0%	2.40 (.63)
	Team leader discusses data with me	6,7%	53,3%	33,3%	0%	6,7%	2.29 (.61)
	School knows the importance of developing data skills in their teachers	0%	40%	46,7%	0%	13,3%	2.54 (.52)
Collabora-tion	I discuss data with students	0%	0%	66,7%	33,3%	0%	3.33 (.49)
	I discuss data with parents	0%	13,3%	80%	6,7%	0%	2.93 (.46)
	I discuss data with colleagues	0%	6,7%	86,7%	6,7%	0%	3.00 (.38)
Vision	Colleagues have same view on good education	20%	46,7%	26,7%	0%	6,7%	2.07 (.73)
	Colleagues have same view on student learning	13,3%	46,7%	33,3%	0%	6,7%	2.21 (.70)
	Colleagues have same view on student assessment	6,7%	60%	13,2%	0%	20%	2.08 (.52)
Norms	Data use is a priority at my school	26,7%	66,7%	6,7%	0%	0%	1.80 (.56)
	Data analysis and interpretation is structured for actions	6,7%	73,3%	13,3%	0%	6,7%	2.07 (.48)
Training and support	I am sufficiently supported in data use	0%	53,3%	33,3%	0%	13,3%	2.38 (.51)
	There is someone who helps me with data questions in school	0%	20%	46,7%	6,7%	26,7%	2.82 (.61)
	There is someone who helps me to change education with data in school	6,7%	66,7%	13,3%	0%	13,3%	2.08 (.49)
	My schools schedules time for data use	20%	66,7%	6,7%	0%	6,7%	1.86 (.54)

Answers to the questions on data-user characteristics by Groenhorst Emmeloord (N=15)

Concept	Question	Totally disagree	Disagree	Agree	Totally agree	I don't know	Mean (SD)
Attitude	Data use to point out student learning needs is important	0%	6,7%	86,7%	6,7%	0%	3.00 (.38)
	Data use is important for educational changes	0%	40%	60%	0%	0%	2.60 (.51)
	Students benefit when instruction is formed by data	0%	33,3%	66,7%	0%	0%	2.67 (.49)
Knowledge and skills	I can improve my instruction based on data	0%	13,3%	66,7%	13,3%	6,7%	3.00 (.56)
	I can point out individual learning needs based on data	0%	13,3%	80%	6,7%	0%	2.86 (.36)
	I understand data use assessment criteria	6,7%	13,3%	53,3%	13,3%	13,3%	2.85 (.80)
	I feel competent to interpret score reports	0%	20%	66,7%	6,7%	6,7%	2.86 (.54)
	I feel competent to interpret graphic displayed data	0%	13,3%	46,7%	26,7%	13,3%	3.15 (.69)

Appendix F: Results of individual questions of the questionnaire in all of Groenhorst's schools

Answers to the questions on data use for accountability and school improvement by all of Groenhorst's schools (N=40)

Concept	Question	Totally disagree	Disagree	Agree	Totally agree	I don't know	Mean (SD)
Accountibility	Data that are used for accountability is accurate	0%	20%	57,5%	5%	17,5%	2.82 (.53)
	Internal evaluation is used for other aspects that external accountability	0%	7,5%	60%	2,5%	30%	2.93 (.38)
	Intern evaluation is shown in external reports.	0%	5%	45%	0%	50%	2.90 (.31)
School improvement	External reports used for improvement	0%	20%	55%	5%	20%	2.81 (.54)
	Student results used to evaluate teachers	10%	32,5%	40%	2,5%	15%	2.41 (.74)
	School leader shows with data if goals are accomplished	10%	30%	47,5%	0%	12,5%	2.43 (.70)
	Thorough data analysis is part of school improvement	5%	25%	42,5%	5%	22,5%	2.61 (.72)
	Distribution of time is based on learning needs	20%	45%	15%	2,5%	17,5%	2.00 (.75)
	Student results are used to formulate goals per year	2,5%	55%	25%	2,5%	15%	2.32 (.59)
	Student results lead to decisions on PD	5%	45%	30%	2,5%	17,5%	2.36 (.65)
	Student results used to identify holes in the curriculum	7,5%	37,5%	37,5%	0%	17,5%	2.36 (.65)
	Data used to set best way of teaching	12,5%	45%	22,5%	0%	20%	2.13 (.66)

Answers to the questions on how often data are used for educational purpose by all of Groenhorst's schools (N=39)

Question	Hardly/ never	Every year	Few times a year	Every month	Every week	Few times a week	n.a.	Mean (SD)
Formulating individual learning goals	44,5%	12,5%	33%	10%	0%	0%	0%	2.10 (1.10)
Determining students' knowledge and skills	10%	8%	49%	23%	10%	0%	0%	3.15 (1.07)
Determining learning curve	5%	5%	54%	23%	13%	0%	0%	3.33 (.96)
Adjusting instruction to needs	18%	18%	21%	15%	21%	5%	2%	3.18 (1.56)
Determining pace of instruction	18%	8%	26%	13%	33%	2%	0%	3.44 (1.54)
Student feedback	5%	3%	38,5%	38,5%	15%	0%	0%	3.56 (.97)
Dividing students into groups for adjusted instruction	38%	5%	21%	10%	5%	3%	18%	2.34 (1.49)
Selecting knowledge and skills that need extra attention	18%	8%	23%	28%	15%	0%	8%	3.17 (1.36)
Study why student makes certain mistake	23%	5%	38%	18%	13%	0%	3%	2.92 (1.32)
Identify learning needs and adapt instruction to highly gifted students	44%	3%	10%	8%	3%	0%	32%	1.85 (1.29)
Identify learning needs and adapt instruction to low gifted students	39%	10%	15%	13%	8%	0%	15%	2.30 (1.43)

Answers to the questions on data characteristics by all of Groenhorst's schools (N=40)

Concept	Question	Totally disagree	Disagree	Agree	Totally agree	I don't know	Mean (SD)
Accessible data	Access to student data in an information system	2,5%	2,5%	37,5%	57,5%	0%	3.50 (.68)
	One system with all data	5%	23%	43%	25%	4%	2.92 (.85)
	Access to relevant student data	0%	5%	58%	38%	0%	3.33 (.57)
	Student data are available at start of school year	7,5%	20%	60%	7,5%	5%	2.70 (.74)
	Student data are timely available when a student transfers to our school	12,5%	17,5%	32,5%	12,5%	25%	2.60 (.97)
Useful data	Data help me to plan my lessons	7,5%	40%	42,5%	5%	5%	2.47 (.73)
	Data show me the learning curve of students of each year	0%	27,5%	52,5%	10%	10%	2.70 (.78)
	Data show learning curve of students	0%	20%	72,5%	7,5%	0%	2.83 (.64)
	Lack of student data	5%	12,5%	67,5%	10%	5%	2.13 (.67)
Data quality	Data are up-to-date	2,5%	20%	67,5%	7,5%	2,5%	2.82 (.60)
	Believe that data are correct	10%	82,5%	2,5%	0%	5%	3.08 (.36)

Answers to the questions on school organizational characteristics by all of Groenhorst's schools (N=40)

Concept	Question	Totally disagree	Disagree	Agree	Totally agree	I don't know	Mean (SD)
Leadership	School encourage data use to support education	7,5%	40%	37,5%	2,5%	12,5%	2.40 (.69)
	Team leader encourages data use to support education	5%	37,5%	40%	5%	12,5%	2.51 (.70)
	Team leader sufficiently uses data	5%	15%	37,5%	12,5%	30%	2.82 (.82)
	Team leader offers resources for data use	7,5%	50%	30%	0%	12,5%	2.26 (.61)
	Data analysis of team leader is discussed with the teachers	10%	35%	42,5%	2,5%	10%	2.42 (.73)
	Team leader discusses data with me	10%	45%	35%	2,5%	7,5%	2.32 (.71)
	School knows the importance of developing data skills in their teachers	0%	30%	35%	2,5%	32,5%	2.59 (.57)
Collabora-tion	I discuss data with students	0%	5%	55%	37,5%	2,5%	3.33 (.58)
	I discuss data with parents	5%	27,5%	52,5%	7,5%	7,5%	268 (.71)
	I discuss data with colleagues	0%	5%	82,5%	10%	2,5%	3.05 (.39)
Vision	Colleagues have same view on good education	10%	37,5%	35%	37,5%	10%	2.44 (.81)
	Colleagues have same view on student learning	7,5%	40%	32,5%	5%	15%	2.41 (.74)
	Colleagues have same view on student assessment	5%	47,5%	25%	2,5%	20%	2.31 (.64)
Norms	Data use is a priority at my school	17,5%	50%	20%	2,5%	10,5%	2.08 (.73)
	Data analysis and interpretation is structured for actions	10%	57,5%	17,5%	0%	15%	2.09 (.57)
Training and support	I am sufficiently supported in data use	2,5%	50%	32,5%	2,5%	12,5%	2.40 (.60)
	There is someone who helps me with data questions in school	0%	12,5%	50%	15%	22,5%	3.03 (.61)
	There is someone who helps me to change education with data in school	7,5%	45%	22,5%	2,5%	22,5%	2.26 (.68)
	My schools schedules time for data use	37,5%	42,5%	7,5%	0%	12,5%	1.66 (.64)

Answers to the questions on data-user characteristics by all of Groenhorst's schools (N=40)

Concept	Question	Totally disagree	Disagree	Agree	Totally agree	I don't know	Mean (SD)
Attitude	Data use to point out student learning needs is important	0%	12,5%	75%	12,5%	0%	2.68 (.53)
	Data use is important for educational changes	0%	35%	62,5%	2,5%	0%	3.00 (.51)
	Students benefit when instruction is formed by data	0%	35%	62,5%	2,5%	0%	2.68 (.53)
Knowledge and skills	I can improve my instruction based on data	0%	17,5%	60%	15%	7,5%	2.97 (.60)
	I can point out individual learning needs based on data	0%	22,5%	67,5%	7,5%	2,5%	2.85 (.54)
	I understand data use assessment criteria	7,5%	12,5%	60%	15%	5%	2.87 (.78)
	I feel competent to interpret score reports	0%	10%	65%	17,5%	7,5%	3.08 (.55)
	I feel competent to interpret graphic displayed data	2,5%	17,%	45%	27,5%	7,5%	3.05 (.78)