Teacher-Student Interaction in Competence-Based Vocational Education in Indonesia

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Thesis

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Chapter 1
General Introduction

1.1 Introduction

Competence-based education (CBE) is an educational approach originating from the social constructivist paradigm, where learners construct their own knowledge by interacting with others (Simons, 2000; Wesselink, et al., 2007). CBE is expected to better prepare students for their future professional life and aims at increasing student motivation to decrease drop out (Biemans, Nieuwenhuis, Poell, Mulder, & Wesselink, 2004). CBE has a secured position in vocational education in countries like the Netherlands, Germany, United Kingdom, and Australia (Biemans et al., 2004; Mulder, 2004, 2007; Smith, 2010; Velde, 1999; Weigel, Mulder, & Collins, 2007; Williams & Raggatt, 1998). The learning environments in CBE are considered as powerful learning environments (De Bruijn & Leeman, 2011) as these aim at facilitating students to be self-directed learners, promoting self-reflection, and creating authenticity (de Bruijn & Leeman, 2011; de Bruijn, 2012; Wesselink et al., 2010). Those characteristics are believed to better prepare graduates for the transition from education to the world of work and a future of lifelong learning.

CBE has competence as its primary outcome, contrary to traditional education that aims mostly at knowledge acquisition (Seezink, Poell, & Kirschner, 2010; Wesselink, De Jong, & Biemans, 2010). CBE stresses the importance for students of not only acquiring knowledge but also for being able to apply such knowledge to perform professional tasks well. However, knowledge is still essential in CBE and important for becoming a competent professional. As indicated above, CBE scholars view competence development partly as the result of learners' experiences from interacting with their society (Simons, 2000; Wesselink, Biemans, Mulder, & Van den Elsen, 2007). In school life, this interaction can be understood as the relationship among students, their peers and teachers. Teachers have an important role in creating healthy interactions in classrooms for stimulating student learning. They are responsible for managing classrooms, and at the same time providing meaningful learning experiences for students. Thus, in CBE, teachers have influential power to create learning environments that are best suited for student competence development.

Studies show that one of the major changes in shifting towards CBE comprises of the changing roles of teachers and students (Wesselink et al., 2007). Teachers should act as coaches and knowledge transmitters, and students should become more active learners. These changing roles might influence the pattern of teacher-student interaction

and the way students perceive their teachers' behaviour. However, teacher-student interaction is still a missing topic of research in the CBE research literature. It is also likely that fostering competence development, instead of only the acquisition of knowledge, requires different student-teacher interactions and teacher behaviour. Furthermore, student's perception of teacher behaviour influences student learning motivation (e.g. Maulana et al., 2011). Thus, it is necessary to investigate teacher behaviour that can stimulate both student motivation and competence development, also because one of the CBE goals is increasing student motivation (Wesselink, 2010). Examining the teacher-student relationship in CBE promises to be a valuable contribution for understanding how competence development can be fostered in a more effective way.

In this thesis, teacher-student interaction in CBE learning environment is studied in the Indonesian context. In 2004 the government of Indonesia decided to implement CBE nationally in the vocational education system. The adoption of CBE was expected to increase the employability of youth and increase their self-directedness and motivation, as many VET students in Indonesia had motivational problems. Raihani (2007) asserted that the implementation of CBE was expected to improve human resources to respond to national development needs, global competition, and the rapidly changing worlds of work, technology and the economy. Indonesian CBE was designed to, or at least intended to, stimulate students with strong personality, and competencies that would allow them to be successful in the workplace or higher education, equip them for lifelong learning and ongoing development, and successful interaction in the social, cultural, and natural environments (Kwartolo, 2002). CBE in Indonesia has been studied before (e.g. Nederstigt et al., 2011) but in a limited number. In the study of Nederstigt (op cit), the so-called matrix of competence-based education (Wesselink, 2010), which was developed in the Dutch context of vocational education, was used to study the implementation of CBE in Indonesian higher education. It appeared that, similar to situations in many other countries, the implementation of competence-based vocational education was not really easy. The study also did not elaborate on the specific interaction between the teachers and students within CBE.

This thesis tries to fill that gap. To start exploring teacher-student interaction in CBE in Indonesia, the thesis firstly investigates the state of affairs regarding competence-based education, and its implementation, in Indonesian vocational education. This investigation is conducted as a follow-up of the studies of Wesselink (2010). The essence of the research of Wesselink (op cit) was to empower teaching teams in VET to implement CBE to the extent they preferred. This view on team-based development of CBE implies that there can be much variation in CBE practices. Different principles of CBE can be implemented at different levels. This may be different in countries with strongy centralized education systems and curricula and a dedicated CBE implementation policy. However, the studies of Nederstigt et. al. (2011), Mulder & Kintu (2013) and Solomon (2016) show that the implementation of principles of CBE often lacks behind nationally or institutionally intended principles of CBE.

As mentioned above, studies related to the realisation of CBE in Indonesia and its effects on student outcomes, like motivation and competence, are hardly found. Given this lack of information on the implementation of CBE in Indonesia, filling the gap will offer deeper insights into how the rationale and design principles of CBE, that were developed in the western countries, are implemented and found to be useful in this non-western context.

To conclude, this thesis investigates competence-based education in Indonesia: the realisation, the student outcomes in CBE, and teacher-student interaction in competence-based education. It aims at giving more insights in how to make learning environments in vocational education more enjoyful and motivating, and geared towards stimulating competence development. This information is urgently needed, to support the current Indonesian policy, i.e. Presidential Instruction number 9/2016, which stresses the importance of revitalising vocational education by improving the quality of vocational teachers, making study programmes more relevant for industrial demands, and increasing public private involvement (MoEC, 2016). The findings of this thesis, therefore, are expected to inform policy makers on how to facilitate improvement of vocational education in Indonesia. Curriculum designers and teachers can benefit from this by using the results for reflecting on their current practices to better facilitate student competence development. Other countries working with vocational education improvement can reflect on the lessons learnt from Indonesia, particularly on the aspects that should be considered when CBE implementation is meant to be a way to improve the vocational schools.

To begin with, the next section presents the problem statement and objective of this thesis, followed by the research questions and general overview of this thesis.

1.2 Problem Statement and Aim of this Thesis

In competence research much attention has been paid to issues regarding the alignment of work and education (Mulder, 2017), curriculum development (Wesselink, 2010) and assessment (Gulikers, Runhaar, & Mulder, 2017). A recent overview of research on competence-based vocational education (Mulder, 2017) has shown that the interaction between teachers and learners in vocational education has received no attention. This is remarkable, since social interaction is regarded as an essential element of social-constructivistic and activity theory, which are foundations of a competence-based curriculum and learning theory. This thesis tries to fill that gap and focuses on teacher student interaction in competence-based vocational education and its relation to student motivation and learning.

To study teacher-student interaction in competence-based vocational education in the Indonesian context, it is necessary to analyse the introduction and implementation of CBE in the case of Indonesia. Implementing competence-based education is not an easy task (Wesselink et al., 2010) and studies on factors supporting effective and sucessful CBE

implementation deemed necessary to help realising CBE in a more effective and evidence-based way. Above it is argued that every country has its own specifics regarding the VET system. Furthermore, the implementation of CBE differs by country and institution. To evaluate whether VET in Indonesia is actually introduced in practice and if its intentions are realised, the matrix of CCBE (Wesselink, 2010) can be employed. Studies on the effectiveness of CBE in terms of student outcomes (i.e., competence and knowledge development or motivation) are still scarce, descriptive or evaluative in nature, and do not compare competence-based education to not (or less) competence-based education (Lassnigg, 2017; Wesselink, Biemans, Gulikers, & Mulder, 2017). This might be because the difficulties in measuring and comparing the degree of competentiveness of schools, among other reasons. Wesselink and colleagues (2007), followed up by Sturing and colleagues (2011), developed a framework for examining the competentiveness of study programmes. This framework is used in this thesis to investigate competence-based education in Indonesian vocational education through examining the competentiveness level of agricultural vocational schools in Indonesia. This led to identify high versus low CBE schools that were used as comparative samples of this thesis for investigating the impact and effectiveness of changing to more competence-based classrooms. Firstly, this thesis seeks the underlying principles of CBE in Indonesia by collecting information from educational policy documents and illuminates implemented practices in school, via triangulation of the perceptions of various stakeholders involved, that is students, teachers and school principals. Therefore, a preceding question is formulated: (1) *To what extent is CBE implemented in vocational education in Indonesia?* By answering such question, this study provides insights into the current state of CBE implementation in Indonesia and lesson learned of implementing CBE and using the CCBE framework, especially in the non-western context.

Once the realisation of CBE and the implementation level of school programmes are determined (Chapter 2), the following studies (Chapter 3, 4, and 5) compare schools, all food processing and technology programmes of agricultural vocational education schools, having high characteristics of CBE (HCBE) with schools having low characteristics of CBE (LCBE). These high versus low CBE schools are compared with respect to student motivation and student competence development, teacher interpersonal behaviour, and relations between these variables. Lassnigg (2017) did a review of the research on competence-based education and educational effectiveness, and found that this theme was hardly studied. In other words, there is only little empirical evidence of the efficacy of competence-based education in terms of its fulfillment of the many policy expectations that go with it. Since it is the purpose of all educational innovation to achieve results which in the end improve student learning, this thesis tries to include student outcomes as the ultimate goal of all education. This is not uncomplicated, and this may also be the main reason why Lassnigg did not find many competence-based education studies that address effectiveness questions. Wesselink et al. (2017) have shown that testing CBE empirically faces challenges of time in which desired results of systems innovations

may be expected (this can take years after the initial decision to implement CBE), levels of intention (not all educational institutions and teacher teams want to implement all principles of CBE at maximum levels) and available resources (implementing CBE takes time, expertise and facilities for applied, practical and work-based learning). Therefore, our second research questions is: (2) *How do HCBE and LCBE learning environments affect student motivation, knowledge and competence development?* By investigation the CBE outcomes in HCBE and LCBE learning environments and following these programmes for a whole year, this thesis is one of the first attempts to do comparative research in the CBE context and thereby provides research-based evidence on the effectiveness of CBE. Investigating the effectiveness of CBE in reaching its goals and involving the perspectives of various stakeholders (e.g., principals, teachers, students) will broadens our knowledge on CBE theory and improves our understanding about how to successfully implement CBE and realise CBE objectives in a more effective way (Gulikers, Biemans, & Mulder, 2009).

One crucial innovation in CBE is that it requires different roles for both teachers and students. In CBE, teacher still needs to be an expert, but also adopt the roles of coach or facilitator of student learning processes and designer of authentic learning and workplace learning (Wesselink, 2010); and students who are expected to be more self-directive and self-steering (Wesselink et al., 2007). The required different roles of teachers and students in CBE would mean inevitable different teacher–student interactions. This thesis takes students' perceptions of their teachers' behaviour, that is teacher interpersonal behaviour (Wubbels et. al., 1998) as its main independent variable. It examines if CBE does indeed result in different teacher behaviour and if and how this teacher behaviour relates to student motivation and competence development. For studying teacher behaviour, the model of teacher interpersonal behaviour, operationalised in the questionaire or TIB, is used. Many studies have reported relations between TIB (in terms of proximity and or influence) on various student learning outcomes and motivational aspects, though the effects on competence development have never been studied before. Next to the various research results from different studies on teacher-student interaction, it can be questioned to what extent these findings can be generalised to effective teacher-student interaction for fostering students' competence-development in competence-based vocational (agricultural) education?

A healthy teacher-student interaction will motivate students to learn. The teacher has sufficient authority to create healthy teacher-student interaction in his/her classrooms. Teachers' ability to generate students' learning motivation in turn affects students' learning outcomes. Previous studies indicated that of certain type of teacher behaviour has positive effect on student (cognitive and affective) outcomes. Other studies showed that the relationship between teacher behaviour and student outcome is mediated by students' motivation. While numeruous studies relating teacher behaviour and student outcomes have been conducted, not many studies focus on teacher interpersonal behaviour in competence-based vocational education, particularly

investigating it in relation to students' competence development. Investigating what kind of teacher interpersonal behaviour best fosters students' competence development is crucial for the effectiveness of CBE for preparing students for the labour market. Thus, our next research questions of this thesis are:

(3) *How do students from HCBE and LCBE vocational (agricultural) schools perceive their teacher interpersonal behaviour?*

(4) *Are there any linkages between teacher interpersonal behaviour, student motivation and competence development in high or low-CBE vocational schools?*

By answering those questions, this thesis attempts to identify what kind of teacher behaviour that better promoting students' competence development effectively. This thesis is expected to contribute to the current discussion on competence-based education, support CBE researches with empirical evidences from a non-western perspective, and provide for more evidence-based insights in CBE effectiveness in terms of CBE outcomes. To conclude, this thesis aims to investigate teacher interpersonal behaviour in CBE and its effects on student outcomes. Prior to that, this thesis investigates the realisation of CBE in Indonesian vocational education to identify low and high-CBE schools for further study. Then, it examines the effectiveness of CBE in terms of student outcomes: competence level, competence development, knowledge development as well student motivation, and studies what teacher interpersonal behaviour in HCBE compared to LCBE schools fosters these outcomes.

1.3 Context of this Study

This thesis is situated in the context of Indonesia which had initiated to adopt competence-based learning for its education system. The education Law No. 20 year 2003 (MoNE, 2004) became the legal basis of CBE implementation nationally accross this country. Currently, there are 464,334 students registered in 13,578 vocational schools and only 269 schools offer food processing and technology in 2016 (MoEC, 2016). Mostly, students are from low test scores and low educated parents (Newhouse & Suryadarma, 2011) which make them vulnerable to drop out from their studies before graduation.

Students in Indonesia can start their vocational education after they finished their compulsory education. They are mostly between 16 – 18 years in age. They can opt for either general or vocational school. Vocational education takes three years, except for special programmes which last for four years (see Figure 1.1). To support the CBE implementation, the government established the Indonesian Qualification Framework (IQF). When students graduate from the vocational education, the context of our study, they are expected to be in level 2 out of 9 in IQF, which equals level 3 in the European Qualification Framework. The studies in this thesis were conducted in agricultural vocational schools. Agricultural opportunities and resources are abundant in Indonesia and the agricultural labour market is in high need of competent personnel. This thesis is

expected to provide insights into how vocational education can be made more effective and motivating for students and thereby strongly stimulates the labour market and the economy in Indonesia in general.

Age	Grade	Level	Formal Education		Vocatinal Education				Non-formal Education
		Higher Education	Islamic S3 Program	Strata 3 Program	Specialist Program 2				Open University
			Islamic S2 Program	Strata 2 Program	Specialist Program 1				
22	16		Islamic Strata 1 Program	Strata 1 Program	Diploma 4 Program	Diploma 3 Program	Diploma 2 Program	D1 Program	
21	15								
20	14								
19	13								
18	12	Secondary Education	Islamic upp. Secundary School (MA)	General Upper Secondary School (SMA)			Vocational Secondary School (SMK)		Paket C
17	11								
16	10								
15	9	Basic Education	Islamic low. Secundary School (MT)	Lower Secondary School (SMP/SLTP)					Paket B
14	8								
13	7								
12	6		Islamic Primary School (MI)	Primary School (SD)					Paket A
11	5								
10	4								
9	3								
8	2								
7	1								
6		Pre-school Education	Islamic Pre-school	Kindergarten (TK)					
5									
4									

Remarks:
Strata 1, 2, 3 (S1, S2, S3) are equivalent to Bachelor, Master, Ph.D.
Specialist programs are programs for academic and/or professional further education
Basic eduction is compulsory and free of charge
Pre-school is optional

Figure 1.1 Indonesian Education system

1.4 Overview of this Thesis

This thesis reported the results of four empirical studies presented in six chapters. The first chapter gives a broad picture of this thesis, including the objectives, general research questions, theoretical frameworks and methodology for answering our research questions. Figure 1.2 illustrates the structure of this thesis.

Chapter 2 reports the results of examining competence-based education in Indonesia and its current implementation. This part attempts to evaluate the implementation of CBE principles in Indonesian vocational schools by examining the policy documents and triangulating data from students, teachers and school principals. Based on this study involving 2219 students, 428 teachers, and 41 school principals and/or respresantative, 41 (agricultural) vocational schools were identified as having a certain level of CBE implementation (competentiveness) based on 10 principles for Competence-based education (Sturing, et al., 2011). Next to answering the question of how and to what extent the CBE principles were actually implemented in Indonesian vocational schools, this study also leads to a selection of six CBE schools (having a competentiveness score four or higher) and five low-CBE schools (with a competentiveness score of two) that were used in the following studies. The follow-up studies compare these schools in terms of (1) students' competence levels; (2) longitudinal competence development, (3) knowledge development; (4) perceived teacher interpersonal behaviour; and (5) students' intrinsic motivation.

Chapter 3 discusses the outcomes of competence-based education: knowledge and competency levels at three moments in time (i.e., cross-sectional) and development over time (i.e, longitudinal), by HCBE versus LCBE schools for food processing and technology programme. Student knowledge development was measured using a multiple-choice test, while competence development was assessed using student self-rating on four competencies combined with teacher' ratings. Also, student and teacher rating on competence development in HCBE versus LCBE context were compared to gain more insights into the effectiveness of CBE learning environment for student outcomes.

Besides comparing students' outcomes in HCBE versus LCBE schools, this thesis examines and compares the way students perceive their teacher interpersonal behaviour in those two different learning environments. Chapter 4 reports the results of a survey, using an Indonesian Questionnaire on Teacher Interaction (QTI, Wubbels, 1995), to identify profiles of teacher in Indonesian vocational schools and compare whether the profiles in HCBE and LCBE schools differ. This chapter also compares students' rating on intrinsic motivation in HCBE versus LCBE learning environments. Next to that, this chapter investigates the links between teacher interpersonal behaviour and student intrinsic motivation in both HCBE and LCBE context.

Chapter 5 reports the last empirical study. This chapter studies the connections between teacher interpersonal behaviour and CBE outcomes in terms of intrinsic motivation and competency levels in HCBE versus LCBE schools. Theoretically expected connections between the two dimensions of teacher interpersonal behaviours (i.e., proximity and influence), student intrinsic motivation, and perceived competency levels, was tested using Structural Equation Modelling (SEM). Student rating on four competencies acted as the dependent variables while student intrinsic motivation acted as the intervening/mediator of the relationships. Additionally, the SEM also tested whether the connections differ in HCBE versus LCBE learning environments.

Finally, the last chapter of this thesis discusses the main conclusions of this thesis in terms of the state of implementation and effectiveness of competence-based education in Indonesia and discusses theoretical and practical implications for vocational educators, teaching and learning in vocational education and future research.

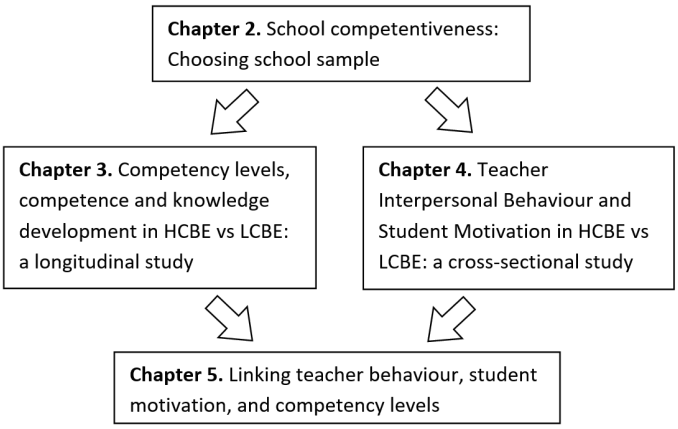

Figure 1.2 Structure of the thesis

Chapter 2
Evaluating Competence-Based Vocational Education in Indonesia

Abstract

This paper investigates the realisation of competence-based education (CBE) in vocational education in Indonesia. It examines the extent to which CBE design principles of the Comprehensive Competence-Based Education Framework (Sturing et al. 2011; Wesselink et al. 2007) developed in a Western context exist in Indonesian policy documents and school practices. This study reviews educational policy documents and collects cross-sectional survey data from 41 school principals, 453 teachers, and 2219 students from 41 agricultural vocational schools in five provinces of Java, Indonesia. Results showed that the ten CCBE principles listed in the framework exist to large extent in Indonesian policy documents. School principals, teachers, and students noticed the realisation of CCBE principles in the study programme to differing degrees, except for the principle of flexibility that was largely absent. The level of CBE implementation varied, from the level of starting competence-based to that of largely competence-based education. The findings contribute to the discussion of CCBE design principles and lesson learned of CBE implementation in a non-western perspective.

This chapter is based on Misbah, Z., Gulikers, J., Dharma, S. & Mulder, M. (2019). Evaluating Competence-Based Vocational Education in Indonesia. *Journal of Vocational Education and Training*.

2.1 Introduction

Recently, scholars and policymakers are paying more attention to the use of competence-based education (CBE) in vocational schools and higher education, and in developed or developing countries (Illeris, 2009). The concepts of competencies and competence-based education have become important considerations in educational reform agendas, as in, for example, Australia (Smith, 2010) and the United Kingdom (Velde, 1999), and are discussed continuously in curriculum redesign of vocational education and training in various countries in Europe (Brockmann, Clarke, Méhaut, & Winch 2008; Mulder, Weigel, & Collins, 2007). CBE is expected to better prepare students for the labour market, stimulate students' competence development, increase their motivation, and decrease school dropout. Despite CBE gaining in its popularity, scholars identify several pitfalls in its implementations. Biemans and colleagues (2004) summarise the pitfalls of CBE implementation as, among others, the lack of a clear definition of competence, problems with standardising among students, and shifting roles of teachers and students. Wesselink and colleagues (2017) show that educational institutes, certainly in (higher) vocational education, extensively experimented with implementing CBE in the last decade, but that implementation problems still exist, and that evidence of its effectiveness in terms of stimulating student learning and motivation is still scarce.

Another issue is that CBE, with its underlying design principles, is mainly developed and studied in Western educational contexts. Some argue that implementing CBE in non-western contexts and learning cultures might encounter obstacles that are comparable but probably also different from Western countries (e.g. Helsema, 2017). However, studies of CBE implementation in non-Western countries are underrepresented in literature. Examining CBE implementation from a non-western perspective offers insights into how CBE theory and its implementation can be improved and how its effectiveness can be studied.

This study examines CBE implementation in the Indonesian education system, with a specific focus on senior secondary vocational education (see Figure 1.1). This country has initiated using competence-based learning in its education system since 2004, as mandated by the Education Law No. 20 year 2003 (MoNE, 2003). While CBE has been used for more than a decade, accessible information concerning the realisation of CBE in Indonesia is still scarce. The studies that do exist examine the introduction of a competence-based curriculum as a means of educational reform in Indonesia (Raihani, 2007), teacher readiness in implementing competency-based learning in the classrooms (Sulfasyah, 2014; Utomo, 2005), and CBE developments in Indonesian higher education (Nederstigt & Mulder, 2012). Studies that specifically examine CBE in secondary vocational schools are hardly found, despite the fact that CBE is specifically suitable for and applicable to vocational education (Kouwenhoven, 2005) as this type of education has a strong direct link to professional practice and aims at preparing students for the labour market. This study starts to fill this gap. For this purpose, this study triangulates information

from educational policy documents and perceptions of various school stakeholders: school principals, teachers, and students. By doing so, the findings of this study help the Indonesian government to make determinations about follow up activities and support for improving the vocational education system. In addition, it informs our knowledge on competence-based education and its underlying design principles, while contributing to the understandings around how this educational innovation, which originated in one culture and in this case a Western culture, is interpreted and implemented in a different learning culture. To begin with, the following section elaborates further on the CBE framework that is used to evaluate CBE implementation in Indonesia.

2.2 Theoretical Framework

The Comprehensive Competence-Based Education Framework

Competence-based education, as an example of outcome-based education (Harden, 2007; Young, 2009), has been trending in curriculum reform of vocational education and training (VET) all over the world (Achtenhagen and Winther 2014; Biemans, Nieuwenhuis, Poell, Mulder, & Wesselink, 2004; de Bruijn & Leeman, 2011; Mulder, 2017). Expected advantages of CBE, compared to more traditional, knowledge-oriented education, are that students are better equipped for and motivated to enter the working world, as CBE aims at fostering students' knowledge, skills, and professional attitudes development through learning in authentic workplace contexts (Biemans et al., 2004; Biemans, Wesselink, Gulikers, Schaafsma, Verstegen, & Mulder, 2009; Wesselink et al., 2007).

In a quest for making competence-based education applicable to educational practice, Wesselink and her colleagues (2007) propose a framework for describing a coherent and comprehensive definition of competence-based education (CBE) comprising eight design principles. This framework adopts the holistic, integrated, and situated conceptualisation of competence (Cheetham & Chivers, 1996; Mulder, 2017). This means that competence is an integrated set of knowledge, skills, and attitude that derives its meaning in the (occupational) context or task in which it is used. The CBE framework also adopts a comprehensive approach to educational design, meaning that educational design for CBE requires that all principles are taken into account when changing towards and implementing competence-based education (Wesselink et al., 2007).

The framework, and its eight design principles with four levels of development, aims to operationalise what CBE looks like and what developing it entails. It strongly links educational practices to vocational practices to help bridge the gap between education and the labour market. It provides practical handles for educational practitioners to start competence-based education implementation and to evaluate the degree of the development in a curriculum. The initial Comprehensive Competence-Based Education (CCBE) Framework (Wesselink et al., 2007) comprises literature study, focus group meetings, and a Delphi study conducted with educational researchers. Sturing and her

co-workers (2011) validate the CCBE framework by gaining information from the teachers' perspective, as teachers have an important role in implementing the CBE curriculum practices. The validation of Sturing and colleagues result in an elaboration of the eight initial CCBE principles, expanding into ten CCBE principles. These are: (1) The study programme is based on vocational core tasks, working processes, and competencies (the qualification profile); (2) Complex vocational core problems are central to learning and assessment tasks; (3) Learning activities take place in different, meaningful vocational situations; (4) Knowledge, skills and attitudes are integrated in learning and assessment; (5) Students' development is regularly assessed for variously purposes; (6) Students are challenged to reflect on their own learning; (7) The study programme is structured in such a way that the students increasingly self-steer their learning; (8) The study program is flexible in that it allows students to have opportunities to learn and progress at their own pace; (9) Teachers guide student learning and this guidance is adjusted to the learning needs of the students, and (10) The study programme pays explicit attention to learning, career, and citizenship competencies. These ten principles are each described on five levels of development from *not competence-based* (score 1) to *fully competence-based* (score 5) (see Appendix 1). Based on how schools rate themselves on the development levels of the ten principles, a 'competentiveness score' can be calculated showing the degree of CBE implementation (Sturing et al., 2011). These ten CCBE principles, the levels, and the competentiveness score is used to examine CBE implementation in Indonesian vocational education in this present study.

The validated CCBE framework promises to be a valuable tool for schools and teachers to reflect on their curriculum and teaching practice, as well as providing a means to self-evaluate the degree to which their own practices are aligned to those principles. However, the framework is developed and mainly tested in a western context, representing more individualist societies. Hofstede and Hofstede (2005) characterise the Indonesian learning culture as a collective society. It is not yet clear to what extent the CCBE principles, which are developed in a more individualist society, can also be applied in a more collective society. There are some initial attempts at evaluating competence-based education implementation in Uganda (e.g. Mulder & Kintu, 2013), Ethiopia (Solomon, 2016), and Indonesia (Nederstigt & Mulder, 2011). Nederstigt and Mulder (2011) examines three study programmes from two universities in the faculty of agriculture and faculty of medicine in Indonesian Higher Education. Their study shows that the CCBE framework offers a fruitful starting point for studying CBE implementation in Indonesia. This present study expands the previous studies by adopting the CCBE framework to study the realisation of CBE in Indonesian vocational education. We discuss findings in the light of cultural characteristics as well. Any country having similar collective characteristics, and are in the process of adopting competence-based education can benefit from the lessons learned in the CBE implementation in Indonesia through this explorative study.

The Implementation of Competence-Based Curriculum in Indonesia

In 2004, the Indonesian Government initiated implementation of competence-based education, as mandated by Law Number 20/2003 concerning the Indonesian national education system. Competence-based education was named *Kurikulum Berbasis Kompetensi* (KBK: Competence-Based Curriculum) in the Indonesian context. The KBK was introduced to replace the previous centralised and content-based curriculum. The government piloted the KBK for two years, and launched the curriculum officially as *Kurikulum Tingkat Satuan Pendidikan* (KTSP: school-based curriculum) in 2006. The KTSP gives schools more autonomy to develop their own curriculum, building on the national guidelines provided by the Ministry of Education and Culture. The KTSP does not only represent the vision statements of Indonesia education, but also includes the list of core competencies students should learn and achieve in their learning trajectories. Additionally, the KTSP documents state the operationalisations of effective teaching and learning which are comparable to the CCBE principles in the CCBE frameworks. The extent to which these two approaches are comparable are further examined in this paper. Thus, this present study investigates competence-based education in the Indonesian vocational education context by examining the KTSP curriculum.

A curriculum, according to Jenkins and Shipman (1975), is the formation and implementation of an educational proposal to be taught and learned within the school or other institution for which that institution accepts responsibility at three levels: its rationale, its actual implementation, and its effect. Curriculum policies flow down from authoritative sources through the medium of school (Pinar et al., 1995) while the curriculum implementation comprises educational experiences jointly created by teacher and student (Fullan, 1992). Van de Akker (2003) makes a distinction between three curriculum representations as the intended, the implemented, and the attained curriculum. The *intended* curriculum refers to the vision or underlying philosophy of the curriculum and the intentions specified in formal curriculum documents, for example: the educational policy documents. In our current study, this is described in the KTSP documents. The *implemented* curriculum refers to the curriculum as interpreted by those who must implement it in the classroom, also called the operational curriculum, i.e., the actual process of teaching and learning as reported by teachers. In our study, the implemented curriculum is evidenced in teacher interpretation of the KTSP documents and subsequent translation into educational practices. The *attained* curriculum refers to learning experiences and learning outcomes which in this study refer to how vocational students perceive and experience the implemented learning activities and processes.

Considering the various aspects of curriculum representations, this study evaluates competence-based education in Indonesian vocational education from gathered information from various sources, i.e., policy documents, participation of and feedback from school principals, teachers, and students. School principals' perceptions are considered important as school principals have a significant role in connecting the national policies to the school. Perceptions from teachers and students give insights into

authentic and realised practices of the CBE implementation in the classroom context. In short, this study aims to reveal the extent to which CCBE principles are activated by the Indonesian policy documents, and how the principles are implemented in the estimation of school principals and teachers, and how principles are then experienced by students in a wide sample of vocational schools in Indonesia.

The Context of this Study

This study is situated in the context of Indonesia during a time period beginning in 2004 when its newly adopted competence-based learning programme was introduced and overlayed onto its then-existing educational system, until the time of this study.

Currently, there are 464,334 students registered in 13,578 schools for senior secondary vocational education of which 269 schools offer food processing and technology (MoEC, 2016). Students in Indonesia can start their vocational education after they finished their six years compulsory education. They are mostly between 16 – 18 years of age. Senior secondary vocational education takes three years, except for special programmes that last for four years (see Figure 1.1). When students graduate from these schools, they are expected to be in level 2 out of 9 in the Indonesian Qualification Framework (IQF), which is the equivalent of level 3 in the European Qualification Framework.

The vocational programmes included in this study all offer agricultural food processing and technology. Students from these agricultural food processing and technology programmes should master the basic concept of food processing technology, such as physical and chemical characteristics of foodstuffs, post-harvest handling technology, quality testing of material and food products, food packaging technology, food sanitation, technological processing of agricultural products (vegetables, animal, herbal, fisheries), waste management, and so forth. When they graduate, they can work as a technician for production, packaging, logistics, quality control, waste management in, for example, a food manufactory or in a supermarket/retail stores.

Research Questions

To guide our study, the research questions in this paper are as follows.

(1) *To what extent are the CCBE principles (developed in a Dutch context) represented in the Indonesia educational policy documents?*

(2) *To what extent do school principals, teachers, and students of agricultural vocational education institutions in Indonesia recognise the CCBE principles in their study programme?*

(3) *What is the level of competentiveness of agricultural vocational education in Indonesia?*

2.3 Material and Methods

Participants

This study involves 41 agricultural vocational secondary schools selected from the Data Pokok SMK (Vocational Schools Database) from the Indonesian Ministry of National Education based on the following criteria: first, they offer a study programme of agricultural food processing technology, second, they are public schools under the auspices of the Ministry of Education, and third, they are accredited by the Board of National Accreditation (BAN). Those criteria are chosen as these schools are obliged to implement the competence-based education policies from 2009 onwards. All school samples are located in Java, the most populated and modernised island in Indonesia. Our study includes five provinces of Java island. (Jakarta province is not included in this study as there are no vocational schools in Jakarta that offer agricultural food processing and technology.) Participating schools in the five provinces are comparable in terms of the types of agricultural industries located in them. All provinces have farms that cultivate rice, corn, and soybeans, and have firms manufacturing soy sauce, tempeh, dried fruit, and syrup. Additionally, in these five provinces students share similar characteristics in terms of social and cultural background. The sample has features representative of the (agricultural) secondary vocational schools on Java. The researcher contacted all sample schools to ask whether or not they were willing to participate. Schools were informed that there were no incentives for participation, so the participation was on a voluntary basis.

In total, 41 schools participated. Of these schools, 41 principals, 428 teachers (48% male) and 2219 students (35% male) participated. Teacher age ranged from 21 to 59 years old, and their teaching experience ranged from 1 to 32 years. The students all studied agricultural food processing technology. The average student age was 16.96 years old, and most of the students were at the end of their study programme (grade 12) meaning that they had experienced nearly the whole learning trajectory and had a clear picture of CBE implementation in their study programme.

Instrumentation

CBE policy documents. To address the first research question in examining whether and how CCBE principles are reflected in the Indonesian documents, the study firstly reads through the Education Law, Government Regulations, the Ministry of Education Policy, and relevant materials to curriculum development. The documents are reviewed on information concerning (1) the curriculum and specification of the study programme; (2) the instruction and the role of teacher in reference to teaching practice; (3) the assessment procedure, and (4) the graduate competence (Sturing et al. 2011, 96). This results in a selection of policy documents relevant for competence-based education implementation as presented in Table 2.1.

Table 2.1 Policy Documents Relevant for the Competence-Based Education In Indonesia

No	Documents	Content	Source
1.	Law No. 20/2003. Indonesian National Education System	The National Education System as the highest source of educational regulation in Indonesia	MoNE, 2003
2.	Presidential Regulation No. 8/ 2012 concerning The Indonesian Qualification Framework.	The desciption of competencies needed for jobs.	MoLHR, 2012
3.	Government Policy No. 19/2005 concerning National Standards of Education.	The standards and outputs that educational programmes should meet.	MoLHR, 2005
4.	Ministry Decree No. 23/ 2006 concerning Standard of Graduate Competence.	The general qualifications of students that are expected to perform when finishing learning trajectories, covering knowledge, attitudes, and skills.	MoNE, 2006a
5.	Ministry Decree No. 22/ 2006 concerning Standard of Contents.	The more detailed explanation about the knowledge, skills, and attitudes of students that are expected to perform for each level of competence.	MoNE, 2006b
6.	Ministry Decree No. 41/2007 concerning Standard of Process.	The standard of teaching and learning to facilitate students reaching competencies required in the curriculum.	MoNE, 2007a
7.	Ministry of National Education Decree No. 20/2007 concerning on Standard of Asssessment.	The standard of assessment procedure in evaluating student learning' outcome.	MoNE, 2007b
8.	The Professional Service of Curriculum 2004.	The effective principle of teaching and learning to support the piloting of KBK. The government issued this guideline as a supplement to KBK curriculum documents.	MoNE, 2003
9.	The Guidelines of Curriculum Development for primary and (general & vocational) secondary education.	The description of guideline for helping schools to implement the policies regarding competence-based education. The government issued this guideline as a supplement of KTSP curriculum documents.	BSNP, 2006

To answer research question 2 and 3, this study uses two instruments to collect data related to the implementation of CCBE principles in school practices: (1) the CCBE Matrix and (2) Inventory of Perceived Comprehensive Competence-Based Education (IPCCBE).

CCBE Matrix. The CCBE matrix is a tool for evaluating CBE implementation (Sturing et al., 2011) (see Appendix 1). It consists of ten CCBE principles that include indicators for five levels of competence-based implementation starting from (1) *not competence-based* to (5) *fully competence-based*. Using this matrix, one can evaluate the extent to which the CBE principles are realised in an educational programme. The matrix proves to be reliable with good content validity in the Dutch context (Sturing et al., 2011). For this present study, the CCBE matrix and indicators are translated into Indonesian language by a teacher teaching Dutch Language and an authorised translator prior to the data collection. Two educational experts from Indonesia reviewed the Indonesian version CCBE matrix to ensure its clarity and readibility. During the data collection, school principals used the CCBE matrix to score the implementation level (1 – 5) of the ten CCBE principles for their agricultural food processing study programme.

IPCCBE. Teachers and students' perceptions on the degree of implementation of the ten CCBE principles are collected using the Inventory of Perceived Comprehensive Competence-Based Education (IPCCBE). IPCCBE was originally developed by Wesselink and her colleagues (2007) to gather perceptions of teachers and students regarding the competentiveness of their study programme. The initial questionnaire consisted of 19 items using a five-points scale from 1 (strongly disagree) to 5 (strongly agree) addressing the eight principles of the initial CCBE Framework (Wesselink et al., 2007). Wesselink (2010) reported that the reliability of the IPCCBE was problematic for vocational education in the Netherlands, partly due to the limited number of items per principle. For this present study, therefore, the IPCCBE was redesigned by adding items per scale as well as adding items addressing the two additional principles[1] of Sturing and colleagues (2011). This results in 36 five-point Likert scale items for our version of the IPCCBE. Two examples of student questions are:

1. The competencies that are put central in the study programme are relevant for my future job.
2. During the learning trajectory, I became increasingly responsible for my own learning process.

For teacher questions, we changed the wording a bit to relate to teachers, e.g 'During the learning trajectory, the students became increasingly responsible for their own learning process'. Fourty students and nine teachers from general and vocational secondary schools pilot-tested the Indonesian version of IPCCBE prior to the data

[1] The Wesselink framework consisted of eight principles in which the principles of self-steering and self-reflection were one principle (called 'Self-responsibility and (self-)reflection of students are stimulated', Wesselink et al., 2007: 47). In Sturing's framework, the principles were separated into two, i.e self reflection and self-regulated learning. Sturing's validation study also led to the addition of the principle of flexibility.

collection. These pilot tests led to some minor changes in the phrasing of items. The reliability test for the IPCCBE in this present study is sufficient as the Cronbach Alpha coefficients range from 0.67 for principle 5 (assessment) until 0.92 for principle 2 (vocational core subject). Thus, the IPCCBE provides a reliable instrument for measuring teacher and student perceptions on the implementation of CCBE in the Indonesian context.

The 41 schools which agreed to participate also helped arrange the data collection process in terms of how student and teacher data was gathered. The data collection was conducted during one day for each school, so that the different participating groups (i.e., principal, teachers, and students) within a school could not interfere in each other's stakeholder responses. The first researcher was present in the class to assist students for any necessary clarification during the data collection conducted in January – March 2012. To ensure confidentiality, we did not ask teachers and students to provide any personally identifying information, e.g., name and identity number.

Analysis

To analyse whether and how CCBE principles are represented in the Indonesian policy documents, this study identifies relevant statements in the selected policy document and links them to the ten pinciples in the CCBE framework. The first researcher conducted this analysis. An educational expert from Indonesia and an English language teacher checked the conclusions for conformity.

Quantitative analyses are conducted per CCBE principle across all schools and per school to address the second and third research questions. Combining the data across all schools, giving an idea of the mean level of CBE implementation across the 41 vocational schools in Indonesia. For this purpose, mean scores for the school principals are calculated per principle. The principle mean scores of the teachers and of the students separately are analysed using one sample *t*-test, to discern whether or not the stakeholders' mean scores differ from the scale mean of 3. The value 3 demonstrates that respondents are neutral regarding specific statements. Mean scores significantly higher than 3 indicate that the teachers or students recognise a specific CCBE principle in their study programme. To calculate the competentiveness score per school, this study triangulates the ratings from students, teachers, and school principals for each school per principle. The aggregated mean scores taken from the three groups of participants for each school are calculated and presented as a school competentiveness score.

2.4 Results

CCBE Principles in Indonesian Educational Policy Documents

This section addresses the first research question dealing with the extent to which the CCBE principles appear in Indonesian educational policy documents. For reporting these

results, this study follows the idea of Sturing et al. (2011) and Baraki and colleagues (2016) to cluster the 10 CCBE principles into four: 1) Competencies, core tasks, and linkages to the labour market (principles 1, 2 and 3); 2) teaching and learning in CBE (principles 4, 6, 7, 8 and 9); 3) competence assessment (principle 5), and 4) career, lifelong learning and citizenship (principle 10).

Competencies, CoreTasks and Linkages to the Labour Market

The first CCBE principle focuses on what students should be able to do after completing the study programme and if competencies are framed as requirements for future professions. The Indonesian policy documents, i.e., the graduate competence standard (nr. 4) and the Indonesian Qualification Framework (nr. 2), describe the outcomes of educational programmes in terms of competencies. This is the first step towards competence-based education. The term 'kompetensi', which refers to 'competence or competency', appears nine times in the Law No. 20/2003, showing that competence development indeed has become the goal of the educational system in Indonesia.

Principle 2 of the CCBE framework deals with the degree to which complex vocational core problems are put central to learning and assessment tasks in the vocational curriculum. In developing their educational programme, the Indonesian documents explicitly encourage schools to collaborate with local contexts and industries to identify the core tasks. The Guidelines of Curriculum Development (BSNP 2006, nr. 9) encourages schools to develop their own curricula based on the guidelines provided by the government, industry, and competencies listed in the Indonesian Qualification Framework. The Guidelines explicitly require schools to show how their educational programmes link to students' future jobs. The Guidelines give greater autonomy to schools to manage their own curriculum, and to align with local context and societal needs. In doing so, the regulation strongly encourages teachers and industries to become involved, partnering in designing curricula that are representative of the labour market and professional tasks. These documents stress the importance of linking competencies taught in the vocational subject to students' future jobs.

With respect to learning activities that should take place in different, meaningful vocational situations (principle 3), the Guidelines of Curriculum Development (nr. 9) suggests that students are to be encouraged to learn by experience both in simulated classroom contexts and in the workplace environment (BSNP, 2006). The regulation requires students to have real work experiences. In responding to this regulation, schools send students out to work in a relevant institution/industry for about two months to learn how to perform tasks in future jobs and to acquire competencies required to perform tasks in the jobs.

Teaching and Learning in CBE

Concerning the teaching and learning in CBE, the CCBE framework addresses the importance of integrating knowledge, skills, and attitudes (principle 4), changing the teacher role from merely knowledge transmitter (principle 9), with an increased responsibility of learner for his/her own learning process (principle 7). In Indonesian policy documents, the Guidelines of Curriculum Development (BSNP, 2006, nr. 9) state the effective and ideal principles of teaching and learning processes which support successful implementation of a competence-based curriculum: student-centred learning, active learning, the role of the teacher as a facilitator, student interaction to promote learning, assessment for learning, and a thematic approach to learning.

With respect to the importance of integration of knowledge, skills, and attitudes in learning and assessment (principle 4), Government Policy No. 19/2005 (nr. 3) and the graduate competence standard (MoNE 2006a, nr. 4) state explicitly that competency covers attitude, knowledge, and skill. The documents defined the term 'kompetensi' (competence) as the integration of knowledge, skill, and attitudes. Furthermore, the Guidelines of Curriculum Development describe the learning perspectives underlying the Indonesian CBE, i.e KTSP, as 'thematic approach' which refers to the integration of two or more subjects in order to provide a meaningful learning experience for students, and involve both cognitive and physical processes (BSNP, 2006). This indicates that aspired student learning outcomes do not only relate to having knowledge but also to the ability to apply the knowledge to perform particular tasks. This perspective on meaningful learning and aspired learning outcomes relates to a large extent to the perspectives underlying the CCBE framework.

The CCBE framework stresses that learning should be student-centred in which students should be stimulated to reflect on their own learning (principle 6) and increasingly steer their own learning (principle 7). The importance of student-centeredness is found in the Guidelines of Curriculum Development (BSNP 2006, nr. 9), stating:

> *'The development of the curriculum is based on the principle that learners are at the center of curriculum development ... Learners' competencies should be developed on the basis of their potential, their developmental level, their needs, benefit to them and the demands of their environment. Thus, having a central position in this context means that learning activities are learner-centered (translated from BSNP, 2006: 5).'*

This quotation shows that the curriculum should be designed and delivered through learning processes that are active, creative, effective, and joyful where the focus is on students. The process facilitates students to increase their curiosity and imagination. These statements all relate to principles 3, 6, 7, and 9 in CCBE framework. Thus, the Indonesian regulation envisaged students actively participating in the learning process. Teacher and students share responsibility for the learning process, practice self-evaluation and reflection, and collaboration between teachers and students is explicitly

promoted (BSNP 2006).

With regard to the principle of flexibility (principle 8), the Law No. 20/2003 article 12 (nr. 1) states that every student is entitled to 'obtain education services in accordance with students' talent, interest, and ability; shifting from one to another stream and unit of education at the same level; and to complete an education programme based on individuals' rate of learning, not to exceed the time determined' (MoNE, 2004, nr. 1). The statement further says that each student is different, and therefore the teaching and learning process must cater to the individual needs of every student. In translating this, the Ministry of National Education further issues a guidance statement for vocational schools to accommodate student flexibly in that students can finish the study programmes at their own pace. This guidance promotes an open system, meaning students are to have flexibility in choice and in the amount of time needed for accomplishment of learning trajectories. However, the above quoted section of the law actually says that students are allowed to proceed at a slower pace, but are not allowed to go *faster*. In practice, this means that students are not allowed to take their final exams sooner than officially scheduled.

In terms of learning guidance and the role of the teacher (principle 9), the Guidelines of Curriculum envisage the learning process as 'the reversed meaning of learning' (MoNE, 2004: 7-8, nr. 8). This refers to learning as information building and understanding by students, not knowledge transfer from teacher to student. The Guidelines of Curriculum Development define learning as an active action by students to build meaning and understanding, while it is the responsibility of teachers to create learning situations supportive to students' creativity, motivation, and responsibility for long life education (MoNE, 2004: 7, nr.8). In reviewing the KTSP educational regulation, Sulfasyah (2014) asserts:

> *'The KTSP involves a paradigm shift in an educational process, from teaching to learning. A teaching paradigm which focuses on the role of teachers as transmitter of knowledge to students should shift to a learning paradigm which gives more responsibility to the students to develop their potential and creativity (translated from Pustaka Yustisia 2011, 30).'*

The excerpt above indicates that Indonesian policy promotes a paradigm shift from a focus on teaching to a focus on learning, implying changed roles for teachers and students. The teacher role shifts from that of a knowledge transmitter to a facilitator of learning, which is in line with CCBE principle 9. Additionally, the document reports on the changed role of students from a passive recipient to an active and collaborative constructor of their own knowledge, which links to CCBE principles 6 and 7. The document encourages interaction amongst the students, and between students and teachers gearing toward students jointly constructing their knowledge (BSNP, 2006). These statements show that the student and teacher roles expected in Indonesian CBE are in agreement with the student and teacher roles described in the CCBE framework.

Competence-Based Assessment

Assessment is another key concept guiding teaching and learning in competence-based education. CCBE requires regularly assessing student learning using multiple assessment methods, both for grading as well as informing and stimulating further learning purposes (principle 5). The Guidelines of Curriculum Development provide supporting documentation explaining what is expected in relation to assessment. In the Guidelines of Curriculum Development, assessment is defined as a set of activities to gather and analyse information in order to measure learning outcomes (BSNP, 2006, nr. 9). Additionally, this document states that assessment is not only to be used for summative purposes but also for formative purposes aimed at monitoring student learning. This entails the use of various assessment methods, not only traditional forms of objective tests and essay tasks. Some of the approaches to formative assessment recommended at the classroom level include, but are not limited to, authentic assessment, performance assessment, and portfolios (BSNP, 2006). Regarding the timing of assessment, the government issued regulations state that before the end of students learning trajectories, the schools should assess students' competencies on the vocational core subject involving experts from industry to ensure the student competence levels meet standards required by the world of work (BSNP, 2006). These policy statements referring to assessment, strongly agree with the perspectives on assessment portrayed in the CCBE framework.

Career Competencies, Lifelong Learning and Citizenship

The CCBE framework pays explicit attention to stimulating competencies needed for surviving in today's society and lifelong learning (principle 10). This principle is clearly reflected in Indonesian regulations stating that the curriculum should be developed to create students to be life-long learners (BSNP, 2006: 6, nr. 9). To realise this, the education process should put emphasis on the development of learning attitudes such as self-confidence, curiosity, the ability to understand others, and communication skills that support development of these attitudes (MoNE, 2003: 12, nr. 1).

Principle 10 CCBE also refers to citizenship which is explicitly found in the Indonesian documents in the Guidelines of Curriculum Development (BSNP 2006, nr. 9) stating that 'the development of competencies to create spiritual, virtuous, healthy, knowledgeable, capable, creative, independent, democratic and responsible citizens' (translated from BSNP 2006, 5). This statement clearly shows that Indonesian CBE desires that its students become democratic and responsible citizens, in line with principle 10 of the CCBE framework.

Additionally, reflecting the national constitution of Indonesia, the policy documents explicitly stress that Indonesian CBE should pay attention to 'creating awareness of the Divine Dimension' (BSNP, 2006: 5) refering to believing in God. This is a newly stated Indonesian CBE characteristic, not initially represented in the former CCBE framework,

in which religion is approached as a neutral topic.

The explanation above indicates that the ten CBE principles described in the CCBE Framework of Sturing and colleagues (2011) are found in Indonesian educational policy documents to a large extent. Thus, the CCBE framework appears to provide an applicable operationalisation of Indonesian CBE that can be used to investigate the implementation level of competence-based education in Indonesian vocational schools.

CCBE Principles as Perceived by School Principals, Students and Teachers

This section presents the results of the cross-sectional analysis of the perceptions of school principals, teachers and students of CBE implementation in their study programmes.

CBE Implementation as Perceived by School Principals

Table 2.2 shows the descriptive statistics of CBE implementation levels as rated by school principals. The mean scores for each principle range from 2.45 (*SD* = 1.12) to 4.49 (*SD* = 0.75). Most principles show a mean score above 4, suggesting that in general school principals were positive about the level of CBE implementation in their schools. On the other hand, most principles showed a wide-scoring range from *not competence-based* (score 1) or *starting to become competence-based* (score 2) to *fully competence-based* (score 5), suggesting that the participating schools differ in the degree to which the CCBE principles are implemented. The lowest mean score of the principle of flexibility (principle 8) indicate that most school principals did not see this principle practised in the study programme.

Table 2.2 Mean Score of Realisation CCBE Principles as Rated by School Principals (N = 41)

	Principles	Min	Max	Mean	SD
1	competence profile	2	5	4.19	0.89
2	vocational core problems	2	5	4.10	0.83
3	authentic learning	2	5	4.15	0.84
4	integration KSA	1	5	4.48	0.91
5	assessment	3	5	4.11	0.44
6	self-reflection	2	5	4.49	0.75
7	self-responsibility learning	2	5	3.66	0.72
8	Flexibility	1	5	2.45	1.12
9	learning guidance	1	5	4.08	1.01
10	life-long learning, career and citizenship	1	5	4.17	0.86

Note: Scale from (1) not competence-based until (5) fully competence-based.

CBE Implementation as Perceived by Teachers and Students

Table 2.3 presents the results of the one sample *t*-tests examining whether the mean scores of teachers' perception on the implementation of CBE differ from the mean value of 3. It shows that teachers rate almost all principles above 3, and notably most above 4 (largely competence-based), except for principle 8 (flexibility) (*M* = 2.81, *SD* = 0.50). This indicates that teachers recognise the CBE implementation in the study programmes, except for principle flexibility.

Table 2.3 Mean Score and The T-Test of CCBE Principles as Perceived by Teachers (N = 428)

	Principles	Min	Max	Mean	SD	t-test	p-value
1	competence profile	3.50	4.64	4.13	0.24	30.01	0.00
2	vocational core problems	3.52	4.55	4.10	0.20	35.45	0.00
3	authentic learning	3.07	4.50	4.01	0.27	23.91	0.00
4	integration KSA	3.47	4.87	4.18	0.26	29.01	0.00
5	assessment	3.05	4.62	4.03	0.30	22.24	0.00
6	self-reflection	3.11	4.59	3.98	0.30	20.68	0.00
7	self-responsibility learning	3.45	4.79	4.06	0.29	23.44	0.00
8	flexibility	1.71	4.18	2.81	0.50	-2.38	0.02
9	learning guidance	3.79	4.79	4.37	0.22	39.77	0.00
10	life-long learning, career, and citizenship	3.73	4.80	4.35	0.23	36.94	0.00

Note: Scale from (1) never until (5) always.

Table 2.4 shows that in the students' view all mean scores differ from the mean value of 3. Almost all principles are significantly higher than 3, except for principle 8 (flexibility) which scores significantly below the mean value of 3 (*M* = 2.52, *SD* = -0.29, p-values < 0.05). Student scores suggest a perceived medium to large implementation of CBE (between 3.49 and 4.11). This result indicates that students notice the ten CCBE principles being implemented in their study programme, except for principle 8 (flexibility).

Table 2.4 Mean Score and t-test of CCBE Principles as Perceived by Students (N = 2219)

	Principles	Min	Max	Mean	SD	t-test	p-value
1	competence profile	3.09	4.39	3.95	0.25	24.12	0.00
2	vocational core problems	3.39	4.50	4.11	0.21	33.60	0.00
3	authentic learning	2.89	4.10	3.76	0.23	21.44	0.00
4	integration KSA	2.86	4.18	3.73	0.25	18.46	0.00
5	assessment	2.75	3.83	3.49	0.21	14.96	0.00
6	self-reflection	2.83	4.07	3.63	0.22	18.46	0.00
7	self-responsibility learning	3.57	4.27	4.03	0.14	45.49	0.00
8	flexibility	1.93	3.14	2.52	0.29	-10.30	0.00

	Principles	Min	Max	Mean	SD	t-test	p-value
9	learning guidance	3.14	4.56	4.13	0.25	28.38	0.00
10	life-long learning, career and citizenship	3.29	4.47	4.04	0.23	28.76	0.00

To conclude, school principals, teachers, and students notice the CCBE principles in their study programmes suggesting medium or large degrees of implementation of the various principles. However, all three stakeholder groups do not see the principle of flexibility as having been successfully implemented in the study programme.

The competentiveness of study programme

Result in Table 2.5 showed that from the 41 schools in the study sample, the competentiveness score range from 2.47 to 4.13, with the average score of 3.52 (*SD* = 0.35). This suggests that the implementation of competence-based education in Indonesian agricultural schools vary, ranging from level 2 (starting to be competence-based) to level 4 (largely competence-based). Figure 2.1 further displays the schools' competentiveness scores from our 41 schools sample.

Table 2.5 Competentiveness Scores of Agricultural Schools (N=41)

Variable	Min	Max	Mean	SD	SE Means	Varians
Competentiveness Score	2.47	4.13	3.52	0.35	0.05	0.12

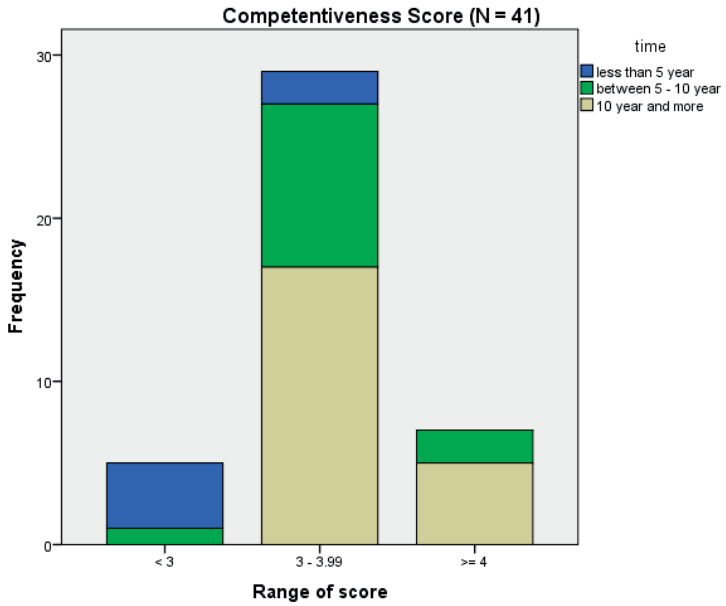

Figure 2.1 Number of Schools with the Range of Competentiveness Score and Length of Establishment

We reviewed the clusters of low versus high scoring schools once more to see if we could find indications for variables that might explain why schools score high or low. We could not detect a trend linking, for example, the size of the school or number of VET programmes offered to its CBE implementation success. However, we did notice that in newer schools (schools existing for no longer than five years) there seemed to be an over representation in the low scoring cluster. An additional analysis indeed supported the idea as can be seen in Figure 2.1. Schools with the competentiveness score of 2 were mostly new schools, while the schools with high competentiveness scores were mostly schools that have been in existence more than ten years.

2.5 Conclusion and Discussion

This study explores CBE implementation in Indonesian vocational schools using the lens of Comprehensive Competence-Based Education Framework which was developed in a Western (i.e. Dutch) context (Sturing et al., 2011). This study collects information from educational policy documents and cross-sectional survey data from school principals, teachers, and students from 41 agricultural schools. Our findings show that CCBE principles appear in Indonesian educational policy documents to a large extent and are practised in schools. However, the degree of implementation of the ten principles in the 41 schools show a wide range of variation, from *starting to be competence-based* to *largely competence-based*. The principle of flexibility receives low rating from all stakeholders, even though the educational policy documents explicitly aim for increasing the flexibility of vocational programmes. This finding challenges both Indonesian CBE implementation as well as the body of knowledge in CBE theory and needs further attention in the realisation of competence-based education in practice. Therefore, the findings do suggest that the western CCBE framework is appropriate for studying CBE in non-Western countries.

The recognition of the CCBE principles in policy documents, as well as finding the principles scoring in a range from 1/2 to 5 by various stakeholders, contributes to the validation of the CBE framework and principles. The findings allow for identifying and differentiating amongst *more-* to *less-* CBE schools, and serve to help identify which CBE principles are more problematic than others. These are interesting findings both from theoretical and practical points of view. The CCBE framework can indeed be used as a tool for evaluating and reflecting on educational programmes, but also opens doors for linking varying degrees of implementation to various CBE outcomes. This is crucial for future effectiveness studies that are lacking hitherto (Lassnigg, 2017; Wesselink et al., 2017).

With respect to the current condition of successful CBE implementation in Indonesian agricultural schools, the findings show that schools realise CCBE principles to different degrees, ranging from *starting to be competence-based* to *largely competence-based*. Although all schools are guided by the same policy documents and qualification

frameworks, the realisation in practice differs. From the 41 school samples, less than twenty percent of schools have a competentiveness score of four or above. This might be due to the legacy of the previous centralised education system in Indonesia, in which teachers were not much involved in curriculum design, while the new CBE system is decentralised and requires teachers and schools to take the lead in (re)designing their curriculum. Surprisingly, in this respect, newer schools (existing for not more than five years) score lower in competentiveness than older schools. While one could argue that newer schools carry less 'burden' from the previous, more centralised system, this does not seem to result in a better implementation of CBE in these newer schools. This finding can probably be explained by a lack of (financial) resources, fewer facilities, and fewer and fewer strong relationships with the surrounding companies who provide the labour market for facilitating workplace learning. Thus, the mere stating of CBE principles in educational policy documents is not sufficient for successful implementation of an educational innovation. Successful implementation requires both adequate resources and facilities, as well as additional support from various stakeholders such as teachers and school principals. Successful school innovation depends on how teachers interpret the underlying concepts and practices, and then translate their new knowledge and skills into actual teaching and learning conditions and activities. Only when provided proper implementation support can schools implement the CBE curriculum as intended (Gulikers, Runhaar, & Mulder, 2017).

This study corroborates previous studies in different countries (e.g, Geerligs & Nijhof, 2002; Solomon, 2016) that also show how the flexibility principle is a difficult principle to realise in educational practice. The low score for the principle of flexibility indicates that the studied vocational programmes do not offer students opportunities to perform learning and assessment activities at their own pace, place, and time, or that the educational programme and methods are not adequately adjusted to meet each individual student's needs. It suggests that vocational programmes are standardised across students, even though the policy documents state that they need to allow for more individualisation and differentiation. Several possible explanations can be provided for this finding, some which are discussed in previously referenced studies, such as Wesselink (2010). Making an educational programme flexible in terms of accommodating each individual student's needs might be the most difficult principle of CCBE to achieve, as it requires systemic change from the organisation of an educational system. One could also argue that this principle can only blossom when the other principles are implemented first.

This study offers several possible explanations for low scores of the flexibility principle. First, the phrasing of the law – saying '[a student must] complete an education programme based on the individual's rate of learning, not exceeding the time determined' (MoNE, 2004, nr. 1) – might discourage schools from putting effort into organising possibilities for students to go *faster* throughout their educational programme. This law does not allow students to take their final exams sooner than officially scheduled.

Second, the Indonesian culture can be characterised by authoritarianism (Hofstede & Hofstede, 2005), hence the flexibility, or learner-directed principle, may not be a cultural fit or possibility. A final discussion with respect to this flexibility principle might be around flexibility as an important characteristic of vocational education, as the degree of flexibility could have a major impact on student motivation and cognitive skills, and might actually make schools and schooling generally more efficient (e.g. Nijhof, Kieft, & van Woerkom, 2001; Soden, 1993). In societies with emerging emphases on (norm-referenced) assessment, and movements toward an overall standardization of education in the global education reform movement, the question arises about the feasibility of *any* degree of flexibility in some schools. Future research should investigate the flexibility principle in competence-based vocational education, how and under which conditions this can actually be successfully implemented, and how it in turn affects learning processes and outcomes.

As has been mentioned earlier, competence-based education was developed in western countries that have markedly contrasting learning cultures from that of Indonesia. The principles of self-steering, self-directed learning, and increased student responsibility (principles 7) are more common and considered appropriate for individualist cultures. Our findings show that teachers and students scored these principles relatively high, while Indonesia is considered to be a collectivist society (Hofstede & Hofstede, 2005). This finding might suggest that either these principles also relate to collectivist societies, or that the Indonesian culture is shifting from a more collectivist into more individualist culture, as previously stated by Mangundjaya (2013). Future research could elaborate on the relationships between the various CCBE principles and those of individualist or collectivist societies.

Despite the study's success in highlighting important findings and implications, the study was challenged by several limitations which need to be addressed to improve future studies on the focus areas. This study utilises quantitative data from a cross-sectional survey, which was limiting in its ability to provide deeper insight into the actual implementation of CBE in schools. Though quantitative data collection is considered to be an efficient way to get information, incorporating data collection using classroom observation might result in clearer and more detailed pictures of what actually happens during the learning process in Indonesian vocational schools. School documents, such as educational vision statements, might differ in the extent to which they adhere, or hope to adhere to the educational policies regarding CBE. The extent to which industries collaborate in designing and providing opportunities for on-the-job education could be pursued, stimulated, and therefore improved. A more systematic review of school documentation might provide more and deeper insights into the variation of school curricula with respect to the intended CBE curriculum.

Another limitation is that of sample size, which is related to the quality of generalisations around findings. Even though the 41 schools in our sample comprised most of agricultural schools in Java, and all VET schools on offering food processing and

technology in Java province were reviewed, this number is actually a small portion of total vocational schools in Indonesia. The overall quality of the supporting resources of vocational schools in the big cities outside of Java might be comparable in term of facilities, but in rural areas the overall supporting resources might differ. The schools with fewer resources and available support are likely not to be as comparable to "newer" schools, resulting in lower CBE scores for the under-resourced schools. Also, the labour market and facilities on other Islands of Indonesia are different from the contexts of our study; and the agricultural product and the available firms/industries to cooperate with in Java and outside Java might be different. Therefore, the results should be interpreted cautiously. Adding more samples from various areas and study programmmes will give a more complete picture of the current CBE condition in Indonesian vocational schools. Additionally, vocational schools that are not obliged to follow the national policy guidelines regarding the CBE educational system (e.g., the private schools) should be left out of a study sample.

To conclude, CCBE principles that were developed in the Western context seem largely applicable to typify CBE policy and implementation in Indonesia, as an example of a non-Western, collectivist society. School principals, teachers, and students recognise most CBE principles as being implemented in their study programme, except for the principle of flexibility. This means that the content and the process of learning in vocational education, at least in agricultural food processing technology programmes, to a relatively large degree adhere to the comprehensive competence-based education framework. This study showed that utilising the ten CCBE principles, together with the resulting competentiveness scores allow for differentiating between *more CBE* and *less CBE* schools. This is a fruitful finding for future effectiveness studies that CBE theory and proponents, for which there is a great demand. This can be done, for example, by comparing school factors that influence student outcomes in high versus *low competence-based* learning environments.

Chapter 3
Competence and Knowledge Development in Competence-Based Vocational Education in Indonesia

Abstract

Theory and research in the field of competence-based education (CBE) in vocational education have advanced enormously during the last decades, although empirical research on CBE lags far behind. CBE researchers have complained about the lack of evidence that CBE results in better competence development, the decreasing attention for knowledge development in CBE practice, and the cross-sectional nature of much CBE research. This study addresses these issues by comparing competence and knowledge development of students in vocational schools which have implemented principles of CBE to a higher or lesser degree (indicated as high, or HCBE, and low, or LCBE). The study involved 506 students majoring in food processing and technology and 32 teachers from 11 agricultural secondary vocational schools. Teachers and students rated student competency levels. Student knowledge was tested with a multiple-choice test. Longitudinal data were collected during one school year, at three points of time. The results showed that the student competence development in HCBE was higher than in LCBE. This means that the implementation of CBE was successful and had a motivating effect on both students and teachers in vocational schools. However, knowledge development was indeed lower in HCBE than in LCBE, which needs further attention.

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3.1 Introduction

Theory and research in the field of competence-based education (CBE) in vocational schools have advanced enormously during the last decades. Originating from psychology (White, 1959), the notions of competent professional performance, competence testing, competence management, and competence-based education have become quite popular (Mulder, 2014). For CBE this has materialised in the institutionalisation of competence within international and national qualifications frameworks (Mulder, 2012) in which competence plays an important role in the definition of the levels of learning. As such, CBE has become a worldwide educational innovation (Mulder, 2017), which goes along with intense debates about the essence and effects of this innovation.

Various authors have criticised the construct of CBE (Lum, 1999; Westera, 2001; Hyland, 2006; Mulder, Weigel, & Collins, 2007), pointing at the reductionist, fragmented, over-specified, standardized, and performative nature of competence-based education approaches, whereas others have pointed at the holistic and integrative nature of competence (Velde, 1999; Wesselink, 2010; Mulder, 2017). Critiques have been valid for certain CBE practices in certain times and places, like those regarding the UK's national vocational qualifications framework, but since the early implementations and evaluations of CBE, much progress has been made certainly with respect to competence theory and practical approaches to its implementation in training, education, and development trajectories (see Mulder, 2017). Despite the advancements in competence theory, empirical research on CBE lags far behind. This contribution is aimed at addressing the comments made by other researchers regarding the lack of evidence regarding the value added of CBE for actual competence development, the neglected knowledge development component in CBE practice, and the issues of competence assessment in CBE research.

3.2. Theoretical Framework

Advancements in Competence Theory and Research

CBE researchers have complained about the lack of evidence that CBE results in better competence development (Lassnigg, 2017), the decreasing attention to knowledge development in CBE practice (Koopman, Teune & Beijaard, 2011), and the cross-sectional nature of much CBE research (Lassnigg, 2017). Although the policy expectations are quite high, research until now did not convincingly inform vocational education and training policy makers about the added value of CBE. On the other hand, key principles about CBE, such as the alignment of CBE with the labour market and society in general, the inclusion of the accreditation of prior learning, the emphasis on the necessity of creating a lifelong learning attitude, authentic formative assessment, are not contested. Furthermore, national and international comparative research on competence achievement is extremely difficult (Wesselink, 2010), because of the diversity of vocational education,

the different implementation stages, the time frame of the innovation before it can show effects, and the presence of multiple confounding factors.

Indonesia was chosen as the context of this study as it has adopted competence-based education since 2004 (MoNE, 2003; Misbah, Gulikers, Maulana & Mulder, 2015), and provides an interesting opportunity to compare schools for vocational education which differ to the degree in which they have adopted and implemented principles of competence-based education (Sturing, Biemans, Mulder, & de Bruijn, 2011; Wesselink, Dekker-Groen, Biemans, & Mulder, 2010). This adherence to those principles has been called the 'competentiveness' of vocational education programmes. Low competentiveness means that vocational education programs are not at all competence-based, or are minimally based on principles of competence-based education. Whereas high competentiveness means the opposite. In this contribution this distinction is abbreviated as HCBE (for high levels of implementation of CBE principles in vocational education) and LCBE (for low levels of implementation of these principles).

Wesselink and colleagues (2007) developed a framework that defines what a competence-based curriculum and the learning environment should look like based on international literatures followed with a delphi study with Dutch educational experts. The framework consists of eight principles describing the essential elements that characterise competence-based education. Researchers used this framework to examine educational programs in the Netherlands (e.g., Wesselink et al., 2010), East Africa (e.g., Mulder, Eppink, & Akkermans, 2011) and in Indonesia (e.g., Nederstigt & Mulder, 2011). Sturing and her co-workers (2011) validated the framework with teacher practices which resulting in a refinement of the framework into ten principles of CBE: (1) The study programme is based on core tasks, working processes, and competencies (the qualification profile); (2) Complex vocational core problems are central; (3) Learning activities take place in different concrete, meaningful vocational situations; (4) Knowledge, skills, and attitudes are integrated in learning and assessment; (5) Students are regularly assessed for various purposes; (6) Students are challenged to reflect on their own learning; (7) The study programme is structured in such a way that students increasingly self-steer their learning; (8) The study programme is flexible; (9) The guidance is adjusted to the learning needs of the students; (10) In the study programme, attention is paid to learning, career and citizenship competences (Sturing et al., 2011).This framework includes five levels of CBE implementation from non-competence-based to fully competence-based study programs. Using this framework, Misbah and colleagues (2013) examined the competentiveness of 41 Indonesian vocational agricultural schools by collecting and triangulating data taken from perceptions of school principals, teachers, and students. Their study showed CBE principles were, to some extent, implemented in Indonesian vocational education, although the levels of competentiveness varied considerably (Misbah, Gulikers, Mulder, & Dharma, 2013). This present study examines competence as well as knowledge development in HCBE versus LCBE schools.

Competence and Knowledge Development in Competence-Based Vocational Education

The primary intended outcome of CBE in vocational education obviously is professional competence. Professional competence '... is seen as the generic, integrated and internalized capability to deliver sustainable effective (worthy) performance (including problem-solving, realizing innovation, and creating transformation) in a certain professional domain, job, role, organizational context, and task situation' (Mulder, 2014). However, internationally, different countries define the competence construct in a different way, ranging from being mainly behaviouristic and fragmented (e.g., England, Australia) (Brockmann, Clarke, Mehaut, & Winch, 2008; Boahin & Hofman, 2014) to being much more comprehensive, integrative and holistic (e.g., France, Netherlands, Germany) (Biemans, Nieuwenhuis, Poell, Mulder, & Wesselink, 2004). These different conceptualisations result in different operationalizations of competence and competencies, i.e., elements of professional competence, e.g., a researcher has a binding leadership ability (Mulder, 2014), into practical educational programs. The role and position of "knowledge" is also different in these programs. One way or the other, CBE programmes aim at developing professional competence, which is a different intended outcome of much more traditional education, which mainly aims at knowledge acquisition (Seezink, Poell, & Kirschner, 2010; Wesselink et al., 2010). This has led to many discussions about the role and place of knowledge in competence-based education and the critique that knowledge development comes at the expense of competence development (Koopman, Teune, & Beijaard, 2011; Mulder, Gulikers, Biemans, & Wesselink, 2009).

Unlike knowledge, competence is not a directly observable phenomenon; it is inferred by performance outcomes (Hager, 1995). Many developments have been made in testing knowledge. This is less the case in competence assessment, although significant progress has been made (see for instance Van der Vleuten, Sluijsmans, & Joosten-ten Brinke, 2017). Researchers have been seeking reliable instruments for measuring competence (e.g., Blömeke, 2016; Gulikers, Biemans, & Mulder, 2009). Current studies show that student self-reports with performance indicators can be reliable and valid, and argue that taking student perceptions into account is important for several reasons (Braun, Woodley, Richardson, & Leidner, 2012; Khaled, Gulikers, Tobi, Biemans, Oonk, & Mulder, 2014; Lizzio & Wilson, 2004). Student perceptions of their own competence can be an important predictor for student achievement (Cho, Weinstein, & Wicker, 2011). For example, high perceived competence facilitates positive expectations for success, intrinsic motivation, and achievement-oriented behaviours (Roberts, Treasure, & Conroy, 2007). Students who believe they are competent, will be motivated in terms of effort and perseverance, put more efforts into understanding their work, and in planning, monitoring and regulating their work (Pintrich, 2003). Students who perceive their competence positively are argued to experience more motivation, and in turn reach better performance (Liu, Wang, Tan, Koh, & Ee, 2009). Knowing students' self-perceived level of competence is also important for teachers, as such information can be used

by teachers to foster student learning, evaluate progress, and assist in determining the effectiveness of curriculum and training programs (Kaslow et. al., 2004). This enables teachers to prioritise which competencies need to be emphasized in curriculum and program planning (Oladele, 2011).

Studies using students' self-reports of their own competency levels are important to generate insights in the effectiveness of CBE for fostering students' competence development. Even though important, examining the effectiveness of competence-based education by only looking at the student perspective is not satisfying. Student self-report is often questioned for its validity and objectivity (e.g., Ward, Gruppen, & Regehr, 2002). Thus, some researchers suggest to combine self-reports with external sources, such as teacher reports (Baartman & Ruijs, 2011). As perceptions of students and teachers on student achievement might differ (Baartman & Ruijs, 2011), taking both perspectives for analysing CBE into account provides valuable and useful information for identifying and strengthening the effectiveness of CBE.

Besides fostering students' competence development, CBE should also enhance students' knowledge development. The development of knowledge is essential for a student to become a competent beginning professional, as a solid knowledge base remains the backbone of competent performance (Biemans et al., 2004; Eraut, 2004; Miller, 1990). As such, knowledge is an integrated part of competence. Meanwhile, CBE is often criticised for ignoring the importance of knowledge development (e.g., Biemans, Wesselink, Gulikers, Schaafsma, Verstegen, & Mulder, 2009). Empirical evidence from a study by Koopman and colleagues (2011) showed that competence and knowledge development are at odds. Their study showed that students in vocational schools that contained fewer characteristics of CBE (i.e., LCBE) developed *more* knowledge than students in a classroom that contained more characteristics of CBE (i.e., HCBE). As knowledge is prerequisite for competent performance, it is important to investigate students' knowledge development in CBE to contribute to our understanding of the effectiveness of competence-based education for student learning and performance (Lassnig, 2017).

Students in vocational education are expected to acquire different types of knowledge. Knowledge is commonly viewed from cognitive psychological and socio-cultural perspectives. From a cognitive psychological perspective, knowledge can be distinguished and differentiated as declarative/factual and procedural knowledge, which are sometimes presented in different qualities such as knowing that and knowing how (Miller, 1990), theoretical and practical knowledge (Bathmaker, 2013), and explicit and tacit knowledge (Schön, 1983). Socio-cultural theories view construction of individuals' knowledge as inseparable from individuals' interaction within society in which they think and act (Baartman & de Bruijn, 2011; Rogoff, 1990; Scribner & Beach, 1993). This view is consistent with the need of students in vocational education to build and reflect on knowledge gained from experiencing professional tasks in workplace learning (Billet, 1998;). In VET students should be prompted to actively build and reflect on knowledge

used various learning activities in interaction with teachers and peers in school and the workplace. By doing this, students can integrate knowledge into their own personal professional knowledge base (Brockmann et. al., 2008; Rauner, 2007; Schaap, de Bruijn, van der Schaaf, & Kirschner 2009). Thus, vocational knowledge and knowledge development in VET is much more that gaining declarative knowledge. However, much 'normal/regular' VET education, at least in Indonesia, puts a lot of emphasis on teaching and testing declarative knowledge. For this reason, this study will only look at the factual/declarative knowledge of vocational knowledge and its development during high- versus low-CBVE programs.

Research Questions

Based on the theory and research described above, it seems worthwhile to study both competence and knowledge development in HCBE and LCBE as observed by test scores, student self-assessments and teacher perceptions. The research questions are:

- *Do students in HCBE achieve a higher level of competence than students in LCBE?*
- *Does students' development of factual/declarative knowledge differ in HCBE versus LCBE?*
- *Do student and teacher ratings of student competence levels differ in HCBE versus LCBE?*

3.3 Methods

Participants

Students (*N*= 506) and teachers (*N*= 32) from eleven public vocational schools in three provinces in Indonesia took part. In total 322 students and 17 teachers followed a HCBE program versus 184 students and 15 teachers working in a LCBE setting. All students followed a same food processing technology study program covering the same content in all schools and using the same study material which were based on the guidelines of national education standards. Students were in their first year (grade ten) with 59 percentage being female and age ranging from 14 to 20 years old (mean age =16.4, *SD* = 0.67).

CBE learning environment. The sample schools were taken from previous study (Misbah et al., 2013) as described in chapter 2. All the schools offer food processing and technology, are public schools and use the same curriculum framework provided by the government. Schools participated on a voluntary basis.

Schools were classified as either HCBE or LCBE, based on the appearance of ten CBE characteristics in the study programme (e.g., self-directed learning, authenticity, student-centeredness) (Sturing et al., 2011; Wesselink et al., 2007). In a previous study, Misbah and colleagues (2013) examined the *competentiveness* of 41 agricultural

vocational schools that adopted the competence-based curriculum. Students, teachers, and school principals rated the level of CBE implementation of their study programmes. The ratings from students, teacher and principals were triangulated to typify schools as either low or high competence-based vocational schools. Schools scoring on or below level 2 were classified as low-competence-based education (LCBE) whereas schools scoring on or above level 4 were classified as high-competence-based education (HCBE). This classification resulted in six HCBE and five LCBE schools to be used for this present study (see Chapter 2 for more detailed information on the scoring and classification of the 41 vocational schools).

Measures

Competency level and competence development. Competency levels and competence development were measured using the Competence Development Measurement Instrument (CDMI), filled in by both students and teachers. CDMI was based on the validated competence measurement instrument COM (in Dutch: *Competentie Ontwikellings Meter*; Khaled et al. 2014). The COM consisted of 25 competencies with 4-6 performance indicators per competency to be scored on a 1 – 10 rating scale. This present study selected in total 31 performance indicators (i.e. items) covering five competencies relevant for the Indonesian Qualification Framework (MoMT, 2009) and important for the context of food processing and technology courses in the Indonesian CBE. These were: *vocational expertise, investigating, showing attention and understanding others, planning and organizing*, and *cooperating and collaborating*. The items were translated into Indonesian language version and contextualised for food and processing technology.

The original instrument is developed and tested in a Dutch context (Khaled et al., 2014). Therefore, factor analysis and Cronbach's alpha analyses were conducted, testing the instrument for our group of respondents. The principal component analysis showed 21 items could be extracted spread over four factors with *eigenvalues* above 1 that explained 64% of the variance, which is acceptable in human sciences (Steven, 2002). The reliability tests for these four competencies were good as the Cronbach's alpha coefficients ranged from 0.78 to 0.89 (Field, 2013). These four competencies in the CDMI will be used for this study. The fifth competency, *investigating,* was deleted from the analysis because the indicators for this competency did not form a single construct but cross-loading on other competencies. The example items and the Cronbach's alpha coefficients of the four competencies are presented in Table 3.1.

Teachers assessed students' competency levels using the CDMI as well. Instead of rating each performance indicator (i.e., *I carefully listen to what other people say*), teachers assessed at the competency levels (i.e., *Showing attention and understanding others*) using a 1-10 scale (see Table 1). Teachers and students in Indonesia are familiar with this scoring system as it represents their grading system, in which a 1 is the lowest

possible grade, less than 5.5 is unsatisfactory, more than 5.5 is satisfactory, and a 10 represents a flawless performance.

Knowledge test. Students' factual knowledge on food processing and technology was measured using a twenty-item multiple-choice test. Two agricultural teachers and one researcher selected the items from a bank of questions provided by the government. Those items were based on the national curriculum material for basic food processing and technology. This resulted in a content-valid knowledge test for this topic for all students in the study programs. All questions contained four answer categories.

Table 3.1 Competencies and Sample Indicators from the CDMI

Competencies	Sample Indicators	Cronbach's alpha		
		t0	t1	t2
Vocational expertise	I have much expert knowledge on food processing and technology.	0.86	0.85	0.82
	I possess many professional skills related to food processing and technology.			
Showing attention and understanding others	I empathize with other people's feelings.	0.80	0.78	0.81
	I carefully listen to what other people say.			
Planning and organizing	During the preparation of an assignment, I first consider which results I want to achieve.	0.87	0.83	0.83
	During the preparation of an assignment, I consider which tasks need to be executed.			
Cooperating and collaborating	During group meetings I give valuable contributions to the final result.	0.89	0.87	0.86
	I do my best to achieve the best result possible together with my group.			

Prior to the data collection, both the CDMI and the multiple-choice test were pilot-tested by 32 vocational students to check its readability.

Procedures

Students were requested to fill in the competence assessment and the knowledge test at three different times during one school year: in the beginning (t0), in the middle (t1), and at the end (t2) of the first year attending vocational schools (August 2012 – June 2013). The items in the competence assessment and questions in the knowledge tests were the same for all three occasions. The time lapse between the knowledge tests was considered to be long enough to prevent students from remembering the questions. Moreover, the answers were not provided in between the measurements, to prevent students from simply recalling answers.

Teachers rated student competencies twice: in the middle (at the end of the first semester – t1) and at the end of a school year (t2). It was impossible for teachers to rate students' competency levels in the beginning, as the teachers did not know the students well at that moment. Both students and teachers were provided instructional guidance before filling in CDMI and the researcher was present during the first measurement to answer questions.

Data Analysis

Students' mean scores for the four competencies and knowledge test were computed. On each occasion (i.e., t0, t1 and t2), MANOVA tests using SPSS 19 for Windows examined whether or not the mean scores differed in HCBE and LCBE schools per moment of measurement with the four competencies and knowledge test as the dependent variables and CBVE as a grouping variable.

For investigating the students' competence and knowledge development, the repeated measure of using MANOVA tests (Field, 2013) was performed with the four competencies and students' knowledge tests as the dependent variables, time as within-subject variable, and CBE as between subject variable. Competence development here refers to the growth of competency levels as represented by mean scores of the four competencies from first (t0), second (t1) and third (t2) measurements.

Students self-rating and teacher ratings on students' competencies were compared using repeated-measures MANOVA with the four competencies as dependent variables, time and participant as within-subject variable and CBE as between-subject variable. Data were analyzed from two occasions, i.e., t1 and t2, due to the availability of data from teachers. Paired sample *t*-tests were conducted to investigate whether teacher ratings in t1 differed from t2, both in HCBE and LCBE groups.

3.4 Results

Student competence and knowledge development

Research question 1 dealt with students' rating on 1) competency levels for each of the four competencies at three different moments; 2) the competency growth during one year, and 3) whether or not differences were found between HCBE and LCBE schools.

MANOVA tests using Pillai's Trace criteria (Field, 2013) showed that students from the HCBE versus the LCBE group rated their competency levels differently, $F(15, 694) = 15.27$, $p = 0.00$. Differences were found in the first (t0), second (t1), and third measurement (t2), all in favour of the HCBE group. Univariate tests presented in Table 2 showed that the mean scores for all four competencies in HCBE were higher than in LCBE, indicating that HCBE students perceived themselves as more competent than students in LCBE in all four competencies at all three testing events.

With respect to the development of the four competencies, repeated measures in the MANOVA showed the main effects of time, $F(10, 699) = 20.49$, $p = 0.00$, indicating that students reported a competency growth during a school year. This growth refers to the difference score from t0 to t1 and t2. The main effect of the CBE variable (i.e., HCBE vs LCBE) was significant, $F(5, 704) = 37.82$, $p = 0.00$, meaning that students in HCBE and in LCBE schools reported differences in the growth of their competencies. The interaction effect of CBVE x time was significant, $F(10, 699) = 2.73$, $p = 0.00$, indicating that the way H-CBVE and L-CBVE students reported the growth of perceived competency levels overtime differed, in favour of the H-CBVE students. Univariate tests showed that the growth of the competency of *cooperating and collaborating* was significantly different between HCBE versus LCBE schools. The growth patterns shown in Figure 3.1 help to make these findings more visible. Figure 1 shows the absolute scores for the four competencies at the three moments in time as well as the growth patterns of the four competencies in HCBE and LCBE schools. The figures visualized that, both in HCBE and LCBE schools, the four competencies increased during one year of study, in line with the main effect of time, and that students from HCBE schools scored higher on all cases, supporting the main effect of CBE learning environment. In line with the found significant interaction effect of time versus CBE on the development of *cooperating and collaborating,* Figure 3.1 showed a different growth pattern for the LCBE and the HCBE students. While students in HCBE reported an almost linear growth of the cooperating and collaborating competency, the competency level in LCBE context dropped at from t0 to t1, but increased again from t1 to t2. While not significant in the MANOVA, Figure 3.1 suggested the similar growth pattern difference for the competency of *showing attention and understanding.*

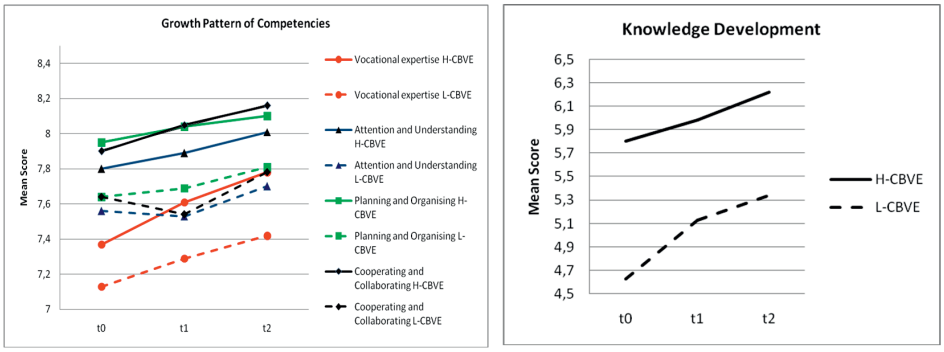


Figure 3.1 Pattern of Competence Development and Knowledge Development in LCBE versus HCBE Schools

With respect to the knowledge tests (research question 2), students from HCBE schools obtained higher scores on all three occasions compared to students from LCBE (see Table 3.3). With respect to the *development* of this knowledge from t0-t1-t2, the MANOVA test showed a significant difference between HCBE and LCBE, $F(2, 1416) = 6.37$, $p = 0.00$, in favour of the L CBE group (see also Figure 3.1). This indicated that students'

(declarative) knowledge development in LCBE and HCBE differed during one year, in favour of the LCBE learning environments. While students in HCBE had higher absolute knowledge scores then students in the LCBE group, students in the LCBE group gained more knowledge during the study year. This suggests that the LCBE programs stimulated knowledge development more than HCBE programs.

Table 3.2 Students' Rating of Competencies in LCBE and HCBE Schools at Three Measurements Moments

Competencies	Time 0			Time 1			Time 2		
	LCBE	HCBE	F	LCBE	HCBE	F	LCBE	HCBE	F
	M (SD)	M (SD)		M (SD)	M (SD)		M (SD)	M (SD)	
Vocational expertise	7.13 (1.08)	7.37 (1.12)	8.13*	7.29 (1.04)	7.61 (0.96)	17.90*	7.42 (0.98)	7.78 (0.75)	30.70*
Showing attention and understanding others	7.56 (1.02)	7.80 (1.10)	8.50*	7.53 (0.95)	7.89 (0.78)	30.10*	7.70 (0.90)	8.01 (0.87)	20.89*
Planning and organising	7.64 (1.13)	7.95 (1.02)	13.85*	7.69 (0.84)	8.04 (0.93)	26.05*	7.81 (0.92)	8.10 (0.82)	20.23*
Cooperating and collaborating	7.64 (1.22)	7.90 (1.10)	9.25*	7.54 (1.03)	8.05 (0.90)	48.61*	7.78 (0.95)	8.16 (0.80)	32.19*

Table 3.3 Students' Knowledge Tests in LCBE and HCBE Schools at Three Measurement Moments

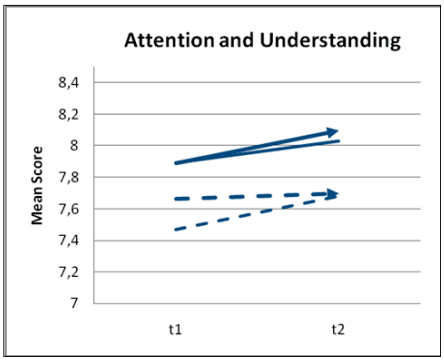
Variable	Time 0			Time 1			Time 2		
	LCBE	HCBE	F	LCBE	HCBE	F	LCBE	HCBE	F
	M (SD)	M (SD)		M (SD)	M (SD)		M (SD)	M (SD)	
Knowledge Test	4.63 (1.26)	5.80 (1.26)	149.45*	5.13 (1.16)	5.98 (1.31)	79.32*	5.34 (1.24)	6.22 (1.34)	80.03*

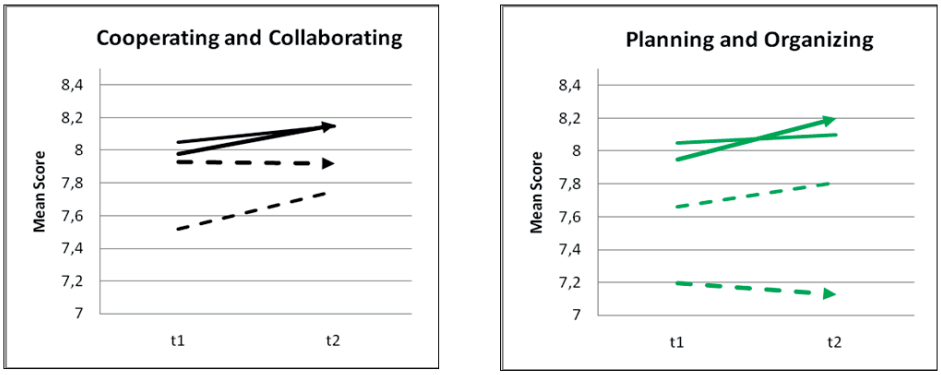
Student versus Teacher Rating on Competency Levels

This section discusses how teachers scored student competency levels at two moments in time, how they reported student competencies to grow and whether or not teacher rating differed from student self-rating in different levels of CBE implementation (research question 3). The three-ways interaction effect of time x participant x CBE was significant, $F(4,785) = 7.57$, $p = 0.03$, and the two-way interaction effects of time

x CBE, $F(4, 785) = 3.22$, $p = 0.01$, participant x CBE, $F(4, 785) = 53.27$, $p = 0.00$, as well as participant x time, $F(4, 786) = 2.94$, $p = 0.00$, were also significant showing that competence development over time was perceived differently by teacher and student in HCBE and LCBE schools. Figure 2 visualises the differences between teacher and students rating on competency levels in HCBE and LCBE schools, and allowed more understanding of the three way repeated measures MANOVA and its significant interaction effects. In HCBE schools, student and teacher ratings showed agreement on both perceived competency levels and competence development between the two different occasions, except for the competency of *vocational expertise.* Teachers rated their student higher on both occasions. On the other hand, in LCBE schools teachers and students showed more disagreement on all competencies as well as their development, except for the competency *showing attention and understanding other,* particularly at t2.

Besides showing the differences in slopes and growth patterns of teacher versus student rating, Figure 3.2 also showed the differences in rating of teachers in HCBE versus LCBE schools. It is important to note that when looking at the comparison between teachers in HCBE versus LCBE schools, teachers in HCBE tended to perceive their students' competencies as growing from t1 to t2 (sloping), while teachers in LCBE rated students' competencies as more stable from t1 to t2 (flat) or even decreasing. This suggestive visualization is corroborated by follow-up paired sample *t*-tests. The paired sample t-tests showed that teachers in HCBE rated their students' competency levels at t2 higher than at t1 for all competencies. Meanwhile, teachers in LCBE reported no significant growth of students' competencies except for a decrease in *vocational expertise* from t1 to t2 ($t = 2.81$, $p = 0.00$). Thus, teachers in HCBE schools saw a growth in students' competency levels within one year, while teachers in LCBE schools reported students' competency levels remained the same, or even decreased.





Note:

- Student Rating L-CBVE
- Teacher Rating L-CBVE
- Student Rating H-CBVE
- Teacher Rating H-CBVE

Figure 3.2 Comparison of Teacher and Students Rating on Competency Levels in LCBE versus HCBE Schools

To conclude, during the first year of vocational education, students reported their competency levels to increase. Students in HCBE felt more competent in all four competencies on all occasions compared to students in LCBE schools. With respect to growth of competency levels, or competence development, students in HCBE schools seemed to develop in a more linear fashion as suggested in Figure 3.1. For the knowledge tests, students in HCBE schools had higher scores than students in LCBE learning environments on all occasions. However, the development of this knowledge was more pronounced in LCBE schools during one school year. It means that students' knowledge development in LCBE and HCBE learning environments differs.

With respect to teacher versus student ratings, differences were found in a high versus low-CBE context. In HCBE, teacher and student ratings were more in line while teacher and student rating in LCBE showed more disagreement. Additionally, teachers in HCBE schools reported a significant growth of their students' competency levels within one year, while teachers in LCBE schools reported students' competency levels to remain the same or even decreased.

3.5 Conclusions and Discussion

This study reveals several important findings about the effectiveness of competence-based education (CBE) in vocational schools. It shows that competencies can be fostered within a school year, certainly in a high-competence-based education (HCBV) context where both students and teachers report a steeper development

of competencies compared to a low-CBE (LCBE) context, a finding that is in line with our hypothesis. Second, the development of declarative knowledge in LCBE and HCBE differs in favour of LCBE while students' perceived competence development is more pronounced in HCBE than in LCBE schools. Third, students and teachers in a HCBE context agree to a much larger extent on students' competency levels and competence development than students and teachers in a LCBE context. Lastly, teachers in HCBE have a more positive perception of students' competence development, while teachers in LCBE perceived students' competence as not growing, or even decreasing. Those results provide evidence for the effectiveness of CBVE schools for fostering competencies required for students' future.

The differential findings with respect to perceived competency levels and competence development suggest that indeed HCBE differs from LCBE schools in the extent to which they pay attention to students' competence development, while all schools are guided by the same national competence standards. This suggests that the educational innovation towards more competence-based education is, at least partly, successful. Additionally, the fact that students in HCBE schools have more positive perceptions of their perceived competency levels and competence development, opens doors to increasing motivation and achievement as perceived competence is an important predictor of intrinsic motivation and achievement (Ryan & Deci, 2000). Thus, this suggests that the goals of CBVE (increased motivation and achievement, and resulting lower drop out rates) are also within reach.

On the other hand, our findings show that knowledge development in HCBE is less-pronounced than in LCBE schools. CBE is sometimes criticised for ignoring the knowledge component of competencies, resulting in too little attention for knowledge development in classes. Also, a previous study (Koopman et al., 2011) showed that CBE compromises the development of knowledge. This study supports that there might be a trade-off between competence development and knowledge development. Paying attention to competence development comes at the expense of core knowledge development (Koopman et. al., 2011). In our study, knowledge was operationalized only as the factual/declarative knowledge of vocational knowledge, which obviously is not the only type of knowledge relevant for vocational knowledge and professional competence. As mentioned in the theoretical framework section, vocational knowledge is much more than only factual/declarative knowledge. However, as knowledge is still the foundation of being competent (e.g., Miller, 1990), the challenge for competence-based education is to find a balance between stimulating competence development as well as knowledge development. Policy makers should encourage program designers and vocational educators to develop teaching models in which knowledge and competence development can be fostered in balance.

With regard to finding that students and teachers in HCBE are more in agreement about students' competency levels, an attractive explanation lies in the nature of CBE learning environments that aim to prepare students for self-reflection (e.g., Sturing et.

al., 2011; Wesselink et al., 2010). Students from HCBE might have a better ability to reflect on their competencies than student from LCBE and as a result be more capable or more objectively identifying their competence levels. This again would support the success of the CBE implementation in Indonesian vocational education. This finding implies that using self-rating of competencies in competence-based assessment can be a useful instrument for investigating students' level of competencies (Khaled et al., 2014) in HCBE schools, while in LCBE, the results should be interpreted more cautiously.

The finding that teachers in HCBE report competence growth during the school year, while teachers in LCBE schools did not perceive their students to develop their competencies or even report a decrease in competency levels corroborates the effectiveness of CBE implementation in Indonesian vocational education. It can be argued that, even though all vocational institutes are guided by the same competence-based national curriculum, HCBE schools succeed more in stimulating competence development than LCBE schools. This finding also supports the effectiveness of the CBE principles (Sturing et. al., 2010; Wesselink et. al., 2007) for differentiating between the competentiveness of vocational schools. Teachers in HCBE schools are possibly more actively involved in implementing the national competence-based curriculum into their school curriculum. They might have a better understanding on the expected students' outcome in CBE.

Lastly, our finding showed that teachers in HCBE were positive toward student competence development. Thus, we can argue that teachers in HCBE schools are, to some extent, satisfied with student progress. As teacher satisfaction is an important element enhancing teacher movitation, CBE learning environments promise to be motivating for both students and teachers. Future research needs to investigate the effectiveness of CBE schools in terms of teacher satisfaction to support this argument.

To our knowledge, this is the first study that examines Indonesian CBE using the Indonesian Qualification Framework (MoMT, 2009). Also, this study is one of the first longitudinal and quasi-experimental studies to compare HCBE versus LCBE learning environments in terms of their effects on learning outcomes, both in terms of competence development as well as knowledge development. As such, the results enrich the evidence-based theory on competence-based education and learning, are promising for more evidence-based educational innovations and for supporting the effectiveness of CBE implementation in Indonesian vocational education in particular.

Chapter 4
Teacher Interpersonal Behaviour and Student Motivation in Competence-Based Vocational Education: Evidence from Indonesia

Abstract

Competence-based education requires changing teacher roles probably affecting teacher-student interactions and student motivation. This study examines how students (N=1469) from high competence-based and low-competence-based vocational schools perceive their teachers' interpersonal behaviour and its relation with their motivation. Results showed comparable teacher profiles in HCBE and LCBE schools, with an unexpected difference at the dimension level. Perceived teacher interpersonal behaviour moderated connections between CBE and student motivation, with greater impact in LCBE than in HCBE learning environments. Required changes in teacher roles are not yet perceived, hampering the expectations of increased motivation in competence-based education.

This chapter is based on: Misbah, Z., J. Gulikers, R. Maulana and M. Mulder (2015). Teacher interpersonal behaviour and student motivation in competence-based vocational education: Evidence from Indonesia. *Teaching and Teacher Education, 50,* August, pp. 79-89.

4.1 Introduction

Researchers in classroom learning environments have indicated the importance of teacher-student relationships in achieving student outcomes. Healthy teacher-student relationships are a prerequisite for engaging students in learning activities (Brekelmans, Sleegers, & Fraser, 2000). Researchers have investigated teacher-student relationships using an interpersonal perspective, that is studying teaching in terms of the relationship between teacher and students (den Brok, 2001). Using this perspective, studies show that the way students perceive their teacher interpersonally (teacher interpersonal behaviour) relates to students' academic achievement (e.g., den Brok, 2001; Goh & Fraser, 1998), attitude towards learning (e.g., den Brok, Levy, Brekelmans, & Wubbels, 2005; Gupta & Fisher, 2011; Henderson & Fisher, 2008; Telli, den Brok, & Cakiroglu, 2007; van Uden, Ritzen, & Pieters, 2014), and students' learning motivation (Maulana, Opdenakker, den Brok, & Bosker, 2011; Maulana, Opdenakker, Stroet, & Bosker, 2013; Opdenakker, Maulana, & den Brok, 2012). Numerous studies have been done using the Questionnaire on Teacher Interaction (QTI) and have involved students from primary schools (e.g., Fisher, Waldrip, Dorman, & den Brok, 2007; Goh & Fraser, 1998), secondary schools (e.g., Gupta & Fisher, 2011; Maulana et al., 2011; Rickards, 1998), and higher education (e.g., Fraser & Soerjaningsih, 2010) including teacher education programmes (e.g., de Jong, Tartwjik, Wubbels, Veldman, & Verlop, 2013). Studies linking student perceptions of teacher interpersonal behaviour and learning outcome in vocational education are still limited (e.g., Henderson & Fisher, 2008; van Uden et al., 2014) while the number of vocational students is increasing (OECD, 2009).

In Indonesia, a limited number of studies using the QTI have been reported. Soerjaningsih, Fraser, and Aldridge (2002) explored the use of QTI in investigating teacher interpersonal behaviour in the context of Indonesian higher education. The instrument provided a valid instrument for management and computer classes. Later on, Maulana and colleagues (2012) reported its validity for lower secondary education in Mathematics and English classes. Those studies confirm the importance of students' perception of their teachers' interpersonal behaviour for students' outcomes in Indonesia. While the QTI instrument has shown to be valid in the Indonesian context, little is known of studies using QTI to analyse teacher-student relationships in Indonesian vocational schools, particularly in competence-based education that is now rising in Indonesia. Indonesia, as is stipulated in the explanation of Indonesian Education Act No. 20 year 2003, employed the competence-based approach for its education system as a strategy to enhance its quality of education (MoNE, 2003; Utomo, 2005).

Investigating teacher-student relationships in competence-based vocational education is important since the competence-based concept in education is currently receiving more and more attention from educational researchers and practitioners worldwide (Illeris, 2009). CBE has a secured position in vocational education (Kouwehoven, 2003) and is considered to be a powerful learning environment (de Bruijn & Leeman, 2011) for fostering learning and motivation, and better preparing students

for their future (working) life. Learning environments in CBE classrooms, or CBE learning environments, typically focus on student-centred learning, and encourage students to be more self-directed and more responsible for their own career paths (Wesselink, Biemans, Mulder, & der Elsen, 2007). Consequently, CBE requires different roles of teachers and students compared to traditionally teacher-centred learning. Besides being a knowledge transmitter, teachers should also act as a coach in guiding students' learning (Biemans, Nieuwenhuis, Poell, Mulder, & Wesselink, 2004; Wesselink et al., 2007). As CBE requires different roles of teachers, differences pertaining to students' perceptions of teacher interpersonal behaviour can be expected.

CBE aims at reducing the number of students who discontinue their education programme due to loss of motivation (Wesselink, 2010). By offering a more challenging and authentic learning environment, a competence-based setting is expected to foster student motivation better than in traditionally teacher-centred education. As the way students perceive teacher interpersonal behaviour is also related to student motivation (den Brok, 2001; Maulana et al., 2011) and CBE requires different roles for teachers and students, teacher interpersonal behaviour theory can provide a useful framework to give insight into how CBE objectives, i.e., student motivation, are fostered in CBE research. Further, studies concerning the connection between CBE and student motivation, which also utilize teacher interpersonal behaviour theory, have not yet been found. Thus, research on teacher interpersonal behaviour in competence-based vocational education will not only contribute to elaborating the knowledge base on teacher interpersonal behaviour in vocational education, but also to the development and successful implementation of competence-based education from the teacher-student interpersonal relationship perspective.

4.2 Theoretical Frameworks

Competence-Based Learning Environments and The Changing Roles of Teachers

Competence-based education (CBE) has become a dominant trend in vocational education and training in several countries due to its expected decrease of problems in the transition from school to work and the expected positive effects on student learning and motivation (Biemans et al., 2004; Wesselink et al., 2007; Biemans et al., 2009). While competence-based education has become a popular development, research on its design is ongoing and its operationalisation in practice (i.e., how it should look like) still remains unclear (Wesselink et al., 2007). Dutch researchers have developed a framework that defines what a competence-based curriculum and the learning environment should look like. The framework is based on literature study and delphy study with educational experts and consists of eight principles describing the essential elements that characterise competence-based Vocational Education and Training in a Dutch context (Wesselink et al., 2007). This framework has been used to investigate educational programmes in the Netherlands (e.g., Wesselink, Dekker, Groens, Biemans, & Mulder, 2010), East Africa (e.g.,

Mulder, Eppink, & Akkermans, 2011) and in Indonesia (e.g., Nederstigt & Mulder, 2011).

Sturing, Biemans, Mulder and de Bruijn (2011) validated this model with teacher practices, which led to a refinement of the framework into ten principles of CBE: (1) The study programme is based on core tasks, working processes and competences (the qualification profile); (2) Complex vocational core problems are central; (3) Learning activities take place in different concrete, meaningful vocational situations; (4) Knowledge, skills and attitudes are integrated in learning and assessment; (5) Students are regularly assessed for various purposes; (6) Students are challenged to reflect on their own learning; (7) The study programme is structured in such a way that the students increasingly self-steer their learning; (8) The study programme is flexible; (9) The guidance is adjusted to the learning needs of the students; (10) In the study programme attention is paid to learning, career and citizenship competences (Sturing et al., 2011). These ten principles provide both insight in what should be taught in CBE (principles 1 – 4) and how this should be done (principles 5 – 10). This framework complies with five levels of CBE implementation from non-competence-based to fully competence-based study programmes. This framework promises to be a useful tool to determine to what extent a learning environment is competence-based, regarding the level of implementation of the CBE principles.

In CBE, teacher roles become more complex (Biemans et al., 2004; Seezink & Poell, 2010; Wesselink, 2010). Besides acting as knowledge transmitters, teachers are encouraged to act as coaches and as sources of information while interacting with students. Teachers are expected to develop authentic learning tasks, for example, by creating classroom situations that resemble workplace/industrial situations. As teacher and student roles in competence-based education differ from the traditional teacher-centred learning, different student perceptions of teacher-student relationships are to be expected in competence-based learning environments compared with those of non competence-based learning environments. The characteristics of the CBE classrooms emphasise student-centred learning more strongly and require more cooperation between teachers and students. Studies show that students in more student-centred learning classrooms describe their teachers' behaviour as more helpful, friendly, understanding and less directive than in teacher-centred learning (Yu & Chen, 2012). Thus, those behaviours are expected to be shown more often in CBE than in the less-CBE schools. This, in turn, can be expected to differentially influence student learning and motivation in CBE as compared to non-CBE contexts. The large body of research on teacher interpersonal behaviour can shed useful information on if and how teacher interpersonal behaviour in CBE differs from non-CBE learning environments, and whether or not this relates to the expected CBE outcomes of improved learning and motivation.

Teacher Interpersonal Behaviour

Teachers use various communication strategies while teaching their students in the classroom. Some teachers might try to be friendly to their students, while others keep more distance. Different strategies used by different teachers create different patterns of relationships between teachers and students. Within educational contexts, researchers conceptualised this teacher-student relationship in terms of teacher interpersonal behaviour. Wubbels, Creton, Brekelmans & Hooymayers (1987) developed an instrument to investigate teacher interpersonal behaviour, the Questionnaire on Teacher Interaction (QTI). The QTI was developed based on a robust theoretical as well as statistical consideration. The underlying theoretical framework is the general interpersonal theory of Leary (1957), often embedded in a systems approach to communication (Watzlawick, Beavin, & Jackson, 1967). Based on Leary's model for interpersonal diagnosis of personality (1957), Creton and Wubbels (1984) developed the Model for Interpersonal Teacher Behaviour (MITB). This model depicts and examines teacher-student relationships in terms of two interpersonal dimensions, namely 'Influence' referring to the degree to which a teacher controls communication in the classroom, and 'Proximity' referring to the degree to which a teacher cooperates with students. These two dimensions make up eight scales, that are originally adopted from the circular structure of Leary's model (Leary, 1957) (see Figure 4.1).

Originally, the QTI was developed for use in the Dutch context (Creton & Wubbels, 1984). After four trial rounds involving statistical analyses, focus group interviews and think-aloud sessions with students and teachers on sample items, the final (original) Dutch version was constructed. The instrument consists of 77 items belonging to one of the eight scales of the Leary model. After the emergence of the Dutch QTI, the 64-items American version of the instrument was constructed, which showed a comparable quality with the original Dutch version (Wubbels & Levy, 1991). The American version has been widely used by international researchers to develop their own countries' versions (see Maulana et al., 2012 for a detailed review). The QTI has been the focus of over 100 learning environment studies and has been translated into over 15 languages (den Brok, 2001; Maulana et al., 2012). The Indonesian version used in this study was also developed based on the American version.

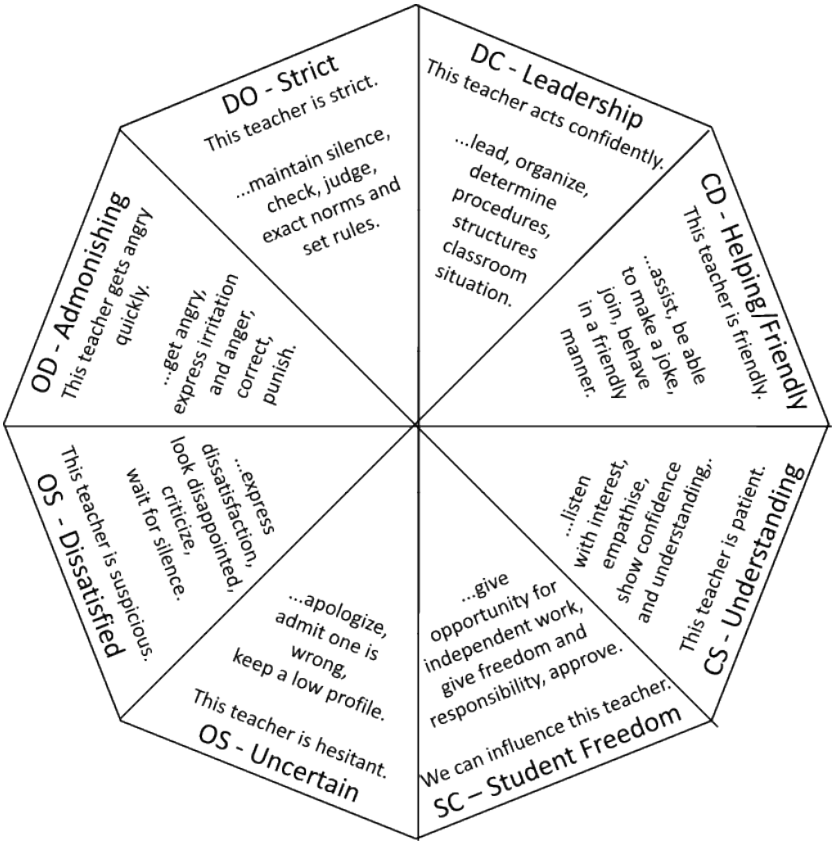


Figure 4.1 The Model for Interpersonal Teacher Behaviour (MITB; Wubbels & Brekelmans, 2005).

Teachers, while interacting with their students, might be viewed exhibiting behaviours as represented in the QTI scales to different degrees. For example, a teacher might be perceived as having a high score in the scale of helpful, low in the strict scale, moderate in the giving students freedom scale, etcetera. In the QTI, the scale scores are reported in a range from zero to one, with 'one' indicating that all behaviours in a scale are always present and 'zero' indicating the absence of scale behaviours (den Brok, Brekelmans, & Wubbels, 2004; Maulana et al., 2011; Wubbels, Creton, Levy, & Hooymayers, 1993). The combinations of the eight-scale scores form a particular communication pattern of a teacher, called a teacher interpersonal profile that is usually depicted in a graph (Wubbels, et al., 1993; Wubbels & Brekelmans, 2005). Brekelmans and colleagues (1993) examined the variety of interaction patterns from the large data set of Dutch secondary teachers and from 94 classes in the United States, and identified eight distinctive interpersonal profiles: Directive, Authoritative, Tolerant/ Authoritative, Tolerant, Uncertain/Tolerant, Uncertain/Aggressive, Repressive and

Drudging (Brekelmans, Levy & Rodriguez, 1993) (see Figure 4.2). The profiles of Directive, Authoritative and Tolerant/Authoritative shared about the same amount of Influence but differ in the amount of Proximity. The Tolerant/Authoritative teacher is considered the most cooperative while the Directive teacher is the least cooperative due to relatively low scores on *helpful/friendly* and *understanding* but high score on *strict*. The Tolerant teacher is about as *helpful/friendly* and *understanding* as the Authoritative teacher, but they differ on the degree of *leadership* and *strictness* (Brekelmans et al., 1993; Maulana et al., 2011).

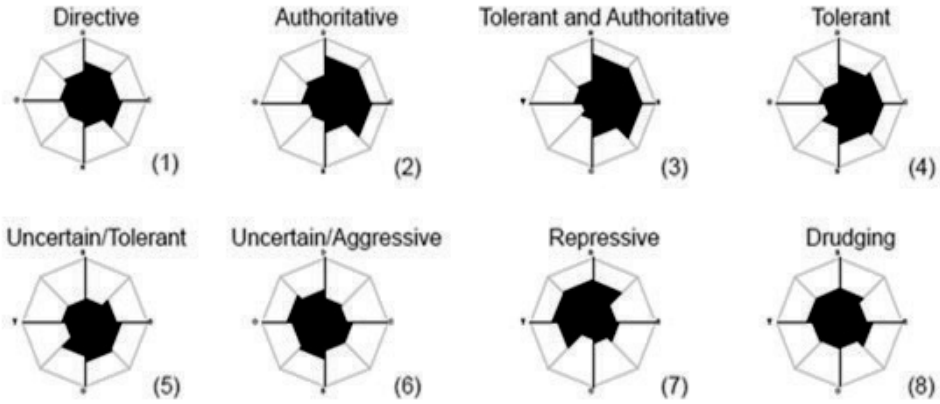


Figure 4.2 Profiles of Teacher Interpersonal Behaviour

Besides appearing in Dutch and American classrooms, the eight profiles were also found in various countries with different frequencies of occurrence. Wei, den Brok, and Zhou (2009) reported the existence of six profiles in Chinese secondary classes, excluding Tolerant and Uncertain/Tolerant, with the Tolerant/Authoritative as the most common profile. Author and colleagues (2011) reported all eight profiles to be found in Indonesian Mathematics and English classes in Junior Secondary Schools with the Directive as the most common profile. The major prevailing profiles of secondary teachers in Australia, Singapore and Brunei were Authoritative, Tolerant/Authoritative and Directive profiles (den Brok, Fisher, Brekelmans, Rickards, Wubbels, Levy, & Waldrip, 2003). In general, the typology of the eight profiles (i.e., the combination of scale scores) is comparatively stable and applicable to various countries. The most common profiles are the Directive, Authoritative, Tolerant and Tolerant/Authoritative profiles (den Brok et al., 2003; Telli et al., 2007; Wei, et al., 2009).

Students' Perceptions of Teacher Interpersonal Behaviour and Learning Motivation

Studies show the way students perceive their teacher's interpersonal behaviour, as assessed using the QTI (Wubbels et al, 1985), is related to students' learning motivation. Brekelmans and Wubbels (1991) reported that when students perceive their teacher as

friendly/helpful, they reported high levels of learning motivation. Van Amelsvoort (1999) elaborated on these findings showing that helpful/friendly and understanding teachers correlated positively with indicators of students' motivation: pleasure, relevance, confidence, and effort. Studies analysing the relationships between the QTI dimensions and student motivation found that proximity and influence dimensions were associated positively with students' enjoyment and interest in science in Turkish science classes (Telli et al., 2007). Maulana and his colleagues (2011) reported that the influence and proximity had moderate correlations with motivational scales in Indonesian Mathematics and English classes. In the Dutch vocational educational system, van Uden and colleagues (2014) stated that when students perceived their teachers as having high scores on the two dimensions, they reported high in learning engagement. Both dimensions positively contributed to students' engagement with proximity proving more important for engagement than influence. In general, effects of proximity are somewhat stronger than effects of influence on student motivation (Wubbels & Brekelmans, 2005).

The connections between teacher interpersonal profiles and student motivation variables were also reported. Brekelmans and colleagues (1993) reported that Directive and Tolerant profiles positively correlate with students' engagement and motivation in the classroom. High motivation had been found in classes of Authoritative, Tolerant/Authoritative and Directive teachers, while low motivation occurred in classes of Drudging and Uncertain/Aggressive Teachers (Telli et al., 2007).

Related to student learning motivation, Vansteenkiste, Simon, Lens, Sheldon and Deci (2004) identified types of motivation: extrinsic, introjected, identified, and intrinsic motivation (Vansteenkiste et al., 2004). In this present study, examining student motivation focuses on intrinsic motivation, as intrinsic motivation is found to have a high association with the dimensions of teacher interpersonal behaviour (Maulana et al., 2012). Intrinsic motivation, in turn, is often found to positively relate to student outcomes (Skinner & Belmont, 1993). Ryan and Deci (2000) defined intrinsic motivation as doing something because it is inherently interesting or enjoyable. They theorised several aspects contributed to intrinsic motivation including *interest*, *perceived competence*, *perceived value,* and *felt pressure* (Deci & Ryan, 2007). Perceived competence and value/usefulness are theorised as positive predictors of intrinsic motivation while pressure and tension are negative predictors of intrinsic motivation. This study examines the association between the two dimensions of teacher interpersonal behaviour, in high competence-based education (HCBE) or LCBE schools and the aspects of student intrinsic motivation as shown in the Ryan and Deci motivation subscales (Ryan & Deci, 2000; Deci & Ryan, 2007).

Research Questions

This study attempts to answer the following questions:

1) *How do students in Indonesian vocational education, in either high*

competence-based (HCBE) or low-competence-based (LCBE) learning environments, perceive their teacher's interpersonal behaviour?

2) *Is the relationship between HCBE, or LCBE, and intrinsic motivation in Indonesian vocational schools moderated by how students perceive their teachers' interpersonal behaviour?*

To our knowledge, studies pertaining to the connection between competence-based education, student intrinsic motivation, and teacher interpersonal behaviour have not been found to date. This study will be the first to explore the connections among those aspects. In exploring this issue, the interpersonal behaviour theory promises a valuable framework for exploring if teachers in HCBE compared to LCBE context indeed display different behaviour as perceived by their students. Moreover, as CBE is theorised to be more motivating, we hypothesise that students in CBE schools will report their intrinsic motivation higher than students in LCBE schools. Lastly, we will explore whether student intrinsic motivation in HCBE compared to LCBE is moderated by the way students perceive teacher interpersonal behaviour.

4.3 Methodology

Participants

Data for this study were gathered from 49 agribusiness classes taught by 87 vocational core-subject teachers from fifteen agricultural vocational schools in the three most populated provinces in Indonesia. The selected school samples were chosen on the basis of being public and accredited providing an agribusiness study programme. Both the research as well as the school samples were approved by the Indonesian Ministry of Education and Culture and based on informed consent of all respondents. The selection of these fifteen schools was taken from previous research identifying the *competentiveness* score (Sturing et al., 2011) of 41 Indonesian agricultural vocational schools by collecting evidences and information from students, teachers and the school principals regarding the ten principles of Competence-Based Education (see Chapter 2). Competentiveness score refers to what extent the CBE principles (e.g., self-directed learning, student-centredness, authentic tasks) existed at schools. Of the fifteen schools, seven schools had a competentiveness score around 2 (categorised as LCBE) and eight schools were around 4 to 5 (categorised as HCBE). Prior to data collection, the first researcher obtained permission from school principals and teachers of selected schools to conduct this study at their schools.

Of these schools, class size varied from 14 to 38 students, with an average of 30 students. A total of 1469 students ranging in age from 14 - 20 years (M = 16.2; SD = 1.02) participated. Of the students, 872 were girls and 597 were boys, 765 were in their first year of vocational education (grade ten), 367 were in the second year, and 337 were in their third year (grade twelve). The participation of the schools was on a voluntary basis, while students got a small gift for their participation.

Instrumentation

All students responded to two questionnaires: the Questionnaire on Teacher Interaction (QTI; Wubbels et al, 1989; Wubbels & Levy, 1991) and the Intrinsic Motivation Inventory (IMI; Decy & Ryan, 2007). The QTI as devised by Wubbels & Levy (1991) contained 64 items on a 5-point Likert scale from (1) never to (5) always. Previous work done by Maulana and colleagues (2012) tested the QTI in the Indonesian context via interviews with teachers and pilot-testing it with Junior Secondary students in Mathematics and English classes. This led to deleting some items as they were not valid or representative in the Indonesian context (e.g., 'It is easy to pick a fight with this teacher'), and adding a few items because some behaviours did not exist in the original context (i.e., the Netherlands) while they were prominent in the Indonesian culture (for example: 'When this teacher comes to the class, we have to stand and greet him'). The final, valid and reliable Indonesian QTI consisted of 57 items (Maulana et al., 2012).

To check the quality of the QTI used for Indonesian vocational (agricultural) education, guidelines of den Brok (2001) and Maulana et al. (2012) are used. First, reliability tests were calculated at the scale level to identify problematic items, after which an exploratory factor analysis was conducted to check the existence of the two QTI dimensions. Problematic items in terms of internal consistency were checked by looking at the average inter-item correlations (Field, 2013). The item '*this teacher closes the door before starting the lesson'* decreased the Cronbach alpha coefficient in the scale of '*strict'*. Furthermore, this item did not match with the particular characteristics of the agricultural classroom as teaching and learning process in this agricultural setting often happened outside for the whole period. Students might have been confused in responding to this item and so it was removed for further analysis. The items '*this teacher worries if students do not do assignments*' and '*this teacher trusts us*' were also problematic in terms of internal consistency and therefore dropped for further analysis. After deleting those three problematic items, the questionnaire used in this study consisted of 54 items.

As suggested in previous works (den Brok, 2001; Maulana et al., 2012), construct validity of the QTI 54 items solution was checked by looking at the presence of the underlying two dimensions on the eight scales. An exploratory factor analysis (EFA) was conducted using the eight scales to examine whether or not the two dimensions (Influence and Proximity) were evident. To see if the eight scales make up the two dimensions, because of the circular relationship between the scales (seen in the teacher profile graphs, see Figure 2), this EFA should lead to two factors with a certain pattern of the scale loadings combined with higher correlation between neigbouring scales and low correlations between scales in the other parts of the circular structure profile. Results from the EFA with varimax rotation corroborated the two dimensions. The EFA identifies two factors (*eigenvalues* larger than 1.0) that explained 57% of the variance, which is acceptable in human sciences (Stevens, 2002), and both the scale loading patterns and the correlations patterns resemble to earlier studies on the QTI. The EFA results were

largely in agreement with results reported by a previous study in the Indonesian context (Maulana et al., 2012). To graphically map teachers in a teacher profile, the mean scores of the scales were used (see also Wubbels et al., 1993). For this reason, the Cronbach's alpha of the scales were checked. These were satisfactory (Field, 2013) ranging from 0.60 to 0.80. Table 4.1 displays those values as well as a worded example of an item representative of each scale. Thus, as the quality checks of the QTI resemble the results of other studies, the Indonesian QTI for this present study provided a reliable and valid instrument for an Indonesian vocational school context.

Table 4.1 *The QTI Scales, Example of Items and Reliability (Cronbach's Alpha)*

Scale name	Example of Items	Cronbach's Alpha
DC - Leadership	This teacher acts confidently.	0.73
CD - Helpful/friendly	This teacher is friendly.	0.75
CS - Understanding	This teacher is patient.	0.78
SC - Student Freedom	We can influence this teacher.	0.61
SO - Uncertain	This teacher is hesitant.	0.60
OS - Dissatisfied	This teacher is suspicious.	0.74
OD - Admonishing	This teacher gets angry quickly.	0.80
DO - Strict	This teacher is strict.	0.61

The second questionnaire used in this study was the Intrinsic Motivation Inventory (IMI) by Deci and Ryan (2007). The IMI assessed students' self-ratings of their *interest/enjoyment, perceived competence, felt pressure/tension,* and *perceived value/usefulness* of a subject taught by their teacher. First, the original 25 items on a 7-point Likert scale rating from (1) not all true to (7) very true were translated into Indonesian and back-translated into English by the first author and three teachers of English as a Foreign Language. The instrument was pilot-tested by thirty-two vocational students to check its readability. After some corrections, the Indonesian IMI was administrated for data collection to the sample as described earlier. Results from exploratory factor analysis of the 25 items showed the five factors (*eigenvalues* larger than 1.0) with the four factors matching with the IMI subscales. Two items formed a new undefined factor and one item that originally belonged to subscale *perceived competence* deviated to subscale *felt pressure/tension*. Those three problematic items were removed for further analysis (Field, 2013). Finally, the 22 items measuring four intrinsic motivation subscales were used. The Cronbach alpha coefficients of the subscales ranged from 0.65 (*felt pressured/tension*) to 0.86 (*perceived value/usefulness*) (see Table 4.2).

Table 4.2 *IMI Scale, Sample Item, and Reliability (Cronbach's Alpha)*

Scale	Example of Items	Cronbach's Alpha
Interest/enjoyment	I enjoyed the subject taught by this teacher very much.	0.80
Perceived Competence	I think I am pretty good at this subject.	0.77
Felt pressure/tension	I felt pressured into taking this subject.	0.65
Value/Usefulness	I think taking this subject is useful for my future career.	0.86

The surveys were administrated in the middle of the first semester to ascertain that students and teachers had time to get to know each other. During the data collection, teachers were not present in the classroom, to minimise bias responses. Students were also informed that their teachers would not read student responses individually.

Data Analysis

To obtain the profiles of teacher interpersonal behaviour, we firstly computed the mean scores and their standard deviations of the eight QTI scales, and continued with calculating the two dimensions scores[1]. The scale scores were then transformed into a value between 0 and 1 representing the range of the scale (den Brok et al., 2004; Maulana et al., 2011; Wubbels, et al., 1993). Next, the transformed scale scores were presented in graphical profiles. The graphical profiles then were compared to which profiles they were nearest to, using the clustering profiles based on Brekelmans' typology (Brekelmans et al., 1993; den Brok, Wubbels, Veldman, & Tartwijk, 2010).

A MANOVA test in SPSS 19 for Windows was performed to examine whether there were differences in the two different learning environments (HCBE and LCBE) by comparing the dimension scores from the two groups. For the MANOVA test, the two QTI dimension scores were the dependent variables and CBE (HCBE schools was coded as 1; LCBE was coded as 0) was the independent variable.

To answer the second research question, teacher-student relationships were analysed on the basis of dimension scores. Using Pillai's trace criterion for its robustness (Field, 2013), a MANOVA test investigated whether students' ratings on the four motivation subscales of IMI differed in CBE compared to less-CBE schools. Follow-up univariate ANOVAs examined which motivation subscales were different between the two groups. Then a MANCOVA test was conducted to see whether the two QTI dimension scores were related to the four motivation subscales and if this effect was moderated by a HCBE versus a LCBE context. In the MANCOVA test, the motivation subscales were used as the dependent variables, CBE as the fix factor and the QTI dimensions (i.e., Proximity and Influence) as the covariates. Follow up analyses further investigated whether the correlations between motivation subscales and QTI dimensions differed in

HCBE and LCBE schools using a Fisher's z transformation (Field, 2013). This compared the correlation coefficients of the motivation subscales and the dimension scores in HCBE and LCBE schools.

4.4 Results

This section first presents the statistics of the scale and the dimension scores. Next, the profiles of teacher interpersonal behaviour in competence-based and less-competence-based learning environments are presented. The MANOVA and MANCOVA results provide insights into the associations between teacher interpersonal behaviour, which focused on the two-dimension scores, and students' learning motivation.

Teacher Interpersonal Behaviour in Indonesian Agricultural Vocational Schools

The first research question of this paper dealt with how students from HCBE and LCBE learning environments perceive their teachers' interpersonal behaviour, and whether or not the perceptions differ between those two learning environments. Table 4.3 presented dimension scores in HCBE and LCBE classes.

Table 4.3 The QTI dimension score and standard deviation in HCBE and LCBE schools

Dimension	HCBE		LCBE		F	Sig.
	M	SD	M	SD		
Influence	0.88	0.36	0.76	0.37	68.79	0.00
Proximity	0.84	0.61	0.81	0.69	1.74	0.19

Note: Dimension score ranges between -3 and +3. Score 0 represents equal amounts of dominance and submissiveness (for influence), cooperation and opposition (for proximity). Range of the dimension scores are: 0 - 0.5 (moderately positive), 0.5 - 1.00 (positive) and above 1 (very positive) (den Brok, Brekelmans & Wubbels, 2004).

The dimension scores of Influence indicated the amounts of perceived dominance, while Proximity indicated the amounts of perceived cooperativeness. Based on the results presented in Table 4.3, the Influence scores (HCBE: $M = 0.88$, $SD = 0.36$; LCBE: $M = 0.76$, $SD = 0.37$) were in the range of 0.5 – 1.0 showing that students both in CBE and less-CBE schools perceived their teachers as dominant. The proximity scores (HCBE: $M = 0.84$, $SD = 0.61$; LCBE: $M = 0.81$, $SD = 0.69$) also in the range of 0.5 – 1.0 showing that students perceived their teachers as cooperative both in HCBE and LCBE schools.

Figure 4.3 shows that the patterns of teacher interpersonal behaviour in HCBE and LCBE learning environments were quite similar, and roughly nearest to the profile of tolerant/authoritative in the Brekelmans's typology (Brekelman et al., 1993; den Brok, Taconis, & Fisher, 2010).

MANOVA results indicated a significant difference at dimension level. The score for the influence dimension (i.e., the degree of teachers' dominance) was significantly different in CBE and less-CBE schools, $F(1, 2983) = 68.79$, $p = 0.00$. Students from HCBE

learning environments perceived their teachers as more dominant than students from LCBE schools. There was no significant difference for the proximity dimension, $F(1, 2983) = 1.74$, $p = 0.19$, showing that students both in HCBE and LCBE schools perceived their teachers as having the same degree of cooperativeness.

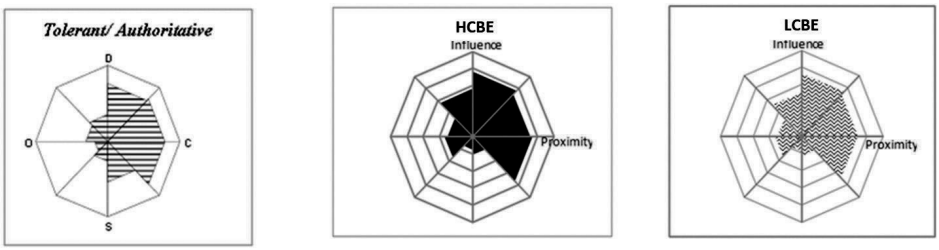


Figure 4.3 The teacher profiles in HCBE and LCBE schools

Association between Student Perception of Teacher Interpersonal Behaviour and Student Intrinsic Motivation in HCBE And LCBE Learning Environments

The second research questions dealt with the associations between teacher interpersonal behaviour and students' intrinsic motivation, as assessed using the four subscales in the IMI, in HCBE and LCBE learning environments. First, a MANOVA examined the difference in IMI scores in HCBE versus LCBE contexts. Using Pillai's trace criterion (Field, 2013), competence-based education had a significant effect on students' intrinsic motivation, $V = 0.01$, $F(4, 2977) = 11.49$, $p = 0.00$, indicating that at least one of the four IMI subscales differed in CBE and less-CBE schools. Follow up *univariate* tests (see Table 4.4) showed that students from CBE schools scored significantly higher on the subscales interest/enjoyment, $F(1, 2983) = 16.931$, $p = 0.00$, perceived values/usefulness, $F(1, 2983) = 30.28$, $p = 0.00$, and significantly lower on the subscale felt pressure, $F(1, 2983) = 4.54$, $p = 0.03$ compared to students in less-CBE schools. There was no significant difference for the subscale of perceived competence $F(1, 2983) = 0.86$, $p = 0.35$.

Table 4.4 The Mean Score and Standard Deviation of IMI Subscales in HCBE and LCBE Schools

IMI Subscale	HCBE		LCBE		F	Sig.
	M	SD	M	SD		
Interest/enjoyment	5.43	0.99	5.26	1.16	16.93	0.00
Perceived competence	4.69	0.97	4.66	1.06	0.86	0.35
Felt Pressure/tension	3.01	1.31	2.90	1.27	4.54	0.03
Value/Usefulness	6.31	0.79	6.13	0.92	30.28	0.00

Note: (1) not at all true – (7) very true

MANCOVA tests showed a significant interaction effect of learning environment and perceived teacher interpersonal behaviour on the four intrinsic motivation subscales, $V = 0.08$, $F(4, 2971) = 6.15$, $p = 0.00$. Table 4.5 showed the effect of the three-way interaction

of CBE x influence x proximity was significant for the subscales interest/enjoyment (p = 0.00), perceived competence (p = 0.05) and perceived value/usefulness (p = 0.00) and not significant for the subscale felt pressure (p = 0.98). The main effect of CBE remained only significant for the subscale of perceived value/usefulness (p = 0.00), while the main effect of proximity and influence was significant for all of the four subscales. These results indicated that students' higher scores on the intrinsic motivation subscales in CBE contexts were due to the interaction between the learning environment and students' perceived proximity and influence of their teacher. Thus, the association between competence-based education and students' intrinsic motivation was moderated by how students perceived their teachers' interpersonal behaviour.

Follow up analyses gave more insight into where the differences in the MANCOVA test actually come from. The results displayed in Table 4.6 confirmed the associations between student intrinsic motivation and teacher interpersonal behaviour dimensions with the Fisher's z tests showing that correlations between both QTI dimensions on the one hand, and the four IMI subscales on the other hand, differ in HCBE and LCBE learning environments. All four intrinsic motivation subscales correlated significantly with proximity, but these correlations differed significantly between HCBE and LCBE schools for interest/enjoyment, z = -6.67, p = 0.00, perceived competence, z = -3.04, p = 0.00, and perceived value/usefulness, z = -1.99, p = 0.04. In all these cases, the correlations were stronger in the LCBE than in the HCBE contexts. Felt pressure correlated negatively with proximity in HCBE and LCBE context, but this correlation did not significantly differ between the two learning environments, z = 1.99, p = 0.23. Three motivation subscales correlated significantly and positively with the influence dimension (see Table 4.6). These correlations were stronger in the LCBE context for the motivation subscales interest/enjoyment, z = -5.08, p = 0.00, and perceived competence, z = -3.08, p = 0.00.

In short, students in a competence-based education context showed higher intrinsic motivation, however, the effect of a HCBE or LCBE learning environment on student intrinsic motivation was moderated by how students perceived their teachers. Proximity moderated the effects of HCBE and LCBE for three intrinsic motivation subscales, compared to two subscales for influence. Moreover, this effect was stronger in a LCBE context. This suggested that students' intrinsic motivation was more closely associated to proximity than to influence and the associations were stronger in LCBE than in HCBE learning environments.

Table 4.5 Interaction Effects of CBE and QTI Dimensions on the IMI Subscales

Variable	Intrinsic Motivation Subscales											
	Interest/ enjoyment			Perceived competence			Felt Pressure/ tension			Value/ Usefulness		
	B	SE	Sig.	B	SE	Sig.	B	SE	Sig.	B	SE	Sig.
Intercept	3.95	0.07	0.00	4.01	0.09	0.00	3.39	0.11	0.00	5.14	0.07	0.00
CBE	-0.07	0.10	0.44	0.01	0.11	0.91	-0.12	0.14	0.38	0.27	0.09	0.00
Influence	0.88	0.08	0.00	0.40	0.90	0.00	0.43	0.11	0.00	0.98	0.07	0.00
Proximity	1.07	0.07	0.00	0.58	0.08	0.00	-0.48	0.10	0.00	0.83	0.07	0.00
CBE x Influence	-0.14	0.11	0.21	-0.16	0.13	0.21	0.04	0.16	0.82	-0.41	0.10	0.00
CBE x Proximity	-0.04	0.09	0.63	-0.18	0.11	0.09	0.00	0.13	0.99	-0.37	0.08	0.00
Influence x Proximity	-0.27	0.08	0.00	-0.21	0.09	0.02	-0.47	0.11	0.00	-0.48	0.07	0.00
CBE x Influence x Proximity	0.26	0.10	0.01	0.40	0.12	0.00	-0.00	0.15	0.99	0.42	0.09	0.00

Table 4.6 Associations of QTI Dimensions and IMI Subscales: Correlation Coefficient, Fisher's z and p-value

Dimension		Intrinsic Motivation Subscales											
		Interest/ enjoyment			Perceived competence			Feel Pressure/ tension			Value/ Usefulness		
		r	z	Sig.	*r*	z	Sig.	*r*	z	Sig.	*r*	z	Sig.
Influence	HCBE	0.24**	-5.08	0.00	0.09**	-3.08	0.00	0.02	-	-	0.28**	-0.82	0.41
	LCBE	0.42**			0.21**			-0.04			0.31**		
Proximity	HCBE	0.51**	-6.67	0.00	0.25**	-3.04	0.00	-0.42**	1.19	0.23	0.31**	-1.99	0.04
	LCBE	0.68**			0.36**			-0.38**			0.38**		

**. Correlation is significant at the 0.01 level (2-tailed).

4.5 Conclusions and Discussion

Competence-based education (CBE) is expected to raise student motivation (Wesselink, 2010) by providing a more challenging, authentic learning and student-centred learning environment (Bruijn & Leeman, 2011; de Bruijn, 2012; Wesselink et al, 2010). CBE requires different roles for students and teachers, also reflected in CBE design principles (Sturing et al., 2011; Wesselink et al., 2007), compared to more traditional learning environments that mainly focus on knowledge transfer from teacher to student. Different patterns of how students perceive their teachers' interpersonal behaviour in HCBE classrooms compared to LCBE classrooms can be expected and related to increasing students' intrinsic motivation. However, empirical evidence for

these expectations is lacking hitherto. This present study attempts to contribute to our understanding of how students from HCBE and LCBE learning environments perceive their teachers' interpersonal behaviour in Indonesian agricultural vocational schools and if these perceptions moderate the connection between competence-based education and students' intrinsic motivation.

This study has several important findings regarding CBE theory and practice, specifically in the roles of teachers in the Indonesian context. Indonesian vocational agricultural students report the tolerant/authoritative teacher as the most common profile of interpersonal behaviour, both in HCBE and LCBE learning environments. The proximity and influence dimension scores indicated that teachers were perceived as similarly cooperative and dominant. This finding is comparable to previous researches in the Indonesian junior secondary schools context (e.g., Maulana et al., 2012), and other Asian countries (e.g., Walberg, Singh, & Rasher, 1977; Wei et al., 2009).

Regarding the QTI dimensions, the finding showed a difference between the HCBE and LCBE context. With respect to the influence dimension, students in HCBE perceived their teachers as more dominant than students in LCBE. While this finding was somewhat unexpected, when looking at the CBE principles as defined in the Netherlands (Sturing et al., 2011; Wesselink et al., 2007), this was probably because teacher dominant behaviour is more valued in the Indonesian context than in the more western countries that implemented CBE (Author et al., 2007) and the more teacher dominance is believed to lead to better student learning engagement in Indonesia (Maulana et al., 2011). While competence-based education principles argue for more sharing of responsibility between teachers and students in students' learning, this finding is likely to challenge the CBE theory in the Indonesian context.

While some significant differences were found between perceived teacher behaviour in HCBE versus LCBE schools, the teacher profiles overall were comparable. This suggests that, even though competence-based education theory (Sturing et al., 2011; Wesselink et al., 2007) stresses drastic changes in students and teacher roles, and therefore in teacher-student interaction, in CBE compared to traditional education, these drastic changes had not (yet) been seen in the Indonesian context. Or, they were at least not perceived by the vocational education students. This finding can be explained in two ways. CBE probably means something different in the Indonesian context than in the original Dutch context. CBE in Indonesia is more 'initiative from above' (Utomo, 2005; p. 116) meaning that changes in teacher roles were more likely depending on whether or not the regulation gave emphasis on those required changes. It might also be because teachers are simply not (yet) equipped with the behavioural repertoire that belongs to competence-based education (see also De Bruijn & Leemans, 2011). CBE principles might say that "teachers should be more of a coach in the student learning process", this does not mean that teachers understand and are able to actually perform this role. Previous research in the Western countries also shows that implementing the CBE principles in concrete education practice is no sinecure (de Bruijn & Leeman, 2011; Gulikers, Biemans,

Wesselink, & van de Wel, 2013; Khaled, Gulikers, Biemans, & Mulder, 2014; Wesselink, 2010). Thus, future research and theory on CBE should pay more attention to how teacher roles and interpersonal behaviour should be concretely operationalised in a competence-based classroom.

Moreover, this study supports earlier findings showing that students' perceptions of teacher behaviour are important intermediating variables between teaching or learning environment characteristics and students' learning outcomes (den Broks, 2001; Khaled et al., 2014). This present study demonstrates that teacher interpersonal behaviour plays an important role in moderating the effect of a learning environment, either high competence-based or low competence based, on students' intrinsic motivation. However, this moderating influence was stronger in the less-CBE context, suggesting that a competence-based learning environment might, as expected, be a more powerful learning environment in itself in stimulating student motivation. However, also in a CBE context, teachers and researchers should be aware of the influential role of teachers and their actual implementation of CBE behaviour in moderating the impact of a learning environment on student outcomes. Therefore, a strong theoretical foundation alone is not enough, as its effect strongly depends on how it is implemented and perceived (e.g., de Bruijn & Leeman, 2011; Gulikers et al., 2013).

This study was subject to limitations. This study mainly focused on investigating teaching from one perspective: an interpersonal quantitative perspective. Future research using different perspectives and/or combined with qualitative data will likely add to our understanding of effective teacher behaviour and its role in competence-based education. A subject-content perspective (Brekelmans et al., 2000; den Brok, 2007), for example, might be used to investigate the content of words used in teachers' instructions in classrooms and its effect on enhancing students' learning motivation. Future research should also consider students' preferred teacher interpersonal behaviour in competence-based education. Students might have preferences for a particular teacher's teaching behaviour (e.g., Brekelmans et al., 2000; van Oord & den Brok, 2004) and students who were taught by their preferred teachers will likely to be more motivated than students taught by teachers showing behaviour they did not prefer (Yu & Chen, 2012). A further limitation, the Cronbach alpha coefficients for some of the eight QTI scales were least satisfactorily indicating they might not measure that scales all that well. Therefore, any associations having to do with that scale should be viewed cautiously and future research need to take this carefully into account to get more reliable findings.

Scientifically, this study examines the extent to which CBE theory and principles designed in a western context transfer to an Indonesian context. Moreover, it adds to the knowledge base on the importance of interpersonal behaviour in relation to students' learning motivation, confirming the previous studies conducted in other learning environments and educational levels. It adds empirical evidence for these relationships in a vocational agricultural context, which has not been the object of a study before.

At a more practical level, this study offers insights for teachers, programme developers and policy makers. It offers food for thought for Indonesian policy makers regarding vocational education and the transition towards competence-based education (Power & Cohen, 2005; Raihani, 2007). When designing professional development activities for vocational teachers, policy makers and programme developers should consider how to improve teachers' abilities to elaborate the roles of the teacher from mainly being a content expert to also being a coach and facilitator of student learning, stimulating students' self-directedness. Teachers should become aware of their interaction with students and how much students can gain from the interaction in terms of motivation and competence development.

As the Indonesian government has recently been focusing on re-establishing the competence-based approach for its latest curriculum reformation (Nuh, 2013), studies on competence-based education that also examine aspects for successful implementation are of great importance and relevance in the current Indonesian context. Countries which are also working on an educational innovation can learn from this study to pay more attention to what type of perceived teacher behaviours are required for supporting the successful implementation of such educational innovations.

Chapter 5
Exploring Connections Between Teacher Interpersonal Behaviour, Student Motivation, and Competency Level

Abstract

Studies that examine connections between teacher behaviour and student outcomes are numerous, but those specifically addressing such connections in a competence-based vocational education and training setting are limited. This paper examines the connections among two dimensions of teacher interpersonal behaviour (proximity and influence) and student competency levels, and how these connections might be mediated by students' intrinsic motivation from a sample of Indonesian students. Additionally, it examines if these relationships differ in learning environments which have high to low characteristics of competence-based education (HCBE vs LCBE). Three questionnaires filled in by 506 first-year students were analysed using Multigroups Structural Equation Modelling. Teacher cooperative behaviour affects student motivation positively, and the influence is stronger in LCBE learning environments. Teacher controlling behaviour lowers student perceived competency levels, and the resulting deteriorating effect is stronger in HCBE learning environments. Implications of the findings for teaching and learning in vocational education then are discussed.

This chapter is based on Misbah, Z., Gulikers, J., Widhiarso, W. & Mulder, M. (under review). Exploring Connections Between Teacher Interpersonal Behaviour, Student Motivation, and Competency Level. *Manuscript submitted for publication*.

5.1 Introduction

Over the past decades, numerous studies have been conducted to examine connections between teacher behaviour and student outcomes. These studies focus on cognitive outcome for a specific subject such as mathematics (den Brok, 2004; Goh & Fraser, 1998; Lapointe, Legault, & Batiste, 2005; Maulana, Opdenakker, den Brok, & Bosker, 2012; Rawnsley, 1997); physics (Brekelmans, 1989); English as a foreign language (Wei, den Brok, & Zhou, 2009; Maulana et al., 2012); or, on attitudinal outcomes such as attitude toward science, academic efficacy, and feeling confidence (den Brok, Fisher, & Koul, 2005; Fisher & Rickards, 1998; Gupta & Fisher, 2011; Kim, Fisher, & Fraser, 2000; Martin & Rimm-Kaufman, 2015; van Petegem, Aelterman, van Keer & Rosseel, 2008). The studies concluded positive and negative relations between certain types of teacher behaviour and student outcomes. While a strong theoretical foundation as well as empirical evidence exists for relations between teacher behaviour and student outcomes, studies that connect teacher behaviour and student outcomes in competence-based vocational education, i.e., student competence development, is rarely found. Equipping students with necessary competencies for future jobs is important, as this is in line with the goals of vocational education which are around preparing students for more successfully entering the market place. This study questions if and what kind of teacher behaviour facilitates students' competence development.

Competence-based education is an educational philosophy comprising methods and strategies which stress the importance of teaching and learning integrated knowledge, skills, and attitudes around core professional tasks. CBE is comparable to student-centered educational innovation in primary and secondary education that focuses on students' learning needs, their interests and ambitions, as well as their background, serving as starting points for the teaching process, instructional development and curriculum design, and self-regulated learning. CBE has a strong position in vocational education and training (VET) setting (Kouwenhoven, 2005). Comparable terms for VET are Technical-Vocational Education and Training (TVET), Workforce Education, and the like. VET is offered at various levels and for all sectors of the economy, such as technology, health care, administration, and agriculture. It is at levels 4 to 7 of the European Qualifications Framework.

Competence-based education in VET (CBVET) aims to equip people with knowledge, know-how, skills and/or competences required in particular occupations or more broadly on the labour market. CBVET implies that the role of teachers and students changes resulting in different student-teacher interactions. In CBVET, traditionally role of a teacher as a knowledge transmitter is no longer sufficient. Teachers are expected to act more as coaches than as instructors. Teachers use less direct instruction by explaining theory and presenting solutions of problems (explanatory mode) and more authentic assignments, group work, and assessment for learning and feedback. This shift in the teacher's role stimulates active learning. Their role evolves from sage on the stage to guide by the side. The teacher is giving more student support, based on the needs of the

students. As currently the VET all over the world is changing towards competence-based, or outcome-based (Young, 2009) education (Billett, 2001; Wiegel, Mulder, & Collins, 2007), studying teacher-student interactions and resulting relationships with student competencies then becomes a highly relevant exercise for examining effectiveness of evidence-based or competence-based VET (Lassnigg, 2017; Slavin, 2008).

CBVET aims at better preparing students for their future jobs and reducing the number of school drop-outs before graduation resulting from of a lack of motivation (Wesselink, 2010). CBVET fosters student motivation by making education more authentic and representative of students' future jobs (Gulikers, Bastiaens, & Kirschner, 2004). In educational psychology literature, student motivation is one of the most important variables contributing to learning (e.g., Brophy, 1986; Deci & Ryan, 2007) and student outcomes (e.g., Chen, 2001; Wijnia, Loyens, & Derous, 2011). Since teacher behaviour research has shown connections between the way students perceive their teacher, their motivation (Maulana, Opdenakker, den Brok, & Bosker, 2011; Opdenakker, Maulana, & den Brok, 2011), and their learning outcomes (den Brok, 2004), motivation should be taken into account when examining the relationship between teacher interpersonal behaviour and student competency levels, when considering the context of education that is more or less moving towards competence-based education models.

The context of our study is in the Indonesian VET that is designed to shift towards more competence-based education (MoNE, 2003; Raihani, 2007). As indicated above, CBVET is characterised by a series of principles (Sturing, Biemans, Mulder, & de Bruijn, 2011; Wesselink, Biemans, van den Elsen, & Mulder, 2007), many of which have been studied (Mulder, 2016). One of the CBVET characteristics is that the role of teacher is changing toward more of a coaching role (Sturing et al., 2011; Wesselink et al., 2007). Research into the role of teachers in CBVET has been studied, but to a limited amount only, and is more focused on modelling and measuring teacher competence (Gulikers & Mulder, 2013; Mulder, 2017). The extent to which VET schools have adopted CBE principles (Sturing et al., 2011) varies (Misbah, Gulikers, Maulana, & Mulder, 2015). It is, however, important to assess whether teachers in CBVET are assuming their new role and are demonstrating interactive behaviours, which augments competence development, in support of successful implementation of CBVET.

This present study examines connections between teacher behaviour and student perceived competency levels, and examines whether student intrinsic motivation mediates these connections. Teacher behaviour is often studied by using the teacher interpersonal behaviour theory (Wubbels et al., 1985; Wubbels & Brekelmans, 2006) that is also used in this present study. Additionally, this study compares these relationships in VET schools that have already adopted competence-based education principles (HCBE) versus schools that remain characterised as being low in characteristics of competence-based education (LCBE schools) (see Misbah et al., 2015, 2018; Sturing et al., 2011). Differences might be expected as CBE (as compared to non-CBE) aims toward stimulating competence development and motivation, and entails, among other characteristics,

different teacher and student roles (e.g., Sturing et al., 2011; Wesselink et al., 2007), and thus contrasting in kinds of teacher-student interactions. Results of this study can give insights into effective teacher behaviour for fostering students' competence development. This study contributes to the body of knowledge on teacher interpersonal behaviour theory for facilitating different student outcomes, and challenges the emerging discussions around motivational effects of teaching and learning in vocational education (Billett, 2003; Stroet, Opdenakker, & Minnaert, 2015; Wesselink, Biemans, Gulikers, & Mulder, 2017). In the next sections, this paper elaborates on the theoretical connections between the studied variables, followed by specific hypotheses, and a proposed model of the connections among those variables.

5.2 Theoretical Framework

Research on Teacher Interpersonal Behaviour and Student Outcome

Researchers investigate connections between teacher behaviour and student outcomes to seek information for improving teaching and learning in a classroom context (e.g., Brophy & Good, 1984; Brophy, 1986; den Brok, Brekelmans, & Wubbels, 2004a; Kyriakides, Creemers, & Antoniou, 2009; Skinner, 2006). Some studies use teacher interpersonal behaviour perspective (Wubbels et al., 1985; Wubbels & Brekelmans, 2006) for examining teacher behaviour in various subjects, across different levels of education, and with locations in various countries. This perspective examines how teachers behave and interact with their students in a classroom using the Model of Interpersonal Teacher Behaviour (MITB). The MITB maps teacher behaviour on two dimensions namely 'proximity' and 'influence'. Proximity refers to the degree of teachers' cooperative/friendly behaviour to students, while influence represents the degree of teachers' control/dominance shown to students (Maulana et al., 2012; Wubbels et al., 1989).

The teacher interpersonal behaviour component contributes to explaining the connections between teacher behaviour and student outcome. For example, den Brok, Brekelmans, and Wubbels (2004) reviewed the association between perceptions of influence and proximity on student outcome showing that teachers' proximity and influence affect students' cognitive as well as attitudinal outcomes. Brekelmans and colleagues (2002) found out that the influence dimension has a positive association with student outcomes on a physics test, the more students perceived their teachers as controlling, the higher students scored on physics tests. Other studies showed that the proximity dimension consistently influences students' attitudinal outcomes such as pleasure, confidence, and students' efforts in mastering subjects. For example, Telli and her colleagues (2007) show, using regression analysis, that proximity is significantly related to students' greater enjoyment and interest in science in Turkish science classes. In the Dutch education setting, den Brok and colleagues (2004) show, using structural equation modelling, that better contact and more closeness between teachers and students (that is, higher scores on proximity) result in higher student motivation. A study

in India show that both influence and proximity dimensions are positively related with attitudinal outcomes for secondary education (den Brok, Fisher, & Koul, 2005). In line with this, Fisher and Rickards (1998) state that cooperative and somewhat dominant teacher behaviour contributes to a favourable student attitude in Mathematics classes in Australia. Maulana and colleagues (2011) assert that in Indonesian high schools, influence and proximity correlate positively with student motivation. In addition, van Uden, Ritzen and Pieters (2014) state that when students in the Dutch vocational schools perceive their teachers as having high scores on the two dimensions, they report a higher learning engagement. Both proximity and influence positively contribute to students' engagement, with proximity proving more important for engagement than influence. In short, many studies show or suggest existing connections between teacher behaviour and student learning outcomes. A higher score on both the influence and proximity dimension is found to be more or less connected to a range of cognitive or attitudinal learning outcomes.

These kinds of relationships between teacher interpersonal behaviour and student outcomes identified in CBVET have not yet been studied. CBVET aims at different student outcomes namely competency, instead of mainly knowledge development. Competency is '... an element and characteristic of competence' (Mulder, 2017, p.14) or '... a part of generic competence; it is a coherent cluster of knowledge, skills and attitudes which can be utilised in real performance contexts' (Mulder, 2014, p.111). Competence is defined as 'the state of being able, or the generic capability which is a necessary requirement to perform; the set of characteristics which enable performance' (Mulder & Winterton, 2017, p.14). Professional competence is defined as '...the generic, integrated and internalised capability to deliver sustainable effective (worthy) performance (including problem solving, realising innovation, and creating transformation) in a certain professional domain, job, role, organisational context, and task situation' (Mulder, 2014, p.111). As such, competence includes not only functional and behavioural requirements for functioning in a profession, but also more complex cognitive abilities and social abilities to function as a person (Le Deist & Winterton, 2005). While some studies discuss competency level as a student outcome for vocational education (e.g. Khaleed et al., 2014; Kyndt et al., 2016), specific connection of this outcome to teacher behaviour is seldom found. Thus, the connections between teacher behaviour and student competency level is not yet clear.

Next to aiming at new learning outcomes, CBVET aims to stimulate various kinds of teacher and student roles (e.g., Sturing et al., 2010) that will result in more successful student-teacher interactions. In CBVET, students are expected to become more active, autonomous, and self-directive, while teachers are expected to take more of a coaching role in student learning as opposed to the role of an expert conveying knowledge to students. In this context, teacher interpersonal behaviour might vary more in form or effectiveness than in more traditional types of education which have mostly been the focus or context of current teacher interpersonal behaviour research.

Research in the teacher interpersonal behaviour area also shows that the connection between teacher behaviour and student outcome is not always straight forward. In some studies, 'unwanted' teacher behaviour like dissatisfied and admonishing behaviour is related to lower performance, whereas preferred teacher behaviour such as friendly and understanding approaches are related to higher performance (den Brok, Brekelmans, & Wubbels, 2004; Rawnsley, 1997). In other studies, the relation between proximity and cognitive outcomes is not linear, but curvilinear (i.e., lower perceptions of proximity go with low outcomes, but intermediate and higher values with higher performance until a certain ceiling of optimal proximity has been reached (den Brok, 2001; den Brok et al., 2004). Thus, it is likely that there are some mediating variables involved. This study examines the mediating role of intrinsic motivation.

Learning Motivation

Skinner and Belmont (1993) stated that identifying motivated students in a classroom might be easy but fostering student motivation might not be. Reeve, Bolt, and Cai (1999) asserted that a student's motivation, at least in part, depends on the quality of a teacher's interpersonal motivational style. Additionally, teacher interpersonal behaviour research shows links between perceived teacher behaviour and student motivation (e.g., den Brok et al., 2004). Motivation to learn, in turn, has a significant contribution to student learning and outcome (Brophy, 1987). Motivated students tend to have better outcomes (Cho, Weinstein, & Wicker, 2011). Also in CBVET studies, student motivation is an important variable. The idea is that CBVET is more motivating for students than traditional types of education, as it has a focus on the relevance of what they are learning for their future world of work (e.g., Biemans et al., 2004). Several studies show that the relationship between teacher behaviour and student outcome is mediated by learning activities and motivation (e.g., Ahmed, Minnaert, van de Werf, & Kuyper, 2010; Shuell, 1996). This study examines motivation as a mediator for the connections between teacher interpersonal behaviour and student competency levels, particularly in a CBVET learning environment context.

To operationalise student learning motivation, this study utilises the idea of Ryan and Deci (2000), in which they distinguish between intrinsic and extrinsic types of motivation. They define intrinsic motivation as doing something because it is inherently interesting or enjoyable, while extrinsic motivation refers to doing something because it leads to a separable outcome (Ryan & Deci, 2000; p.55). This current study examines motivation in terms of student intrinsic motivation since intrinsic motivation is found to have a higher significant association with the two dimensions of teacher interpersonal behaviour than extrinsic motivation (Maulana et al., 2012) and is a more consistent predictor of student achievement across different school contexts and across different cultures (Taylor, Jungert, Koestner et al., 2014). Furthermore, intrinsically motivated students are consistently found to positively relate to student outcomes (Skinner & Belmont, 1993).

Research Questions

CBVET strives for different learning outcomes (i.e., competencies relevant for the labour market). Moreover, a CBVET learning environment is designed to be more motivating and representative of the future world of work, and aims at developing more self-steering and lifelong learners. These three core ideas behind CBVET require different roles for students and teachers that are likely to result in different students-teacher interactions. The teacher interpersonal behaviour perspective promises a useful handle to investigate effective teacher behaviour for fostering student competencies and motivation, certainly in a competence-based vocational education setting. While the existing teacher interpersonal behaviour studies cannot directly be transferred to the CBVET context, teacher interpersonal behaviour in relation to new learning outcomes (i.e., competencies) deserves explicit attention in empirical studies. Examining this in a competence-based versus a less-competence-based vocational school setting adds to the existing body of knowledge of interpersonal behaviour theory, and challenges the emerging discussions on teaching and learning in competence-based vocational education (Billett, 2003).

The research questions of this study are the following:

1. *Are perceived teacher interpersonal behaviour, intrinsic motivation, and student competency levels connected in Indonesian VET?*
   - *Do the two dimensions of teacher interpersonal behaviour influence student competency levels?*
   - *If the relationships do exist, does student motivation mediate the connection between teacher interpersonal behaviour and student competency levels?*
2. *Do the connections differ in HCBE and LCBE VET schools in terms of structure and strength?*

To answer these questions, the current study uses a structural equation modelling to characterise the relationship between the independent variables of the two dimensions of teacher interpersonal behaviour (proximity and influence; Wubbels et al., 1985), the mediating or intermediate variable of intrinsic motivation (Ryan & Deci, 2000), and the four dependent variables being four competencies relevant in the context of our study (MoMT, 2009). As literature suggests that the higher a teacher was perceived on the influence and proximity dimension, the higher various cognitive or attitudinal outcomes of students, we hypothesise that perceived teacher interpersonal behaviour also influences students' competency levels (H1). More specifically, we hypothesise that students who perceive their teachers as more influential (i.e., more dominant, more in control) also report higher scores on their competencies (H1a) and students who perceive their teachers as more collaborative/friendly (i.e., higher score on the proximity dimension) report higher competency levels as well (H1b).

As a range of previous studies has shown positive relationships between two dimensions of teacher interpersonal behaviour and student intrinsic motivation, we hypothesise that there is also a positive relationship between teacher behaviour and student intrinsic motivation in this study in the context of Indonesian VET (H2).

With respect to the relationship between student motivation and student outcome in terms of competencies, both theoretical and empirical arguments can be found. Certainly in competence-based education, it is expected (or at least it is the purpose of changing toward competence-based education) that students become more motivated because of the educational approach, and in turn reach higher levels of competence (e.g., Wesselink, 2010). Thus, we hypothesise that higher intrinsic motivation relates to higher learning outcomes, including students' perceived competency levels (H3). As studies showed that teacher interpersonal behaviour influences student intrinsic, and later on students' outcome, we hypothesise that student intrinsic motivation mediates the connections between teacher interpersonal behaviour and student perceived competency levels (H4).

As described earlier, this study involves two different learning environments: HCBE versus LCBE. Since an HCBE learning environment has different characteristics than an LCBE environment (e.g., more self-directed learning, less-teacher control, more authentic learning), the connections between teacher interpersonal behaviour and student competency levels is likely to be different in HCBE versus LCBE contexts (H5). In a study relating competence-based learning environment to student intrinsic motivation, Misbah and colleagues (2015) find that students from schools with more characteristics of CBE (HCBE) scored higher on their intrinsic motivation than students from schools with fewer characteristics of CBE (LCBE). Also, students' intrinsic motivation is more closely associated to proximity than to influence. The associations are stronger in LCBE than in HCBE learning environments. Therefore, it can be argued that the connections between teacher behaviour, intrinsic motivation, and student outcomes in HCBE and in LCBE context differ (H6).

The variables mentioned-above and their theory based hypothesised relationships together make up the hypothesised model shown in the Figure 5.1.

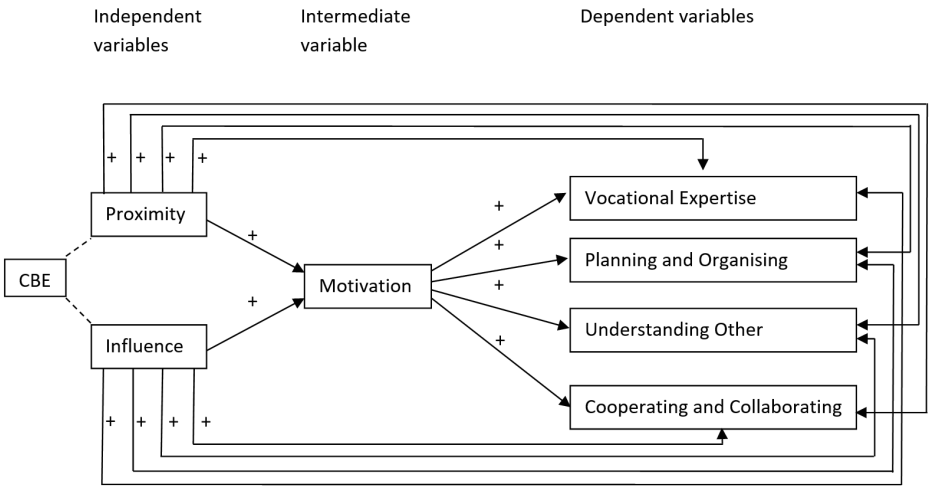


Figure 5.1. The Hypothesised Model of Teacher Interpersonal Behaviour, Motivation and Competency Levels.

5.3 Methodology

Participants

This study involves 506 students in their first year (grade tenth) of agricultural vocational schools. They are from eleven schools in three provinces of Indonesia. These schools are typified as either having high or low characteristics of competence-based education (HCBE or LCBE) based on the existence ten characteristics of CBVET as described by Sturing et al. (2011). The characteristics included are, for example, authentic learning, self-directedness, and teacher roles (Biemans et al., 2004; Wesselink et al., 2007). School principals, teachers, and students rate the extent to which the CBVET characteristics were found in their study programme (see appendix 1 for more detail).

From the eleven schools, five schools score on or below 2 for their competentiveness (categorised as LCBE) and six schools score around 4 (categorised as HCBE group). In total, 322 students taught by 17 teachers follow a HCBE programme and 184 students taught by 15 teachers working in a LCBE setting participate. All students take a food processing technology study programme covering the same content in all schools (based on a national curriculum), and their age ranges from 14 – 18 years old (M = 16.01, SD = 0.65) with 61% of them being female.

Materials

Perceived Teacher Interpersonal Behaviour. The validated Indonesian Questionnaire on Teacher Interaction (QTI) (Maulana et al., 2011; Wubbels et al., 1989) assesses students' perceptions of their teachers' interpersonal behaviour. The QTI consists of 54 items

provided in a five-point likert scale from (1) strongly disagree until (5) strongly agree, assessing the two dimensions of influence and proximity. 'Influence' refers to the degree to which a teacher controls communication in the classroom (e.g. 'This teacher is strict'). 'Proximity' refers to the degree to which a teacher cooperates with students, (e.g. 'This teacher is someone we can depend on'). Previous studies report the validity and reliability of the QTI test. Examples are in Maulana et al., 2012 and Misbah et al., 2015. Following the idea of Uden and colleagues (2014), this study treats scores of proximity and influence as an observable score and uses them as independent variables in the structural model.

Student intrinsic motivation. Students' intrinsic motivation was measured using the Intrinsic Motivation Inventory (IMI) of Deci and Ryan (2007). Although the IMI provides five subscales for intrinsic motivation, this present study uses only a subscale of interest/enjoyment as this is considered the self-report measure of intrinsic motivation per se (Deci & Ryan, 2007). The subscale of student intrinsic motivation (i.e., interest/enjoyment) consists of six items on a 7-Likert scale basis from (1) not at all true until (7) very true (e.g., 'I enjoyed the subject taught by this teacher very much') with the Cronbach's alpha in this study population was 0.78. The intrinsic motivation score is used as an intermediate variable in the structural model.

Competency level. This study measures students' competency levels using the validated instrument called the Competence Development Measurement Instrument (CDMI). CDMI adapts the work of Khaled, Gulikers, Biemans, Tobi, Oonk, and Mulder (2014) and the Indonesian Qualification Framework for food processing and technology sector (MoMT, 2009). A previous study by Khaled and colleagues (2014) reports the validity and reliability of CDMI and its indicators. CDMI for this present study assesses four competencies that are relevant in the context of this study: to demonstrate vocational expertise (e.g., 'I have much knowledge on food processing'), to plan and organise (e.g., 'During the preparation of an assignment, I first consider which results I want to achieve'), to show attention and understanding (e.g., 'I carefully listen to what other people say', $\alpha = 0.87$), and to collaborate and discuss (e.g., 'During group meetings, I give valuable contributions to the final result') with each competency measured by 4 to 6 performance indicators (i.e., items), resulting in 21 items in total. Students score each item on a scale of 1 to 10, where 1 represents low achievement and 10 which stands for high achievement. We use the four competencies as the dependent variables in the structural model.

Procedure

Students complete the three instruments in the middle of the first-year study. The first researcher is always present in the class during the data collection to answer any possible questions from students. To minimise bias response, teachers are not present in the class during the data collection and the researcher informs that teachers would not

see students' individual responses. The study protocol was approved by the Educational Authorities. School principals and teachers gave permission for the researcher to access the sample classes.

Data Analyses

We initially conduct preliminary analysis to obtain the mean scores, standard deviation, and correlation coefficients among variables. A measurement model is tested to check the structure of the instruments before testing our hypothesis. This included the latent constructs of the four competencies and the intrinsic motivation variable and this assesses whether the indicators represent the constructs properly by means of confirmatory factor analysis. Standards of measure of fit are reported including the chi-square (X^2), the comparative fit of index (CFI), the non-normed fit of index or Tucker-Lewis Index (TLI), the root-mean squared error of approximation (RMSEA), the standardised root mean square residual (SRMR), and Gamma Hat. CFI values greater than or equal to 0.95, TLI values larger than or equal to 0.90, a RMSEA value smaller than 0.08, SRMR and Gamma Hat are considered to be indicatives of a good fit (Bentler, 1990; Bentler & Bonnet, 1980; Bollen, 1989). We also provide the acceptable levels of fit for the normed chi-square values (i.e., chi-square divided by degrees of freedom).

To explore possible misfits of the model, we examine the modification indexes (MI) for the regression weights. High MI scores can indicate that an important link is missing in the model. The missing links then are cautiously connected in our model to get a satisfactory measurement model. Once the satisfactory model is obtained, we use Structural Equation Modelling (SEM) to assess the extent to which the hypothesised model adequately fits or describes the empirical data. The structural model includes the hypothesised relationships among the dimensions of teacher interpersonal behaviour and the latent constructs (i.e., intrinsic motivation and level of competencies).

A significant link between the independent variables (i.e., proximity and influence) and the presumed mediator (i.e., intrinsic motivation), between the mediator and the dependent variables (i.e., the levels of four competencies), and between the independent and dependent variables are examined to test intrinsic motivation as a mediating variable. If full mediation is present, this latter effect is rendered non-significant when the mediator is entered into the model, and test of the indirect effect must be significant. If the effect of the independent variable on dependent variable is still significant even after the mediator is added, this can be considered as partial mediation (van Ryzin, 2011).

To examine if the relationships in the models for HCBE and LCBE groups were equal or different, multi-group SEM is used. Multigroup model analyses provide a better, more differentiated picture of the associations between teacher interpersonal behaviour and student outcomes than traditionally regression data analyses (den Brok et al., 2010). Group differences are assessed by comparing a fully constrained model (i.e., all path coefficients to be equal across group) versus unconstrained/baseline model (i.e., the

path coefficients are not constrained across the group) using the X^2 difference test. If the chi-square difference is higher than critical ratio and proved significant, it indicates a difference between HCBE and LCBE groups (Byrne, 2010). Then, the differences for each path coefficients are analysed by sequentially comparing X^2 difference test between the baseline model and a particular constrained path model. The data analyses are conducted using Amos Graphics IBM.

5.4 Results

This section presents the descriptive statistics of and the correlations between the studied variables followed by the measurement model and the structural equation modeling for testing our hypothesis. Next to that, results of the comparison between the HCBE versus LCBE groups are presented.

Correlational Analyses and Descriptive Statistics

Mean, standard deviation, and correlation coefficients among the study variables are presented in Table 5.1. As expected, influence and proximity correlate positively with student intrinsic motivation, and also correlated positively with the level of four competencies. Lastly, intrinsic motivation significantly correlated with all four competencies. These associations provide a foundation for testing intrinsic motivation as a mediating variable influencing the link between teacher interpersonal behaviour and student competency levels.

Table 5.1. Mean, standard deviation and correlations of variables

	Variables	M	SD	1	2	3	4	5	6
1.	Influence	.85	.34	1					
2.	Proximity	.84	.55	.05	1				
3.	Intrinsic Motivation	5.60	1.02	.26**	.52**	1			
4.	Vocational expertise	7.49	1.00	.13**	.09**	.20**	1		
5.	Collaboration	7.84	.96	.15**	.09**	.18**	.57**	1	
6.	Planning and Organising	7.90	.92	.12**	.20**	.22**	.58**	.54**	1
7.	Understanding	7.58	.97	.09**	.08**	.17**	.59**	.54**	.52**

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Assessment of Measurement Model

The initial measurement model by means of confirmatory factor analysis on the four competencies of Competence Development Measurement Instrument (CDMI) and the intrinsic motivation scale of Intrinsic Motivation Inventory (IMI) showed that model fit is acceptable, X^2 (290) = 944.869; CFI = 0.943; TLI = 0.931; RMSEA = 0.048; SRMR = 0.039, gamma hat = 0.932 and X^2/DF = 3.258. However, the factor loading of two items in the IMI scale and one item in the competency to show and understanding are then problematic (below 0.40) (Tabachnik & Fidell, 2007). Those problematic items are deleted as long as this does not affect the meaning of the constructs. After deletion, the factor loading improves, ranging from 0.45 to 0.85, and the items' critical ratio values exceed 9.922 ($p < 0.01$). The model fit improves as well, X^2 (242) = 843.190; CFI =0.946; TLI=0.933; RMSEA = 0.050, SRMR = 0.039, Gamma Hat = 0.935 and X^2/df = 3.484.

Structural Model

Subsequent to establishment of acceptable measurement model fit, hypothesised regression paths of the connections in a structural equation modeling (see Figure 5.1) are conducted. The structural model indicates good fit, X^2 (263) = 871.219; CFI = 0.945; TLI = 0.932; RMSEA = 0.049; SRMR = 0.039; Gamma Hat = 0.936; X^2/DF = 3.313. The statistically significant coefficient paths *($p < 0.05$*) in our proposed model are shown in Figure 5.2. This model accounts for moderate variance in intrinsic motivation *($R^2 = 0.39$),* and the four competencies: vocational expertise *($R^2 = 0.33$)*, planning and organising *($R^2 = 0.22$)*, understanding other ($R^2 = 0.25$), and cooperating and collaborating ($R^2 = 0.18$).

Figure 5.2 showed that both dimensions of teacher behaviour significantly influence student intrinsic motivation ($\beta = 0.87$, $p < 0.05$ for proximity and $\beta = 0.41$, $p < 0.05$ for influence). This means that teachers perceived as more collaborative/friendly (Proximity) and/or more dominant (Influence) positively stimulate intrinsic motivation, supporting H2.

With respect to H1, H1a, and H1b, significant relations are found, but in an unexpected direction. Both proximity and influence have negative associations with the four competencies, meaning that the more teacher controls students, the lower students rate their competency levels. This also holds for proximity, meaning that when student perceives their teacher as more cooperative, they report lower perceived competency levels. In addition, the effect of proximity is stronger than influence. Student intrinsic motivation is associated positively with the levels of all four competencies with different degrees. This suggests that students who were more intrinsically motivated report higher levels of competencies, supporting H3.

To test the mediating effect of intrinsic motivation, the direct relations of proximity and influence on the four competencies (the direct model) are compared with the relationships in our hypothesis model. The direct model shows the goodness fit of index, X^2 (125) = 500.526; CFI = 0.955; TLI = 0.939; RMSEA = 0.054; X^2/df=4.004, Gamma Hat

= 0.952, SRMR = 0.0319 and the paths between proximity and influence on the four competencies are all significant. Table 5.2 presents the coefficient paths of direct effects with and without mediating variable and indirect effects of our hypothesised model.

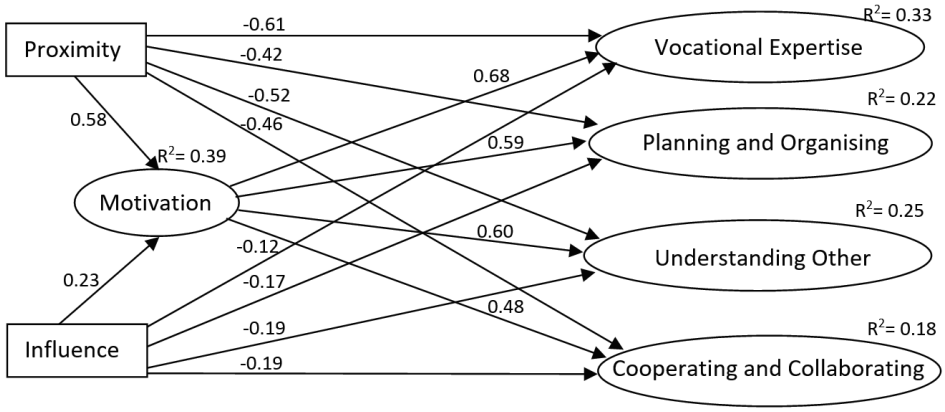


Figure 5.2 Structural model paths and standardised regression weights of the paths

Figure 5.2 showed that both dimensions of teacher behaviour significantly influenced student intrinsic motivation ($\beta = 0.87$, $p < 0.05$ for proximity and $\beta = 0.41$, $p < 0.05$ for influence). This means that teachers who were perceived as more colllaborative/friendly (Proximity) and/or more dominant (Influence) positively stimulated intrinsic motivation, supporting H2.

With respect to H1, H1a and H1b, significant relations were found, but in an unexpected direction. Both proximity and influence had negative associations with the four competencies, meaning that the more teacher controlled to students, the lower students rated their competence levels. This also held for proximity, meaning that when student perceived their teacher as more cooperative, they reported lower perceived competence levels. In addition, the effect of proximity was stronger than influence. Student intrinsic motivation was associated positively with the levels of all four competencies with different degree. This suggested that students who were more intrinsically motivated reported higher levels of competencies, supporting H3.

To test the mediating effect of intrinsic motivation, the direct relationships of proximity and influence on the four competencies (the direct model) were compared with the relationships in our hypothesis model. The direct model showed the goodness fit of index, X^2 (143) = 606.218; CFI = 0.942; TLI = 0.942; RMSEA = 0.057 and the paths between proximity and influence on the four competencies were all significant. Table 5.2 presented the coefficient paths of direct effects with and without mediating variable and indirect effects of our hypothesised model.

Table 5.2 Direct and Indirect effects of teacher interpersonal behaviour and competency levels

Paths	Direct effect without mediator	Direct effect with mediator	Indirect effect [95% CI]
Proximity → Vocational expertise	0.098 (0.00)	-2.596 (0.00)	4.16 [2.86 – 7.95]*
Proximity → Planning and Organising	0.221 (0.00)	-2.576 (0.00)	3.94 [2.67 – 7.48]*
Proximity → Understanding Others	0.170 (0.00)	-2.401(0.00)	3.42 [2.28 – 6.64]*
Proximity → Cooperating and Collaborating	0.080 (0.01)	-2.254 (0.00)	3.71 [2.47 – 7.13]*
Influence → Vocational expertise	0.139 (0.00)	-1.124 (0.00)	3.25 [2.10 – 6.40]*
Influence → Planning and Organising	0.167 (0.00)	-1.146 (0.00)	3.08 [1.91– 5.87]*
Influence → Understanding Others	0.131 (0.00)	-1.074 (0.00)	2.67 [1.66 – 5.11]*
Influence → Cooperating and Collaborating	0.168 (0.00)	-0.927 (0.00)	2.90 [1.82 – 5.46]*

As can be seen from Table 5.2, all paths in the direct model are significant indicating that the influence and proximity dimensions have significant direct effects on the four competencies, with and without intrinsic motivation as a mediating variable. A significant indirect effect, shown by confidence intervals that are not containing zero, indicate the significance of intrinsic motivation as a mediating variable. As the indirect effects are significant, and the direct effects remain significant when student intrinsic motivation variable is included as a mediator in the model, it can be concluded that intrinsic motivation partially mediate the connection between proximity and influence and student competency levels (H4). However, the direction of the direct effects changes into negative when intrinsic motivation is included, indicating that intrinsic motivation is an inconsistent mediator variable (MacKinnon, Fairchild, & Fritz, 2007).

HCBE versus LCBE

Research question 2 asked whether the hypothesised connections between teacher interpersonal behaviour, intrinsic motivation, and competency levels differ in a HCBE versus a LCBE context. For this purpose, multi-group confirmatory factor analyses are first conducted to test the measurement model for the four competencies and the motivation scale for both groups. The invariance test shows the latent scores on competency levels and intrinsic differ significantly between the groups but these differences do not harm the proposed measurement model. To test whether the structural model differs in a HCBE versus LCBE context, evaluating of the SEM model as shown in Figure 5.2 is conducted for each group by testing the chi-square difference between the baseline/constrained model versus the fully constrained model (equal across groups). The goodness of fit statistics for the two-group structural models is presented at Table 5.3. The fit indices for both the unconstrained and fully constrained models fit the data adequately. The chi-square

difference ($\Delta X^2 = 69.1$; $p < 0.05$) is statistically significant which suggests that the groups are different.

Table 5.3 Goodness-of-fit statistics for two-group structural models

Model Description	X^2	Df	X^2/df	CFI	TLI	RMSEA	GFI	IFI
Unconstrained/ baseline model	1266.324	440	2.878	0.918	0.897	0.044	0.903	0.919
Fully-constrained model	1389.176	470	2.956	0.909	0.893	0.045	0.895	0.909
$\Delta X^2 = 69.1$; $p < 0.05$								

Given the significant difference for HCBE versus LCBE groups, we test the path coefficients for each group. Table 5.4 presents the two group model estimates. As can be seen from Table 5.4, two paths are significantly different. The negative relationship between influence and competency planning and organising differs between HCBE and LCBE groups, with the effect to be stronger in HCBE than in LCBE ($\beta_{HCBE} = -1.424$, $\beta_{LCBE} = -1.189$). This means that, when HCBE students perceive their teacher as more controlling, this results in a stronger negative impact on their planning and organising competency level compared to a controlling teacher in a LCBE context. The effect of proximity on student motivation is also different between HCBE versus LCBE ($\Delta X^2 = 20.255$, $p < 0.05$), in which the effect of proximity was stronger in LCBE than in HCBE ($\beta_{HCBE} = 0.867$, $\beta_{LCBE} = 0.874$). Thus, in a LCBE context, teachers perceived as closer to students, more strongly impact students' motivation, which in turn, affects student perceived competency levels.

Table 5.4. HCBE versus LCBE model estimate

Path estimated	X^2	X^2/Df	CFI	RMSEA	Coefficient estimate		ΔX^2 (Δdf=1)	*p*
					HCBE	LCBE		
Influence → Planning and Organising	1270.674	2.881	0.918	0.044	-1.424	-1.189	4.35	$p < 0.05$
Proximity → Motivation	1286.549	2.917	0.916	0.044	0.867	0.874	20.255	$p < 0.05$

Note: the non-significant chi-square differences were not presented.

5.5 Conclusions and Discussion

Competence-based vocational education and training focuses on preparing students to be successful in the world of work by placing greater focus on competencies rather than merely on cognitive outcomes. This study investigates the connections between teacher interpersonal behaviour, student motivation, and perceived competency levels in a sample of students from schools which have high and low characteristics of competence-based education in Indonesian vocational schools. Structural Equation Modelling analyses showed that students' perceptions of teacher interpersonal

behaviour influences how students rate their competency levels, mediated partially by student intrinsic motivation. Teacher interpersonal behaviour deserves more attention, in practice and in research, in an educational innovation that requires changing roles of teachers and students, as in competence-based vocational education.

Our finding showed that the strength of connections between teacher behaviour, students' intrinsic motivation, and perceived competency levels in a HCBE versus a LCBE context differ. A more controlling teacher in an HCBE context has a stronger negative influence on students' planning and organising competency level than a controlling teacher in an LCBE context. In CBE theory, teachers are expected to be less-controlling when facilitating the student learning process. More control is given to the students as this is theorised to be important for letting students develop their own competencies. When a teacher is then more controlling, this in conflict with what competence-based education actually requires. This might result in confusion or conflict between student and teacher roles: who is in charge? Who is deciding on the planning? The student or the teacher? This kind of confusion can be a possible explanation for the negative impact of teacher controlling behaviour on students' competency levels.

The difference between HCBE and LCBE groups is also evident in connections between teacher proximity and student motivation. In an LCBE context, teachers perceived as closer to students, more positively impact students' motivation, which in turn affects student competency levels. This might also be due to the characteristics of CBVET learning environment. In CBVET, students expect to be more autonomous and self-steering and thus, less reliant on their teachers. CBVET also expects this increased autonomy for students to be intrinsically motivating for them. Students in LCBE are likely to be more reliant on their teachers and, as a result, appreciate more closeness of their teachers. Thus, this finding might suggest that principles of competence-based education are actually implemented as intended in the studied classrooms, in the sense that the HCBE participants are less dependent on their teachers.

The finding that teacher proximity is more influential to student outcome (competencies) compared to controlling teacher behaviour corresponds to previous studies on learning environments, and teacher interpersonal behaviour studies (e.g., Hughes & Ciao, 2017; van Uden et al., 2014;). Our study confirms that the LCBE group is more consistent with the results of previous studies, while the HCBE learning environment leads to different patterns of results. A possible explanation is that the LCBE learning environment is a more 'traditional learning environment,' comparable to many classrooms of other teacher interpersonal behaviour studies. While the HCBE learning environment is a new (different kind of) classroom that indeed aims at different teacher and student roles and different interactions and as a result also leads to different relationships between teacher behaviour and student learning motivation. So, this study interestingly shows that connections between teacher interpersonal behaviour and student learning outcome are indeed different in these new contexts.

Another important aspect of the results of this study is the mediational role of intrinsic motivation in linking teacher behaviour and student outcome. Our study shows that student intrinsic motivation partially mediates the connection between teacher behaviour and student perceived competency levels. That intrinsic motivation becomes an inconsistent mediator suggests that the positive influence of teacher behaviour on competency level is an indirect effect that happens via motivation, while a direct effect of teacher interpersonal behaviour on competency level is negative. This result suggests that effective teacher behaviour for fostering student competence development is the teacher's behaviour that can continuously foster student intrinsic motivation.

The findings of this study have some implications for teaching and learning in vocational education. Results of our study can be used as policy input for improvement of vocational education, certainly in Indonesia. VET students appear most vulnerable to quit their study before graduation partly because of a lack of motivation (van Uden, Ritzen & Pieters, 2014). This study supports the previous works that suggest students' learning environment perceptions, including teachers in it, can certainly make a difference in this motivation as shown in this study (e.g., Hughes & Cao, 2018; Urdan & Schoenferder, 2006). As teachers are the most important players in creating the actually implemented learning environment, teacher behaviour deserves more attention in teacher training programmes and educational innovations. The effect of teacher behaviour on student motivation can be positive or negative (Gorham & Christopel, 1992) and the kind of teacher behaviour that is most appreciated by students differs in a more traditional (i.e., LCBE) versus a HCBE context. With the appropriate amount of teacher control, students might feel secure and cared for, but too much controlling behaviour results in students feeling incapable, resulting in decreasing student intrinsic motivation. This seems even more true in CBE contexts where the whole education context places emphasis on student autonomy compared to teacher control. As Indonesian vocational education is changing towards competence-based education (Nuh, 2013; Raihani, 2007), seriously considering successful teacher behaviour for fostering motivation and competence development is essential.

Some limitations in this study need consideration for future studies. One of the limitations is that the study had a cross-sectional design which prevents drawing conclusions about the effects of teacher behaviour on student competence development over time. While this present study provides a theoretical model for such connection, a longitudinal study is needed to gain more insights about the complex process of student learning and its outcomes in vocational education. In addition, current research using longitudinal designs show that students' perceptions of teacher behaviour changes over time, and student motivation decreases within a year (Maulana et al., 2012; Opdenakker et al., 2011). Thus, examining the relationships between variables in a longitudinal way would give additional knowledge about the complexity of the connection between teacher behaviour, student motivation, and competence development in the long run. Secondly, the data in this study is collected only through self-report measures that could be a

threat to internal validity (Ward, Gruppen, & Regehr, 2002). While previous studies showed that student self-perception is important (e.g., Khaled et al., 2014), multiple methods for assessment could be used to reduce the impact of subjectivity in future researches. Another limitation is the participant group of our study sample was merely from the Indonesian culture, which might limit the generalisability of the findings. Similar studies for different cultures, certainly comparing more individualistic (i.e., many western countries) versus more collectivistic cultures (i.e., Indonesia), need to be conducted to get better insights in the connections between teacher behaviour, student motivation, and perceived competency levels.

Despite the limitations above, this study is important as it provides an empirical support for paying more attention to teacher behaviour in educational innovations in vocational education settings, particularly when the innovation involves drastically changing teacher and student roles, like in competence-based education. This study challenges the existing theory of teacher interpersonal behaviour by expanding the effect for different student outcomes (i.e., competency level). As to our knowledge this is the first study that connects teacher behaviour to student perceived competency level, our model can serve as a starting point to further research on effective teacher behaviour for students' competence development in a longitudinal study design.

Chapter 6
General Discussion

This final chapter summarises the findings of the four studies presented in the preceding chapters and answers the main research questions presented in Chapter 1. This final chapter discusses the findings in a broader perspective, focusing on the validation of competence-based education framework, the effectiveness of competence-based vocational education, and teacher behaviour for student competence development. Evidence for the effectiveness of competence-based education is currently lacking and urges for more evidence-based studies. This chapter also discusses practical implications of the findings for improvement of teaching and learning in vocational education. Lastly, this chapter ends with limitations of our studies and implications for future research.

The research in this thesis contributes to the body of knowledge on competence-based education, its design, its implementation, teacher and student interaction, and most importantly its effectiveness. All within the context of Indonesian agricultural vocational education, a collective culture in which CBE is stimulated by the National Policies since 2004. For this, both cross-sectional and longitudinal studies were conducted and data from policy documents, school principals, teachers and students triangulated and analysed in various ways. The core is validating CBE theory (framework/matrix) in a non-western, collective context, and finding empirical evidence for the effectiveness of CBE by large scale, cross-sectional as well as longitudinal studies comparing high versus low-CBE VET programmes in terms of teacher interpersonal behaviour, student motivation, competence development and knowledge development.

This thesis incorporated competence theory reflected in the competence-based education framework (Sturing et al., 2011; Wesselink, et al., 2007), work on teacher interpersonal behaviour theory (Wubbels, 1998), and the self-determination theory (Ryan & Deci, 2000). The competence-based education framework (Sturing et al., 2011; Wesselink, et al., 2007) is used to examine and typify competence-based education policy and practices in Indonesian VET schools for food processing and technology (chapter 2). Teacher interpersonal behaviour theory offered an opportunity to examine patterns of communication between teachers and students when they interact with each other during the teaching and learning process. This theory conceptualised teacher behaviour by two dimensions being 1) proximity, which is seen as the extent to which a teacher cooperates with students, and 2) influence, seen as the extent to which the teacher controls the teaching and learning process. The self-determination theory conceptualises student intrinsic motivation as doing something out of interest. This theory provides a

valid and reliable instrument to measure student motivation which has been used in chapter 4 and 5.

Of the four studies, this thesis employs a quasi-experimental design in a real classroom setting to enhance its ecological validity. It compares Indonesian VET programmes for food processing and technology that can be characterised by a high or low level of implementation of the CBE principles (chapter 2). In terms of data, in this thesis both cross-sectional and longitudinal data were collected. To provide comprehensive and meaningful data, this thesis collected information from various stakeholders, i.e school principals, teachers and students. Thus, this thesis delivers a valuable contribution to the discussion of teaching and learning in vocational education and the more evidence-based implementation of competence-based education. This final chapter discusses the findings on the effectiveness of CBE to contribute to the rather limited literature on evidence-based CBE studies. This chapter also proposes a teacher behaviour style that can be stimulating for student competence development. Next to that, this thesis provides timely food for thought for Indonesian policy makers as the Government of Indonesia currently issued the Presidential Instruction No. 9/2016 aiming at improving the quality and relevance of Indonesian vocational education.

6.1 Summary of the findings

Realisation of CBE

Chapter 2 discusses the state of affair of CBE implementation in Indonesian vocational schools, particularly in food processing and technology study programme. This chapter addresses the question: '*What is the current CBE condition of vocational (agricultural) education in Indonesia based on the Comprehensive Competence-Based Education (CCBE) principles?*' To answer this question, the chapter firstly examines the extent to which CCBE principles, as proposed by Sturing and colleagues (2011), are shown in Indonesian policy documents. Next to that, this chapter investigates perceptions of school principals, teachers and students on whether or not the CCBE principles were practised in their schools. Additionally, this study calculates competentiveness scores of 41 agricultural schools (i.e food processing and technology study programme) based on the rating of school principals, teachers, and students. It is concluded that CBE implementation levels in Indonesian agricultural schools, represented by competentiveness score, varied from level (2) 'starting to be competence-based' to level 4 'largely competence-based'. This finding indicates that stipulating CCBE principles in educational policy is important but not sufficient for successful implementation of CBE. The study offers relevant ideas for improving and further stimulating the development towards more CBE in Indonesia VET. Additionally, this study allows us to select a set of schools with a low implementation of CBE (competentiveness score of 2 or lower) and a set of schools with a high implementation (competentiveness score of 4 or higher). These sets are used in the follow-up studies to examine teacher interpersonal behaviour, student motivation, competence-development

and knowledge development in LCBE versus HCBE food processing and technology VET programmes.

Expected Effects of CBE: New Learning Outcomes and New Teacher Roles

CBE in an educational innovation that aims to stimulate "new" learning outcomes for students: CBE is expected to raise student motivation and stimulate students' development of professional competencies via learning environments that resemble students' future professional practice (Wesselink, 2010). However, empirical evidence for the effectiveness of CBE learning environments for fostering these learning outcomes is lacking hitherto (Lassnigg, 2017; Wesselink, Biemans, Gulikers, & Mulder, 2017). Chapters 3 and 4 investigate various student learning outcomes of CBE: competency level (chapter 3), competency development (chapter 3), knowledge level and development (chapter 3), and intrinsic motivation (chapter 4). Chapter 5 links the students learning outcomes in chapter 3 (i.e. competency levels) and 4 (i.e student motivation), with the teacher interpersonal behaviour in low versus high CBE learning environments.

Additionally, the teacher is a crucial player in educational innovation, particularly when the innovation requires drastic changes in teacher roles like in competence-based education (CBE). In CBE, teachers need to act as a facilitator and coach of learning instead of only being an content matter expert who provides students with knowledge and expertise via passive, lecture-based education. Moreover, they have to be able to create authentic learning environments that help to bridge classroom learning and workplace learning. CBE also requires different roles of students as they are expected to be active learners, self-directed, and steering of their own learning. The changing roles of teachers and students might influence the interaction between students and teacher in CBE, and the way in which students perceive their teachers' behaviour in the classroom. As students' perceptions of teacher behaviour influence their learning outcomes, this thesis examines if and how teacher-student interaction in H-CBE or different from LCBE VET programmes (chapter 4) and how this relates to students outcome in terms of motivation (chapter 4), and competence-development (chapter 5).

CBE Outcomes and Teacher Interpersonal Behaviour

Chapter 3 examines student outcomes in terms of perceived competency levels at three moments in time and the development of competencies and knowledge throughout an academic year. Our findings show that students taught in HCBE report higher perceived competency levels at all moments in time and score higher on the declarative knowledge test than students from LCBE learning environments. The longitudinal data analysis shows that, as expected, HCBE stimulates more competence development, while LCBE programmes stimulates more knowledge development. Teachers and students in HCBE context agree to a much larger extent about student competency levels and competence development than do teachers and student in LCBE context. Teachers in HCBE have more

positive perceptions of students' competence development, while teachers in LCBE perceived student's competence as not growing.

Chapter 4 examines if HCBE programmes led to more student motivation than L-CBE programmes and if this motivation is moderated by how students perceive their teacher interpersonal behaviour. Chapter 4 shows that students in HCBE, as expected, reported higher intrinsic motivation than students from LCBE learning environments. The effect of HCBE or LCBE learning environment on student motivation is however moderated by how students perceived their teachers. This study compares students' perceptions of teacher interpersonal behaviour in H-CBE versus L-CBE learning environments.

Teacher interpersonal behaviour can be examined from the profiles (i.e. directive, authoritative, tolerant, tolerant/authoritative, uncertain/tolerant, uncertain/aggresive repressive, and drudging), the dimension (i.e proximity versus controlling behaviour) and the scale level (i.e. leadership, helpful/friendly, understanding, student freedom, uncertain, dissatisfied, admonishing, and strict). This study compares teacher interpersonal behaviour in H-CBE and L-CBE in the profiles and dimension levels. The finding showed comparable profile of teacher interpersonal behaviour in HCBE and LCBE, in which the common profiles to be found is tolerant/authoritative. Even though the profile is comparable, the study finds an unexpected results in the dimension level. Teacher behaviour in H-CBE is more controlling than in L-CBE learning environment, suggesting that the teacher behaviour in Indonesian CBE aren't fully supporting for competence-based education principles.

With respect to student motivation, Chapter 4 showed that teacher interpersonal behaviour intermediated the connections between competence-based education and student motivation. Students' motivation was more closely related to teacher cooperative behaviour than controlling behaviour. These associations were stronger in L-CBE than in H-CBE learning environments, suggesting that CBE learning environment is more motivating for students.

The final empirical study reported on in chapter 5 links all studies learning outcomes and student perceptions of teacher interpersonal behaviour and examines their relationships in HCBE versus LCBE. The research questions addressed are: *Are there any linkages between teacher interpersonal behaviour, student motivation and competence development?* and: *Are these linkages different in HCBE versus LCBE?* This study examines connections between student perceived teacher interpersonal behaviour and student competency levels using structural equation modelling, with student motivation as a mediating variable. This study concludes student motivation mediated the connection between teacher interpersonal behaviour and student competency levels. Teacher cooperative behaviour is more closely associated with student motivation than teacher controlling behaviour. Next to that, teacher controlling behaviour lowered student competency levels, and the deteriorating effect was stronger in HCBE than in LCBE. Thus, teachers who sucessfully in creating cooperative behaviour and support student

autonomy seems best for stimulating students' competence development.

6.3 Research findings in a broader perspective

Chapter 2 until 5 present the four studies and the findings are summarised in the section above. This section discusses the findings in a broader perspective. This general discussion raises three main issues: (1) the validation of CBE theory (framework/ matrix) in a non-western context, (2) the effectiveness of a competence-based learning environment for student outcomes, and (3) teacher behaviour in relation to student competence development.

The Validation CCBE Theory Framework in a Non-Western Context

Competence-based education emerged in Western societies and currently gets much consideration in the Vocational Education and Training (VET) worldwide. To operationalise what CBE should looks like and how schools can change from having a more traditional type of education to a more competence-based education, Dutch researchers developed the comprehensive competence-based education (CCBE) framework of ten educational design principles that has been discussed in Chapter 2. This thesis adopts this framework to study CCBE in a non-western context, Indonesia, and as such helps to validate the CCBE framework from a non-western perspective. In this thesis, the CCBE matrix was validated by gathering information from school principals, teachers, and students on whether or not they perceived the CCBE principles in their schools and classroom activities. Additionally, Indonesian Policy documents on CBE were reviewed using the principles of CCBE. Chapter 2 showed that all principles can be found in Indonesian educational policy documents as well as in educational practice, except for the flexibility principle that was not perceived in practice. The policy documents showed that although the regulation supports students to finish their study based on their own pace, the curriculum programmes in practice do not yet allow students to finish the program faster than scheduled. Thus, this might not stimulate flexibility in practice. Also, in the Dutch/Western context this principle was found to be very challenging as it requires a lot from the organisation of educational institutes (De Bruijn, Doets & Van Esch, 2004). This raised questions concerning this principle like: should other principles be dealt with first before school organisations can start to make their programmes more flexible? Is there any order in the CCBE principles or difference in their level of importance?

An additional aspect of the CCBE matrix validation in this study is that it examines its application in a collective culture. The CCBE matrix is developed in the predominantly individualistic Western culture. This thesis shows that in the more collective culture of Indonesia, the CCBE principles still seem to work, as Indonesian school principals, teachers and students recognised almost all principles in the CBE programmes, and the principles also allowed for differentiating school programmes that implemented the principles to a more or lesser extent. These findings suggest that the CCBE principles might be applicable

across cultures. Or another possibility is that the Indonesian culture is not that collective anymore. These are intrigueing obervations for future research.

The Effectiveness of CBE Learning Environments

While there are some studies on the design of competence-based learning environments (e.g., Biemans et al. 2009; De Bruijn & Leeman, 2011), research on the effectiveness of competence-based education is still scarce hitherto (Lassnigg, 2017; Wesselink, Biemans, Gulikers, & Mulder, 2017). School effectiveness research (e.g Creemers & Kyriakides, 2008; Opdenakker & van Damme, 2010) generally agrees that learning environments that positively improve student learning outcomes are considered as more effective. As such, effectiveness means 'better student outcomes' which in our study relates to (1) more competence development (2) more knowledge development. Our study aimed to examine if schools that are characterised by more competence-based education design characteristics result in more competence development and more knowledge development (that is, are more effective) than schools that are less characterised by these CBE design characteristics.

Our studies showed that VET programmes that have implemented more CCBE principles lead to more student motivation, higher competence levels and more competence development throughout a school year. On the other hand, students' declarative knowledge development is more stimulated in low-CBE programmes. Motivation and competence development were stimulated more in CBE. Thus, our studies are among the first to show an empirical relationship between CCBE design principles and the effectiveness of these new learning environments for the learning outcomes that CBE is theorised to stimulate.

The finding that the CBE learning environment is more effective in stimulating student motivation and competence development than the traditional VET learning environment, might be due to the characteristics of CBE learning environments. For example, the CBE learning environment characteristics related to student motivation are, among others, providing an authentic learning environment, meaningful tasks, and formative assessments. The authentic learning environment reflects vocational reality and make students enjoy their learning. Also, providing meaningful tasks enhances student motivation because that way students understand the benefits of learning these tasks for their future career. The stimulation to be more self-directed also improves student outcomes.

With respect to knowledge development, this study fuels the discussion about the question as to whether CBE is hampering students from developing important knowledge, a sound that arised from CBE critics. Indeed, our study (in chapter 3) supports to some extent the discussion raised by Koopman et al. (2011) that competence development and knowledge development are at odds. However, this study only examined a snapshot of students' vocational knowledge, namely declarative, factual knowledge development

within a specific topic in food processing technology via a multiple choice, reproduction test. It can be questioned if this is the important type of knowledge and learning process (i.e., learning/testing by reproduction) to be developed and stimulated in CBE. As competence-based education originated from a constructivist view on knowledge and learning, knowledge is something that students actively build during various activities. Being able to apply this knowledge in various (practical) situations might be much more relevant in vocational knowledge than the factual knowledge examined in our studies.

However, we did not dig into an elaborate discussion about what vocational knowledge is or is not, as in this study we only examined student knowledge in terms of declarative knowledge, as this relates to the kind of knowledge and way of testing that is normally used in the Indonesian classroom. This might give the idea of not viewing knowledge from a constructivist viewpoint. However, in terms of Miller (1990), this kind of factual knowledge is still the backbone of competence. There is a strong relationship between declarative, factual content knowledge and competence: (professional) knowledge is included in (professional) competence. Therefore, this finding needs further attention for policy makers and curriculum designers, as to how to maintain a balance between knowledge development and competence development in CBE. CBE researchers can further investigate the trade-off between knowledge and competence development to provide a research-based solution and contribution to the discussion of this issue to improve successful implementation of CBE programmes.

Teacher Behaviour for Student Competence Development

As has been previously mentioned, CBE requires different roles of teachers and students. Teachers are expected to not only transfer knowledge, but also stimulate students to develop competencies needed for their professional jobs. Teachers are encouraged to act as a coach when guiding students to develop these competencies. Student on the other hand are also expected to take a more active role in steering and regulating their own learning and learning paths with an eye on their future aspired career. This makes teacher-student relationship likely to be different in HCBE and LCBE learning environments. Teacher interpersonal behavior theory offers a tool to identify effective teacher behaviour in CBE learning environments and for fostering student competence development.

Chapter 5 indeed showed an interesting finding of interplay between teacher-interpersonal behaviour, student motivation and competence development in HCBE versus LCBE. As previously discussed, teacher interpersonal behaviour theory maps the way teacher communicate with students as proximity and controlling behaviour. Teacher behaviour influenced student perceived competency levels, suggesting that stimulating student competence development needs an appropriate amount of teachers' proximity and controlling behaviour. Thus, an effective teacher behaviour for fostering students' competence development is teacher behaviour that can stimulate cooperation with

students (to foster student intrinsic motivation) and gives students certain amount of authority for their own learning (to develop their own competencies).

The connections between teacher interpersonal behaviour and student perceived competence levels in HCBE and LCBE differ. Teacher proximity has stronger effect on student motivation and the effect was stronger in LCBE. Teacher cooperative behaviour is more closely associated with student motivation than teacher controlling behaviour. Next to that, teacher controlling behaviour lowered student competency levels, and the deteriorating effect was stronger in HCBE than in LCBE. Thus, teachers who sucessfully in creating cooperative behaviour and support student autonomy seems best for stimulating students' competence development. This finding supports the idea from previous studies showing that teacher behaviour perceived as autonomy supportive, i.e teachers provide students support and opportunities to make choices and decisions in their own learning, is linked to how students value their learning and how they acquire competencies (Jang, Reeve & Deci, 2010; Skinner & Belmont, 1993). Also, Reeve, Bolt, and Cai (1999) stated that students taught by autonomy-supportive teachers are more likely to show greater perceived competence compared to students taught by controlling teachers. On the other hand, teachers who displayed behaviour that was perceived as very controlling resulted in students feeling confused and less competent. This negative feeling has a detrimental effect on students' competence development, which also shown in this thesis.

It was interesting to know, however, that students from Indonesian vocational schools participating in our studies reported a high rating for teacher controlling behaviour (chapter 4). CBE theory expects student and teacher behaviour to be very different in CBE than in more traditional, less CBE schools. This study did not find the expected big differences in teacher behaviour, reflected in how students perceived their teachers on the 'influence' and 'proximity' dimensions of teacher interpersonal behaviour theory. In CBE, teachers were still found to be relatively authoritative/controlling, while CBE theory argues teachers to be more of a coach instead of an authoritative figure in the classroom telling students what to do. Future research should dig more deeply in what this effective 'authoritative' behaviour in CBE really means. This might explain why student competence development in Indonesia is not yet fully stimulated in schools as most effective teacher behaviour for student comptence development was not yet fully exist. It might mean that also in CBE students need a certain kind of clear structure and guidance, but this study is still inconclusive in what kind of 'controlling' behaviour of the teacher and respective student behaviour that this would imply is best for fostering competence development. Another explanation can also be the Indonesian collective culture is used to a more authoritative/controlling teacher and students might feel even more comfortable with a more controlling teacher. This might be because teacher controlling behaviour is still (explicitly of implicitly) rewarded in Indonesian society (Maulana et. al., 2011). In LCBE the teachers was perceived as more controlling than in the HCBE programmes, however, also in the HCBE contexts students perceived their teachers are relatively high on the authorative/controlling scale. The possible implications for LCBE and HCBE is that

students in LCBE might experience the stressful learning environment which later affects student learning outcomes. Thus, promoting teacher behaviour for improving student competence development is highly relevant, particularly in the context of Indonesian vocational education.

6.4 Implications

Scientific Contribution and Future Reseach

This thesis uses a diversity of methods and analyses in the various studies. The large-scale data set, the triangulation of principals', teachers' and students' data, cross-sectional and longitudinal data, not only student perceptions but also teacher ratings of competence levels and development, and multi-group structural equation modelling building as well as empirically testing of theory on CBE effectiveness, all contribute to the scientific value of this thesis in the field of CBE research.

First of all, this study shows the applicability of the ten design principles of the Comprehensive Competence Based Education Framework and its related matrix for competence-based education (Sturing et al., 2011; Wesselink et al., 2006), which was developed in a Dutch and more individualistic culture, for the non-Western more collective culture in Indonesia. This is a critical finding for the validation and generalisability of the CCBE framework too characterise, classify and further study the competentiveness of study programmes (Sturing et al., 2011; Wesselink et al., 2006). This in turn lays a more solid ground for stuyding this effectiveness of more or less competence-based study programmes.

Secondly, this thesis contributes to scientific literature on competence-based vocational education in Indonesia. This thesis mapped the competentiveness of study programmes from 41 agricultural VET via the CCBE matrix. This is one of the first efforts to compare more and less competence-based study programmes, on a large scale, in terms of teacher-student interactions and students' competence development, knowledge development, and motivation. By doing this, it is the first attempt to empirically support some of the theoretically expected effects of CBE: students develop more competencies and are more motivated in study programmes that are more competence-based.

With respect to knowledge development in competence-based vocational education, this study supports previous findings (e.g Koopman et al., 2011) by showing that a certain pedagogy (in this case more or less CBE) can stimulate students' development of generic competencies, but on the other hand hamper the development of their knowledge, at least their factual, declarative knowledge (Chapter 3). This finding requires more research and discussion on the role and place of knowledge and knowledge development in CBE.

Thirdly, this thesis contributes to the disuccion of teacher interpersonal behavior in Indonesia for vocational education setting which is hardly found. In a previous study, Maulana et al. (2011) investigated teacher interpersonal profiles in Indonesian secondary schools for English and Mathematics classes and concluded that the most common profile

of teacher interpersonal behaviour in Indonesian Mathematics and English classes is directive. Different from previous study, this thesis showed that the most common profile in Indonesian agricultural vocational schools is tolerant-authoritative (see Chapter 4). This adds to the limiting literature on teacher interpersonal behaviour in the context of vocational education in Indonesia. Next to that, this can be questioned: does the change of teachers behaviour from junior secondary education affect on students learning? How students should react on this transition smoothly? How they should deal with the change?

Fourthly, the mapping of competentiveness scores enables us to compare teacher behaviour in Indonesian agricultural vocational education in LCBE versus HCBE. Based on the CCBE principles, it can be expected that in HCBE programmes teachers are less dominant compared to teachers in LCBE learning environment. And additionally, the displayed teacher expected teacher behaviour in CBE correlated to more competence development and motivation of students. However, our findings show that expected teacher behaviour in Indonesian CBE has not fulfilled what CBE actually requires. This result needs more consideration in future educational program planning to make teachers realise that their own teacher behaviour can effect studentcompetence development.

Lastly, this thesis showed that teachers displayed different behaviour or at least that students perceived their teachers' behaviour differently. Does this mean that students also display different behaviour in interaction with teachers? CBE theory also expects students to behave differently. Can this be observed in their interaction with teachers and/or also in the way they study – more self-regulated and reflective – and work in their work placements?

Practical Implications

This thesis offers several contributions to practical issues on teaching and learning in vocational education and provides inputs for educational policy and practice on how to enhance attractiveness of agricultural vocational education in Indonesia.

Firstly, the principles in the CCBE matrix can be used to guide stakeholder to succed the implementation of Presidential Instruction Number 9/2016. The instruction emphasised to improve Indonesian vocational education by, among other things, improving teacher quality, making study programmes more relevant given the demands of industries and society, building bridges between school-based and workplace learning. The principles in the CCBE matrix, that seem to largely fit the Indonesian context, reflect many of these issues and also show growth levels for schools to develop from more traditional education to this more labour market oriented (competence-based) education. As such, the CCBE matrix can be a useful instrument for schools to reflect on their curriculum and their teaching and learning activities and processes. This can help schools to self-evaluate or identify the strength and the weaknesses of their educational programmes and set priorities for further development. Schools can be encouraged to fulfill the point of weaknesses in requirement as stated in the principles. Also, the government can use the

CCBE principles to fine-tune their rules, regulations and support for schools and teachers as well as to develop a school acrreditation and quality assurance process.

Secondly, with respect to effective teacher behaviour for competence development, the finding of this thesis can be used as input for the improvement of Indonesian teacher education programmes. Indonesian vocational students are vulnerable to drop-out (Suryadharma, 2011). The importance of teacher interpersonal behaviour for student outcomes can be an eye opener for teachers to reflect whether or not their behaviour stimulates student motivation and competence development. If teachers want to stimulate student competence development, instead of only focusing on knowledge, they need to adjust their behaviour accordingly towards a more cooperative and not too controlling teaching style, and additionally check how they are actually being perceived by their students. This can help to keep students motivated and might reduce the number of drop-outs.

Thirdly, Chapter 2 and 4 emphasised the strong needs of improving teacher professional development programmes to support the improvement of the quality of vocational education. As teacher behaviour affects student outcomes, this thesis recommends the government to include teacher interpersonal behaviour and effective teacher behaviour for student competence-development when designing teacher professional development programmes. Previous studies in other countries have shown that teacher professional development programmes can improve teacher awareness on the importance of teacher-student relationship (Driscoll & Pianta, 2010; Pianta, Mashburn, Downer, Hamre, & Justice, 2008) in a classroom. Teachers' knowledge, awareness, and understanding of effective teacher behaviour for competence development will likely have a beneficial effect on students' learning, especially students at risk for school failure because of low motivation as in Indonesia vocational education.

6.5 Limitations and future direction

The limitations for each empirical study have been presented in previous chapters. This section highlights the limitations of investigating competence-based vocational education for CBE effectiveness and teacher behaviour for competence development in the whole thesis regarding theoretical perspectives, design and implications.

With respect to the theoretical perspectives used, this study investigated teaching in CBE from the perspective of teacher interpersonal behaviour. Educational effectiveness research has gained much information about teacher factors contributed to student outcomes (Creemers & Kyriakides, 2008). There are evidences that teacher expectation more activating teaching methods, and more formative assessments make difference on student outcomes. Thus, investigating teaching using different kind of perspectives would also be useful for investigating effective teaching and learning for competence development in competence-based vocational education and might contribute a more evidence-based implementation of CBE.

Related to the study design, the studies used mostly a quantitative approach. A more in depth, qualitative and observatory study might give more detailed information on how CBE principles are actually implemented, how they link to certain types of student-teacher interactions and how they affect student learning. The findings of our large-scale quantitative studies can help to more purposefully decide on and focus future in-depth studies (e.g., what to focus on, what to look for etc.). Additionally, this thesis focuses on food processing and technology. While this was chosen because of the agriculture skill workers for food processing and technology needed, this does not represent the vocational education in Indonesia. Adding more study programmes will give more comprehensive condition of vocational education in Indonesia.

With respect to data analysis, this thesis used multivariate tests and Structural Equation Modelling to test our hypotheses. Even though these analyses allow for taking into account various mediating variables, some scholars might suggest using multilevel modelling due to the hierarchal nature of our data set. With respect to our structural model we can defend that our model and analysis can stand as the baseline for examining connections of teacher interpersonal behaviour, student motivation and student perceived competence levels, we did not explore all possible relationships between the variables and their causality. Some studies in psychology for example showed the reciprocal effects of student intrinsic motivation and perceived competence (e.g., Skinner & Belmont, 1993) which was not yet explored well in this thesis. Further study could consider this reciprocal effect in the next model linking teacher behaviour, student motivation and competence development. Such studies will give more information how effective CBE should come about.

This thesis explored student outcomes in CBE in terms of motivation, perceived competence level, competence development and declarative knowledge. The ultimate goal of CBE is to better prepare students for the labour market. Our research shows that study programmes that have implemented the CBE principles to a higher extent (i.e. High-CBE) result in more motivation, higher levels of competence and more competence development. CBE theory infers that these outcomes will result in students being better equipped for entering the labour market and a variety of jobs. This would be an interesting theme for future research: Do students of H-CBE feel more ready to enter the labour market? Do they find better jobs? Do they find jobs sooner? And do employers notice a difference between graduates educated in H-CBE compared to L-CBE programmes?

Finally, regarding to its implications, this thesis adds to the lacking body of knowledge and empirical evidence for the effectiveness of competence-based education in terms of student learning outcomes. It also enhances our understanding on the effects of teacher behaviour on these student outcomes in the context of competence-based vocational education. Even though this study is conducted in Indonesia, by building on the Comprehensive Competence Based Education framework, its results can offer fruitful new insights and avenues to pursue in other countries in which education systems are being changed towards competence-based education.

References

Ahmed, W., Minnaert, A., Van de Werf, M. P. C., & Kuyper, H. (2010). Perceived social support and early adolescents' achievement: The mediational roles of motivational beliefs and emotions. *Journal of Youth and Adolescence, 39*(1), 36-46.

Baartman, L.K.J. & de Bruijn, E. (2011). Integrating knowledge, skills and attitudes: Conceptualising learning processes towards vocational competence. *Educational Research Review, 6*, 125–134.

Baartman, L.K.J. & Ruijs, L. (2011). Comparing students' perceived and actual competence in higher vocational education. *Assessment & Evaluation in Higher Education, 36* (4), 385 – 398.

Bathmaker, A.M. (2013). Defining 'knowledge' in vocational education qualifications in England: an analysis of key stakeholders and their constructions of knowledge, purposes and content. *Journal of Vocational Education and Training, 65*(1), 87-107. DOI: 10.1080/1363682020012755210.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*, 238-246.

Bentler, P.M. & Bonnet, D. G. (1980). Significance tests and goodness of fit in the analysis of covariances structures. *Psychological Bulletin, 88*, 588-606.

Biemans, H. J. A., Wesselink, R., Gulikers, J.T.M, Schaafsma, S., Verstegen, J. & Mulder, M. (2009). Towards competence-based VET: dealing with the pitfalls. *Journal of Vocational Education & Training*, *61* (3), 267-286.

Biemans, H., Nieuwenhuis, L., Poell, R., Mulder, M., & Wesselink, R. (2004). Competence based VET in the Netherlands: backgrounds and pitfalls. *Journal of Vocational Education and Training, 56*(2), 523-538.

Billett, S. (1998). Constructing Vocational Knowledge: situations and other social sources. *Journal of Education and Work, 11* (3)*, 255 – 273.*

Billett, S. (2001). Knowing in practice: re-conceptualising vocational expertise. *Learning and Instruction, 11* (6)*,* 431-452*.*

Billett, S. (2003). Vocational Curriculum and Pedagogy: an activity theory perspective. *European Educational Research Journal, 2* (1)*,* 6-19.

Blömeke, S. (2017). Assuring quality in competence assessments: The value-added of applying different assessment approaches to professional education In: M. Mulder (Ed.). *Competence-Based Vocational and Professional Education. Bridging the World of Work and Education.* Singapore: Springer, 631-648.

Boahin, P. & Hofman, W.H.A. (2014). Perceived effects of competence-based training on the acquisition of professional skills. *International Journal of Educational Development, 36,* 81 – 89.

Bollen, K.A. (1989). *Structural equations with latent variables*. New York: Willey.

Braun, E., Woodley, A., Richardson, J. T. E. & Leidner, B. (2012). Self-rated Competencies Questionnaire From a Design Perspective. *Educational Research Review, 7*(1), 1 – 18.

Brekelmans, M. (1989). Interpersonal teacher behaviour in the classroom. [In Dutch: Interpersoonlijk gedrag van docenten in de klas]. Utrecht: WCC.

Brekelmans, M., Levy, J., & Rodriguez, R. (1993). A typology of teacher communication style. In T. Wubbels & J. Levy (Eds), *Do you know what you look like?* (pp. 46-55). London: The Falmer Press.

Brekelmans, M., Sleegers, P., & Fraser, B. J. (2000). Teaching for active learning. In P. R. J. Simons, J. L., van der Linden, & T. Duffy (Eds.), *New Learning* (pp. 227-242). Dordrecht: Kluwer.

Brockmann, M., Clarke, L., Méhaut, P., & Winch, C. (2008). Competence-based vocational education and training (VET): the cases of England and France in a European Perspective. *Vocations and Learning, 1*, 227–244.

Brophy, J. (1986). Teacher influences on student achievement. *American Psychologist, 41*, 1069-1077.

Chen, A. (2001). A theoretical conceptualization for motivation research in physical education: An integrated perspective. *Quest, 2,* 35-38.

Cho, Y. J., Weinstein, C.E., & Wicker, F. (2011). Perceived competence and autonomy as moderators of the effects of achievement goal orientations. *Educational Psychology: An International Journal of Experimental Educational Psychology, 31*(4), 393-411. DOI: 10.1080/01443410.2011.560597.

Creemers, B.P.M., & L. Kyriakides. (2008). *The dynamics of educational effectiveness: A contribution to policy, practice and theory in contemporary schools*. London: Routledge.

De Bruijn, E., & Leeman, Y. (2011). Authentic and self-directed learning in vocational education: Challenges to vocational educators. *Teaching and Teacher Education, 27*, 694-702.

Deci, E. L. & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior.* New York: Plenum.

Deci, E. L. & Ryan, R. M. (2007). *SDT: Questionnaires: Intrinsic Motivation Inventory (IMI)*. Retrieved 8 February 2011, from http://www.psych.rochester.edu/SDT/measures/intrins.html.

Den Brok, P. (2001). *Teaching and student outcomes: a study on teachers' thoughts and actions from an interpersonal and a learning activities perspective* (Unpublished doctoral dissertation). Utrecht University, the Netherlands.

Den Brok, P., Bergen, T., Stahl, R. J., & Brekelmans, M. (2004). Students' perceptions of teacher control behaviours. *Learning and instruction, 14,* 425-443.

Den Brok, P., Brekelmans, M., & Wubbels, T. (2004). Interpersonal teacher behavior and student outcomes. *School Effectiveness and School Improvement*, *15*, 407-442.

Den Brok, P., Fisher, D., Brekelmans, M., Rickards, T., Wubbels, Th., Levy, J., & Waldrip, B. (2003). *Students' perceptions of secondary teachers' interpersonal style in six countries: a study on the validity of the Questionnaire on Teacher Interaction.* Paper presented at the annual meeting of the American Educational Research Association, Chicago.

Den Brok, P., Levy, J., Brekelmans, M., & Wubbels, T. (2005). The effect of teacher interpersonal behaviour on students' subject-specific motivation. *Journal of Classroom Interaction, 40* (2), 20-33.

Den Brok, P., Taconis, R., & Fisher, D. (2010). How well do science teachers do? Differences in teacher-student interpersonal behavior between science teachers and teachers of other (school subject). *The Open Education Journal, 3*, 44-53.

Den Brok, P., Tartwijk, J. van, Wubbels, T., & Veldman, I. (2010). The differential effect of the teacher-student interpersonal relationship on student outcomes for students with different ethnic backgrounds. *British Journal of Educational Psychology, 90,* 199 – 221.

Driscoll, K. & Pianta, R.C. (2010). Banking Time in Head Start: Early efficacy of an intervention designed to promote supportive teacher-child relationships. *Early Education and Development, 21*(1), 38–27.

Eraut, M. (2004). Informal learning in the workplace. *Studies in Continuing Education, 26*(2), 247-273, DOI: 10.1080/158037042000225245.

Field, A. (2013). *Discovering statistics using SPSS*. Thousand Oaks, California: Sage Publications Limited.

Fisher, D. & Rickards, T. (1998). Associations between Teacher-Student Interpersonal behaviour and Student Attitude to Mathematics. *Mathematics Education Research Journal, 10,* (1), 3 – 15.

Fisher, D., Waldrip, B., Dorman, J., & den Brok, P. (2007, April). *Interpersonal behavior styles of science teachers in primary education*. Paper presented at the annual meeting of the American Educational Research Association, Chicago.

Fraser, B. J., Aldridge, J. M., & Soerjaningsih, W. (2010). Instructor-student interpersonal interaction and student outcomes at the university level in Indonesia. *The Open Education Journal, 3,* 32-44.

Goh, S. C., & Fraser, B. J. (1998). Teacher interpersonal behaviour, classroom environment and student outcomes in primary mathematics in Singapore. *Learning Environments Research, 1,* 199-229.

Gorham, J. & Christophel, D. M. (1992). Students' perceptions of teacher behaviors as motivating and demotivating factors in College classes. *Communication Quarterly, 40*, (3), 239 – 252.

Gulikers, J. & M. Mulder (2013). “Modelling and Measuring Competencies” Conference, Berlin, 24 - 25 February 2011. In S. Blömeke, O. Zlatkin - Troitschanskaia, C. Kuhn & J. Fege (Eds.). *Modelling and Measuring Competencies in Higher Education: Tasks and Challenges.* Rotterdam: Sense Publishers, pp. 231-236.

Gulikers, J. T. M., Biemans, H. J. A., Wesselink, R., & van der Wel, M. (2013). Aligning formative and summative assessments: A collaborative action research challenging teacher conceptions. *Studies in Educational Evaluation, 39*(2), 116-124. doi: http://dx.doi.org/10.1016/j.stueduc.2013.03.001

Gulikers, J., Bastiaens, T., & Martens, R. (2005). The surplus value of authentic learning environment. *Computers and Human Behavior, 21*, 509 – 521.

Gulikers, J.T.M., Biemans, H., & Mulder, M. (2009). Developer, teacher, student and employer evaluations of competence-based assessment quality. *Studies in Educational Evaluation, 35*(2-3), 110-119.

Gupta, A. & Fisher, D. (2011). Teacher-student interaction in a technology-supported science classroom environment in relation to selected learner outcomes: an Indian study. *MIER Journal of Educational Studies, Trends and Practice, 1* (1) 41 – 59.

Hager, P. (1995). Competence Standards – a Help or a Hindrance? *An Australian Perspective, The Vocational Aspect of Education, 47*(2), 141-151.

Hein, V. (2012). The effect of teacher behavior on students motivation and learning outcomes: A review. *Acta Kinesiologiae Universitatis Tartuensis, 18*, 9 – 19.

Henderson, D. G., & Fisher, D. L. (2008). Interpersonal behavior and student outcomes in vocational education classes. *Learning Environments Research*, *11*, 19-29.

Heusdens, W. T., Baartman, L. K. J., & de Bruijn, E. (2018). Knowing everything from soup to dessert: an exploratory study to describe what characterises students’ vocational knowledge. *Journal of Vocational Education & Training*, 1-20. doi:10.1080/13636820.2018.1437065.

Hughes, J. N. & Cao, Q. (2018). Trajectories of teacher-student warmth and conflict at the transition to middle school: Effects on academic engagement and achievement. *Journal of School Psychology*, *67*, 148-162. DOI: https://doi.org/10.1016/j.jsp.2017.10.003.

Hyland, T. (2006). Swimming Against the Tide: Reductionist Behaviourism in the Harmonisation of European Higher Education Systems. *Prospero, 12*(1), 24-30.

Illeris, K. (2009). *International Perspectives on Competence Development: Developing skills and capabilities*. London: Routledge.

Kaslow, N. J., Borden, K. A., Collins, F. L., Forrest, L., Illfelder-Kaye, J.,Nelson, P. D., et al. (2004). Competencies Conference: Future directions in education and credentialing in professional psychology. *Journal of Clinical Psychology, 80*, 699–712.

Khaled, A. E., Gulikers, J. T. M., Tobi, H., Biemans, H. J. A., Oonk, C., & Mulder, M. (2014). Exploring the Validity and Robustness of a Competency Self-Report Instrument for Vocational and Higher Competence-Based Education. *Journal of Psychoeducational Assessment,* DOI: 10.1177/0734282914523913.

Khaled, A., Gulikers, J., Biemans, H., & Mulder, M. (2014). How authenticity and self-directedness and student perceptions thereof predict competence development in hands-on simulations. *British Educational Research Journal, 41*(2), 265-286, doi: 10.1002/berj.3138.

Kim, B., Fisher, D. L., & Fraser, B. J. (2000). Environment and teacher interpersonal behavior in secondary science classes in Korea. *Evaluation and Research in Education, 14*(1), 3-22.

Koopman, M., Teune, P., & Beijaard, D. (2011). Development of student knowledge in competence-based pre-vocational secondary education. *Learning Environments Research, 14*(3), 205-227. DOI: 10.1007/s10984-011-9092-0.

Kouwenhoven, W. (2003). *Designing for competence: towards a competence-based curriculum for the faculty of education of the Eduardo Mondlane university* (Unpublished doctoral dissertation). Twente University, Enschede the Netherlands.

Kwartolo, Y. (2002). Catatan Kritis tentang Kurikulum Berbasis Kompetensi [Critics on Competence-Based Curriculum]. *Jurnal Pendidikan Penabur*, *1* (1), pp. 75 – 85.

Kyndt, E., Jansenns, I., Coertjens, L., Gijbels, D., Donche, V., & van Petegem, P. (2014). Vocational Education Student's Generic Working Life Competencies. *Vocations and Learning, 7*, 365 – 392. DOI: 10.1007/s12186-014-9119-7.

Kyriakides, L., Creemers, B. P. M., & Antoniou, P. (2009). Teacher behaviour and student outcomes: Suggestions for research on teacher training and professional development. *Teaching and Teacher Education*, *25*(1), 12–23.

Jang, H., Reeve, J., & Deci, E. (2010). Engaging Students in Learning Activities: It Is Not Autonomy Support or Structure but Autonomy Support and Structure. *Journal of Educational Psychology, 102*(3), 588-600. DOI: 102. 588-600. 10.1037/a0019682.

Lapointe.J.M., Legault, F., & Batiste, S.J. (2005). Teacher interpersonal behaviour and adolesents' motivation in mathematics: A comparison of learning disabled, average, and talented students. *International Journal of Educational Research, 43,* 39-54.

Lassnigg, L. (2017). Competence-based education and educational effectiveness: A critical review of the research literature on outcome-oriented policy making in education. In: M. Mulder (Ed.). *Competence-Based Vocational and Professional Education. Bridging the World of Work and Education.* Singapore: Springer, 667-694.

Le Deist, F. D. & Winterton, J. (2005). What is competence? *Human Resource Development International, 8* (1), 27-46.

Liu, W. C., Wang, C. K. J., Tan, O. S., Koh, C., & Ee, J. (2009). A self-determination approach to understanding students' motivation in project work. *Learning and Individual Differences, 19*, 139–145.

Lizzio, A. & Wilson, K. (2004). First-year students' perceptions of capability. *Studies in Higher Education, 29* (1), 109-128. DOI: 10.1080/1234567032000164903.

Lum, G. (1999). Where's the Competence in Competence-based Education and Training? *Journal of Philosophy of Education, (33)*3, 403-418.

MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation analysis. *Annual Review of Psychology, 58*, 593-614.

Mangundjaya, W. L. H. (2013). Is there cultural change in national culture of Indonesia. In Kashima, Y., Kashima, E., & Beatson, R. (Eds.), *Steering Cultural Dynamics Selected Papers from The 2010 Congress of The International Association Cross Cultural Psychology (IACCP)*. University of Melbourne, Australia.

Martin, D. P. & Rimm-Kaufman. (2015). Do student self-efficacy and teacher-student interaction quality contribute to emotional and social engagement in fifth grade math? *Journal of School Psychology*, *53*, 359 - 373.

Maulana, R., (2012). *Teacher-student relationships during the first year of secondary education. Exploration of change and link with motivational outcomes in The Netherlands and Indonesia*. Doctoral Degree Dissertation, University of Groningen, the Netherlands.

Maulana, R., Opdenakker, M. C., Brok, P. den., & Bosker, R. (2011). Teacher-student interpersonal relationship in Indonesia: Profiles and importance to student motivation. *Asia Pacific Journal of Education, 31*, 33-49.

Maulana, R., Opdenakker, M. C., den Brok, P., & Bosker, R. (2012). Teacher-student interpersonal behaviour in mathematics classroom in Indonesia. *International Journal of Science and Mathematics Education, 10,* 21-47.

Maulana, R., Opdenakker, M. C., Stroet, K., & Bosker, R. (2013). Changes in teachers' involvement versus rejection and links with academic motivation during the first year of secondary education: a multilevel growth curve analysis. *J Youth Adolesc, 42*(9), 1348-1371. doi: 10.1007/s10964-013-9921-9.

Miller, G. E. (1990). The assessment of clinical skills/competence/performance. *Academic Medicine, 65*(Suppl.), S63-S67.

Misbah, Z., Gulikers, J. T. M., Mulder, M., & Dharma, S. (2013, July). *Evaluating Competence-Based Education in Indonesian Agricultural Vocational Schools.* Paper presented at the Journal of Vocational Education and Training 10th International Conference. Oxford, United Kingdom.

Misbah, Z., Gulikers, J.T.M., Maulana, R., & Mulder, M. (2015). Teacher interpersonal behaviour and student motivation in competence-based vocational education: Evidence from Indonesia. *Teaching and Teacher Education*, *50*, 79-89.

MoMT. (2009). *Decree No. Kep. 45/MEN/II/2009 on Establishment of Indonesian Qualification Framework for Subsector of Food and Beverage Processing Industry*. Jakarta : Ministry of Manpower and Transmigration.

MoNE. (2003). *Act of the Republic of Indonesia Number 20 year 2003 National Education System*. Jakarta: The Ministry of National Education of the Republic of Indonesia, MoNE.

Mulder, M. & Winterton, J. (2107). Introduction. In: Mulder, M. (Ed.). *Competence-Based Vocational and Professional Education. Bridging the Worlds of Work and Education.* Singapore: Springer, 1-46.

Mulder, M. & D.K. Kintu (2013). Curriculum Development in the Floriculture Sector in Uganda: a Design-Based Validation-Research Study. In: T. Plomp & N. Nieveen (Eds.). *Educational Design Research: Introduction and Illustrative Cases*. Enschede: Netherlands Institute for Curriculum Development.

Mulder, M. (2012). European Vocational Education and Training. Wilson, J.P. (Ed). *Human Resource Development: Learning, Education and Training,* 3rd Edition. London: Kogan Page, pp. 155-175.

Mulder, M. (2014). Conceptions of Professional Competence. In: S. Billett, C. Harteis & H. Gruber (Eds). *International Handbook of Research in Professional and Practice-based Learning,* pp. 107-137. Dordrecht: Springer.

Mulder, M. (2107). Competence Theory and Research: a Synthesis. In: Mulder. M. (Ed.). *Competence-Based Vocational and Professional Education. Bridging the Worlds of Work and Education***.** Singapore: Springer, 1071-1106.

Mulder, M. (Ed.) (2017). *Competence-Based Vocational and Professional Education. Bridging the World of Work and Education.* Singapore: Springer.

Mulder, M., Eppink, H. & Akkermans, J. (2011, September). *Competence-Based Education as an Innovation in East-Africa.* Paper presented at the ECER conference, Berlin.

Mulder, M., Gulikers, J., Biemans, H., & Wesselink, R. (2009). The New Competence Concept in Higher Education: Error or Enrichment? *Journal of European Industrial Training*, *33*(8/9), 755-770.

Mulder, M., Weigel, T., & Collins, K. (2007). The Concept of Competence in the Development of Vocational Education and Training in Selected EU Member States: A Critical Analysis. *Journal of Vocational Education & Training*, *59*(1), 67-88.

Nederstigt, W. & Mulder, M. (2011, September). *The Matrix of Competence-Based Education Evaluated in Indonesian Higher Education*. Paper presented at the ECER conference, Berlin.

Newhouse, D. & Suryadarma, D. (2011). The Value of Vocational Education: High School Type and Labor Market Outcomes in Indonesia. *The World Bank Economic Review, 25*(2):296-322. DOI: 10.2307/23029754

Nuh, M. (2013, March 7). Kurikulum 2013. *Harian Kompas*. Retrieved from http://kemdikbud.go.id/kemdikbud/artikel-mendikbud-kurikulum2013.

OECD. (2009). How many students enrol in vocational programmes? *Highlights from Education at a Glance 2008.* OECD Publishing. Retrieved from http://dx.doi.org/10.1787/eag_highlights-2008-7-en.

Oladele, O.I. (2011). Self-perceived competence among graduating students in the school of agriculture, North-West University, Mafikeng, South Africa. *Journal of Food, Agriculture and Environment, 9*, 639-642.

Opdenakker, M.-C., Maulana, R., & den Brok, P. (2012). Teacher–student interpersonal relationships and academic motivation within one school year: developmental changes and linkage. *School Effectiveness and School Improvement, 23*(1), 95-119. doi: 10.1080/09243453.2011.619198.

Pianta R., Mashburn A., Downer J., Hamre B., & Justice L. (2008). Effects of Web-mediated professional development resources on teacher-child interactions in pre-kindergarten classrooms. *Early Childhood Research Quarterly*, *23*(4), 431–451

Pintrich, P. R. (2003). A motivational science perspective on the role of student motivation in learning and teaching contexts*. Journal of Educational Psychology, 95*, 667-686.

Power, L. & Cohen, J. (2005). *Competency-Based Education and Training Delivery: Status, Analysis and Recommendations*. Retrieved 19 May 2014 from http://datatopics.worldbank.org/hnp/files/edstats/IDNdprep05.pdf.

Raihani. (2007). Education Reforms in Indonesia in the Twenty-first Century. *International Education, 8* (1), 172-183.

Rauner, F. (2007). Practical knowledge and occupational competence. *European Journal of Vocational Education Training, 40*, 52–66.

Rawnsley, D. G. (1997). *Associations between classroom learning environments, teacher interpersonal behavior and student outcomes in secondary Mathematics classrooms.* Unpublished doctoral dissertation. Perth: Curtin University, Science and Mathematics Education Centre.

Reeve, J., Bolt, E., & Cai, Y. (1999). Autonomy-Supportive Teachers: How They Teach and Motivate Students. *Journal of Educational Psychology*, *91*(3), 537-548.

Rickards (1998). *The relationship of teacher-student interpersonal behavior with students sex, cultural background and student outcomes* (Unpublished doctoral dissertation). Curtin University, Perth.

Rickards, T., Brok, P. den., & Fisher, D. (2005). The Australian science teacher: a typology of teacher-student interpersonal behaviour in Australian science classes. *Learning Environments Research, 8*(3), 267-287.

Roberts, G.C., Treasure, D.C., & Conroy, D.E. (2007). Understanding the dynamic of motivation in sport and physical activity: An achievement goal interpretation. In G. Tenenbaumand R.C. Eklund (Eds.), *Handbook of sport psychology (3rd ed., pp.*

3–30). Hoboken, NJ: Wiley.

Rogoff, B. (1990). *Apprenticeship in thinking – Cognitive development in social context*. New York, NY: Oxford University Press.

Ryan, R. M. & Deci, E. L. (2000). Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology, 25*, 54–67.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55,* 68-78.

Schaap, E. H., de Bruijn, E., van der Schaaf, M.F., & Kirschner, P.A. (2009). Students' personal professional theories in competence-based vocational education: the construction of personal knowledge through internalisation and socialisation. *Journal of Vocational Education and Training, 61*(4), 481-494, DOI: 10.1080/13636820903230999.

Schaap, H., de Bruijn, E., Van der Schaaf, M. F., Baartman, L. K. J., & Kirschner, P. A. (2011). Explicating Students' Personal Professional Theories in Vocational Education through Multi-method Triangulation. *Scandinavian Journal of Educational Research, 55*(6), 567-586. doi: 10.1080/00313831.2011.555922.

Schön, D. A. (1983). *The Reflective Practitioner. How Professionals Think in Action*. New York: Basic Books.

Scribner, S., & Beach, K. (1993). An activity theory approach to memory. *Applied Cognitive Psychology, 7*, 185–190.

Seezink, A. & Poell, R. F. (2010). Continuing professional development needs of teachers in schools for competence-based vocational education: A case study from the Netherlands. *Journal of European Industrial Training, 34*(5), 455-474.

Shuell, T. J. (1996). Teaching and learning in a classroom context. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology* (pp. 726-764). New York: Simon & Schuster Macmillan.

Sivan, A. & Chan, D. W. K. (2013). Teacher interpersonal behaviour and secondary students' cognitive, affective and moral outcomes in Hong Kong. *Learning Environment Research*, *16,* 23–36 DOI 10.1007/s10984-012-9123-5

Skinner, E. A., & Belmont, M. J., (1993). Motivation in the classroom: Reciprocal effects of teacher behaviour and student engagement across the school year. *Journal of Educational Psychology, 85,* 571-581.

Slavin, R.E. (2008). Perspectives on Evidence-Based Research in Education – What Works? Issues in Synthesizing Educational Program Evaluations. *Educational Research, 37* (1), 5 – 14. Doi: 10.3102/0013189x08314117.

Soerjaningsih, W., Fraser, B.J, & Aldridge, J.M. (2002, April). *Instructor-student interpersonal behaviour and student outcomes at the university level in Indonesia*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans.

Solomon, G. H. (2016). *Towards competence-based technical-vocational education and training in Ethiopia*. Doctoral Degree Dissertation, Wageningen: Wageningen University and Research.

Steven, J. P. (2002). *Applied multivariate statistics for the social sciences* (4 th ed.). Hillsdale, NJ: Erlbaum.

Stroet, K., Opdenakker, M. C., Minnaert, A. (2015). What motivates early adolescents for school? A longitudinal analysis of associations between observed teaching and motivation. *Contemporary Educational Psychology, 42*, 129–140

Sturing, L., Biemans, H.J.A., Mulder, M. & De Bruijn, E. (2011). The Nature of Study Programmes in Vocational Education: Evaluation of the model for Comprehensive Competence-Based Vocational Education. *Vocations and Learning*, *4*(3), 191-210.

Sulfasyah. (2013). *Investigating the implementation of the Indonesian KTSP (school-based curriculum) in the teaching of writing in year two*. Retrieved from http://ro.ecu.edu.au/theses/602

Taylor, G., Jungert, T., Mageau, G. A., Schattke, K., Dedic, H., Rosenfield, R., & Koestner, R. (2014). A self-determination theory approach to predicting school achievement over time: the unique role of intrinsic motivation. *Contemporary Educational Psychology, 39*, 342–358.

Telli, S., den Brok, P., & Cakiroglu, J. (2007). Teacher–student interpersonal behavior in secondary science classes in Turkey. *Journal of Classroom Interaction, 42,* 31-40-rex.

Urdan, T. & Schoenfelder, E. (2006) Classroom effects on student motivation: Goal structures, social relationships, and competence beliefs. *Journal of School Psychology*, *44*, 331–349.

Utomo, E. (2005). *Challenges of Curriculum Reform in the Context of Decentralization: The Response of Teachers to a Competence-Based Curriculum (CBC) and Its Implementation in Schools* (Unpublished doctoral dissertation). University of Pittsburgh, USA.

Van Amelsvoort, J. (1999). *Perspective on instruction, motivation and self-regulation* (Unpublished doctoral dissertation: in Dutch). Nijmegen University, the Netherlands.

Van der Vleuten, C., Sluijsmans, D., & Joosten-ten Brinke, D. (2017). Competence assessment as learner support in education. In: M. Mulder (Ed.). *Competence-Based Vocational and Professional Education. Bridging the World of Work and Education.* Singapore: Springer, 607-630.

Van Oord, L. & den Brok, P. (2004). The International Teacher: Students' and teachers' perceptions of preferred teacher-student interpersonal behaviour in two United World Colleges. *Journal of Research in International Education, 3,* 131-155.

Van Ryzin, M. J. (2011). Protective factors at school: Reciprocal effects among adolescents' perceptions of the school environment, engagement in learning, and hope. *J Youth Ado lescence*, *40*,1568–1580. DOI 10.1007/s10964-011-9637-7.

Van Uden, J.M., Ritzen, H., & Pieters, J.M. (2014). Engaging students: The role of teacher beliefs and interpersonal teacher behaviour in fostering student engagement in vocational education. *Teaching and Teacher Education, 37*, 21-32.

Vansteenkiste, M., Simon, J., Lens, W., Sheldon K. M., & Deci, E. L. (2004). Motivating learning, performance, and persistence: The synergistic role of intrinsic goals and autonomy support. *Journal of Personality and Social Psychology, 87,* 246-260.

Velde, C. (1999). An alternative conception of competence: implications for vocational education. *Journal of Vocational Education and Training, 51*(3), 437-447.

Walberg, H.J., Singh, R., & Rasher, S.P. (1977). Predictive validity of student perception: A cross-cultural replication. *American Educational Research Journal, 14,* 45-49.

Ward, M., Gruppen, L., & Regehr, G. (2002). Measuring self-assessment: Current state of the art. *Advances in Health Sciences Education, 7*, 63–80.

Watzlawick, P., Beavin, J. H., & Jackson, D. (1967). *The pragmatics of human communication.* New York: Norton.

Wei, M., Van den Brok, P., & Zhou, Y. (2009). Teacher interpersonal behaviour and student achievement in English as a Foreign Language classrooms in China. *Learning Environment Research, 12,* 157-174.

Wesselink, R. (2010). *Comprehensive competence-based education. The development and use of a curriculum analysis and improvement model*. Doctoral Degree Dissertation, Wageningen: Wageningen University and Research.

Wesselink, R., Biemans, H. J. A., Gulikers, J. T. M. & Mulder, M. (2017). Models and Principles for Designing Competence-based Curricula, teaching, learning and assessment, In: Mulder. M. (Ed.). *Competence-Based Vocational and Professional Education. Bridging the Worlds of Work and Education.* Singapore: Springer, 533-554.

Wesselink, R., Biemans, H. J. A., Mulder, M., & Van der Elsen, R. (2007). Competence-based VET as seen by Dutch researchers. *European Journal of Vocational Training, 40*, 38-51.

Wesselink, R., Dekker-Groen, A. M., Biemans, H. J. A., & Mulder, M. (2010). Using an instrument to analyse competence-based study programs: experiences of teachers in Dutch vocational education and training. *Journal of Curriculum Studies, 42*(6), 813-829.

Westera, W. (2001). Competences in education: a confusion of tongues. *Journal of Curriculum Studies, (33)*1, 75-88.

White, R. W. (1959). Motivation reconsidered: The concept of competence. *Psychological Review, 66,* 5, pp. 297-333.

Weigel, T., Mulder, M., & Collins, K. (2007). The concept of competence in the development of vocational education and training in selected EU member states. *Journal of Vocational Education and Training, 59*(1), 51-64.

Wijnia, L., Kunst, E., Van Woerkom, M., & Poell, R. (2016). Team learning and its association with the implementation of competence-based education. *Teaching and Teacher Education*, 56, 115–126.

Wijnia, L., Loyens, S. M. M., & Derous, E. (2011). Investigating effects of problem-based versus lecture-based learning environments on student motivation. *Contemporary Educational Psychology, 36*, 101–113.

Williams, S. & Raggatt, P. (1998). Contextualising Public Policy inVocational Education and Training: the origins of competence-based vocational qualifications policy in the UK, *Journal of Education and Work*, *11*(3), 275-292, DOI: 10.1080/1363908980110304.

Wright, S; Paul, H., Sandra P & Sanders, W. L. (1997). Teacher and Classroom Context Effects on Student Achievement: Implications for Teacher Evaluation. *Journal of Personnel Evaluation in Education, 11*, 57-67.

Wubbels, T. & Brekelmans, M. (2005). Two decades of research on teacher-student relationships in class. *International Journal of Educational Research, 43,* 6 – 24.

Wubbels, T. & Levy, J. (1991). A comparison of interpersonal behaviour of Dutch and American Teachers. *International Journal of Intercultural Relations, 15,* 1 – 18.

Wubbels, T., Creton, H., Brekelmans, J. M. G., & Hooymayers, H. P. (1987). De perceptie van de leraar-leerlingrelatie; constructie en kenmerken van een instrument [The perception of the teacher-student relationship; construction and characteristics of an instrument]. *Tijdschrift voor Onderwijsresearch, 19,* 3-16.

Wubbels, T., Creton, H.A, & Hoymayers, H.P. (1985). *Discipline problems of beginning teachers: Interactional teacher behaviour mapped out*. Paper presented at the Annual Meeting of the American Association Research.

Young, M. (2009). National qualification frameworks: An analytical overview. In R. Maclean and D. Wilson (Eds.), *International handbook of education for the changing world of work* (pp. 2867 – 2880). Dordrect, The Netherlands: Springer.

Yu, T., & Chen, C. (2012). Thinking styles and preferred teacher interpersonal behavior among Hong Kong students. *Learning and Individual Differences, 22,* 554-559.

Appendix

	Principle	Not CB	Starting to be CB	Partially CB	Largerly CB	Completely CB
1	**The study programme is based on core tasks, working processes, and competences (the qualification profile)**	During the development of the study programme the qualification profile is not synchronized with professional practice. Teachers are not familiar with the qualification profile	During the development of the study programme the qualification profile is seldom used and the programme is not synchronized with professional practice. Teachers are seldom familiar with the qualification profile.	During the development of the study programme the qualification profile is partially used and the programme is partially synchronized with professional practice. Teachers are moderately familiar with the qualification profile.	During the development of the study programme the qualification profile is often used and the programme is largerly synchronized with professional practice. Teachers are familiar with the qualification profile.	During the development of the study programme the qualification profile is at all times used and the programme is synchronized with practices and developments in the profession. Teachers are familiar with the qualification profile.
2	**Complex vocational core problems are central.**	Complex vocational core problems are not central to the study programme.	Complex vocational core problems are occassionally central to the study programme. Occassionally students work on vocational core problems.	Complex vocational core problems are central to some parts of the study programme.	Complex vocational core problems are often central to the study programme and are assessed in different contexts. The compexity of the problems does not increase during the study programme.	Complex vocational core problems are at all times central to the study programme and are assessed in many different contexts. The compexity of the problems increase during the study programme.

	Principle	Not CB	Starting to be CB	Partially CB	Largerly CB	Completely CB
3	**Learning activities take place in different concrete, meaningful vocational situations.**	Students learn in school. Learning in practice is of subordinate importance.	Students learn occassionally in practical settings but classroom work is predominant. A link is seldom made between classroom learning and learning through practical experience.	Learning activities (both in and outside school) take place partially in concrete, meaningful practice settings. A link is sometimes made between classroom learning and learning through practical experience.	Participants often work (both in and outside school) individually and in teams on learning activities that take place in several meaningful, concrete practice settings. A link is often made between classroom learning and learning through practical experience.	Participants always work (both in and outside school) individually and in teams on learning activities that take place in various meaningful, concrete practice settings. A link is always made between classroom learning and learning through practical experience.
4	**Knowledge, skills and attitudes are integrated.**	Knowledge, skills and attitudes (K, S and A) are separately developed during the learning process. The three aspects are assessed separately.	K, S and A are seldom integrated in the learning process. K, S and A are assessed separately.	K, S and A are integrated in some parts of the study programme. K, S and A are assessed separately.	K, S and A are often integrated in the learning process. Assessment of K, S and A is integrated as much as possible.	K, S and A are always integrated in the learning process. K, S and A are assessed as an integrated whole.

	Principle	Not CB	Starting to be CB	Partially CB	Largerly CB	Completely CB
5	**Students are regularly assessed**	Assessment is the final stage of a learning task and is qualifying. Vocational practice is not involved during the assessment.	Assessment takes place at several times during the learning process and is qualifying. The students' competence development is seldom assessed. Vocational practice is seldom involved during the assessments.	Assessment takes place at several times and is qualifying. Sometimes the students' competence development is assessed. Vocational practice is sometimes involved during the assessments.	Assessment takes place at before, during and after the learning process and is both qualifying and focused on the competence development of students. The timing and format of the assessments are the same for all students. Vocational practice is often involved during the assessments.	Assessment takes place at before, during and after the learning process and is both qualifying and focused on the competence development of students. Students determine the timing and format of the assessments themselves. Vocational practice is at all times involved during in the assessments.
6	**Students are challenged to reflect their own learning.**	Students are not challenged to reflect their own learning.	Students are seldom challenged to reflect on their learning and the learning outcomes.	Students are sometimes challenged to reflect on their learning and the learning outcomes.	Students are often challenged to reflect on their learning and the learning outcomes.	Students are at all times challenged to reflect on their learning, the learning outcomes and the occupation.

	Principle	Not CB	Starting to be CB	Partially CB	Largerly CB	Completely CB
7	**The study programme is structured in such a way that the students increasingly self-steer their learning.**	There are no possibilities during the study programme for self-steering. The teacher is responsible for the learning process of the student.	The study programme seldom offers possibilities for self-steering. The teacher is responsible for the learning process of the student.	The study programme partially offers possibilities for self-steering. Students have an influence on their own learning process. The teacher and the student are jointly responsible for the learning process of the student.	The study programme often offers possibilities for self- steering. Students have an influence on their own learning process. The teacher and the student are jointly responsible for the learning process of the student.	The study programme offers at all times possibilities for self-steering. Students design their own learning process. The student's self steering of their learning process increases during the programme. Each student is ultimately self-responsible for his/her learning process.
8	**The study programme is flexible**	The study programme is the same for each student. There are no possibilities to alter the study programme for a specific student.	The study programme is the same for each student. There are possibilities for the students to follow the courses at their own pace.	The study programme is the same for each student, but there are possibilities to alter the programme based on the accomplished competences of the students and earned dispensations.	The study programme is the same for each student, but can be followed at a student's own pace. The students can choose between different learning activities.	The study programme is flexible and planned with the coach based on the characteristic of the student.

	Principle	Not CB	Starting to be CB	Partially CB	Largerly CB	Completely CB
9	**The guidance is adjusted to the learning needs of the students.**	The teacher is an expert. Transfer of knowledge is crucial.	The teacher is an expert. The teacher offers guidance which is seldom adjusted to the learning needs of the students.	The teacher is a coach and an expert. The teacher offers guidance which is partially adjusted to the learning needs of the students.	The teacher is a coach, mentor and an expert. The teacher offers varied guidance which is often adjusted to the learning needs of the students.	The teacher is a coach, mentor and an expert. The teacher offers varied guidance which is at all times adjusted to the learning needs of the students. Students are stimulated to help each other.
10	**In the study programme attention is paid to learning, career, and citizenship competencies.**	No attention is paid to learning, career, and citizenship competencies during the study programme.	Attention is seldom paid to learning, career, and citizenship competencies during the study programme. These competencies are not integrated during the study programme.	Some attention is paid to learning, career and citizenship competencies during the study programme. These competencies are not integrated during the study programme.	Attention is oftenpaid to learning, career and citizenship competencies during the study programme. These competencies are integrated with vocational core problems.	Attention is often paid to learning, career and citizenship competencies during the study programme. These competencies are integrated in the study programme.

Summary

Competence-based education (CBE) is an educational innovation that has entered many countries all over the world during the last 20 years. Also Indonesian Vocational Education and Training started to implement CBE from 2004 onwards. Theory and research in the field of CBE in vocational education have advanced enormously during the last decades, although empirical research on CBE lags far behind. CBE research and practice is criticised for the lack of evidence on the effectiveness of CBE for actually stimulating student motivation and competence development or decreasing dropout; for the diminishing attention to knowledge development in CBE practice, and the cross-sectional nature of much CBE research. Chapter 1 defines the core of this thesis through explaining the framework of CBE and the Indonesian vocational education context in which this is implemented and studied throughout this thesis. It also presents the overview of methodologies and research questions.

Chapter 2 investigates the realisation of competence-based education (CBE) in vocational education in Indonesia. It examines the extent to which CBE design principles of the Comprehensive Competence-Based Education Framework (Sturing et al. 2011; Wesselink et al. 2007) developed in a Western context exist in Indonesian policy documents and school practices. This study reviews educational policy documents and collects cross-sectional survey data from 41 school principals, 453 teachers, and 2219 students from 41 agricultural vocational schools in five provinces of Java, Indonesia. Results showed that the ten CCBE principles listed in the framework exist to large extent in Indonesian policy documents. School principals, teachers, and students noticed the realisation of CCBE principles in the study programme to differing degrees, except for the principle of flexibility that was largely absent in the eyes of all stakeholders. The level of CBE implementation varied, from the level of *starting competence-based* to that of *largely competence-based* education. This study was used to select "high CBE" VET schools versus "low CBE" VET schools to participate in the follow up studies of this thesis.

Chapter 3 examines student outcomes in high CBE programmes versus low CBE programmes. Specifically, this chapter compares students' competence and knowledge development in VET programmes that have implemented the CBE principles to a higher or lesser degree (indicated as high, or HCBE, and low, or LCBE). The study involved 506 students majoring in food processing and technology and 32 teachers from 11 agricultural secondary vocational schools (six HCBE; five LCBE). Teachers and students rated student competency levels using the Competence Development Measurement Instrument (based on Khaled et al., 2014). Student knowledge was tested with a validated multiple-choice test. Longitudinal data were collected during one school year, at three points in time. The results showed that students' competence development was higher in HCBE was higher compared to LCBE. This means that the implementation of CBE was successful in terms

of stimulating competence development. On the other hand, knowledge development was lower in HCBE than in LCBE, supporting more often heard criticism that knowledge development and competence development might be at odds.

Shifting to CBE requires changing roles of teachers and students (Wesselink et al., 2007). Teachers should act not only as knowledge expert, but also take on the role of coach and facilitator of students' learning processes, while students should be more active during the learning process. The changing roles are likely to influence the pattern of teacher-student interaction and the way students perceive their teachers' behaviour. Chapter 4 examines how students (*N*=1469) from high competence-based and low competence-based vocational schools perceive their teachers' interpersonal behaviour and how this impact on their motivation. Results showed comparable teacher profiles in HCBE and LCBE schools, with an unexpected difference at the dimension level: student in the HCBE perceived their teacher to be more dominant than student in LCBE. Expected changes in teacher roles were not yet perceived in HCBE schools, while perceived teacher interpersonal behaviour moderated connections between high or low CBE and student motivation, with greater impact in LCBE than in HCBE learning environments. Students in a high competence-based context showed higher intrinsic motivation, however, this relation was moderated by how students perceived their teachers. Results suggested that students' intrinsic motivation was more closely associated to teachers' proximity than to their influence and the associations were stronger in LCBE than in HCBE learning environments.

Chapter 5 identifies the relations between teacher perceived behaviour and student motivation and competence development in wither a high or low CBE context. Specifically, this study examines the connections between the two dimensions of teacher interpersonal behaviour (proximity and influence) and student competency levels of four measured competencies, and how these connections might be mediated by students' intrinsic motivation. Additionally, it examines if these relationships differ in learning environments which have high to low characteristics of competence-based education (HCBE vs LCBE). Three questionnaires filled in by 506 first-year students were analysed using Multigroups Structural Equation Modelling. In both HCBE and LCBE context, the results showed direct effects of teacher interpersonal behaviour dimensions on students' competency development as well as indirect effects partially mediated by students' intrinsic motivation. Two significant differences were found between the structural model of the HCBE versus LCBE contexts: first, teacher cooperative behaviour (i.e., the proximity dimension) affected student motivation and in turn their competency development more positively in LCBE environments. Second, teachers' controlling behaviour (i.e, the influence dimension) lowered students' perceived competency levels, and the resulting deteriorating effect is stronger in HCBE learning environments.

Finally, chapter 6 summarises the findings of preceding chapters and answers the main research questions presented in Chapter 1. This discusses the findings in a broader perspective, focusing on the validation of competence-based education framework, the

effectiveness of competence-based vocational education, and teacher behaviour for student competence development.

Authorship Statement
Wageningen University

PhD candidate's name	:	Zainun Misbah
First promotor	:	Prof. Dr. Martin Mulder
Title of PhD thesis	:	Teacher-student interaction in competence-based vocational education in Indonesia
Date of public defence	:	21 May 2019

Chapter 1 General Introduction. I discussed the chapter's structure with my promotor and co-promotor. I developed a framework linking four main research questions of this thesis and connecting them with the existing literature. I then wrote the first draft and revised it incorporating feedback from my promotor and co-promotor.

Chapter 2 Evaluating competence-based vocational education in Indonesia. Based on the existing literature, I developed the research questions in collaboration with my promotor and co-promotor. In order to address these questions, I jointly worked with my promotor and co-promotor to design specifications of the theoretical framework. I collected the data and carried out the empirical analysis. I wrote the first draft of this chapter and revised it according to the comments of my promotor and co-promotor. After finishing this chapter, I submitted it to a peer-reviewed journal.

Chapter 3 Competence and knowledge development in competence-based vocational education in Indonesia. Collaborating with my promotor and co-promotor, I developed the research questions. We designed the questionnaire and developed the strategy for data collection and analysis. I conducted a survey, analysed the data, wrote the first draft of this chapter elaborating the link between these questions and the existing literature, revised the draft. I submitted this chapter as a separate manuscript in Learning Environments Research. It was finally published online in November 2018.

Chapter 4 Teacher interpersonal behaviour and student motivation in competence-based vocational education: Evidence from Indonesia. Working with my promotor and co-promotor, I defined research questions. As for chapter 3, we designed the questionnaire and set up the data analysis plan. I carried out the survey, analysed the data, wrote the first draft of this chapter describing the link between these questions and the existing literature and revised it. I submitted the final version of this chapter as a separate manuscript to Teaching and Teacher Education. It was finally published in August 2015.

Chapter 5 Exploring connections between teacher interpersonal behaviour, student motivation, and competency level. Working with my promotor and co-promotor, I defined research questions, and proposed the model used in this study based on the existing literature. My co-promotor suggested the data analysis strategy. I collected the data and

analysed them. I wrote the draft of the chapter and revised it incorporating feedback from my promotor and co-promotor. After finishing this chapter, I submitted it as a separate manuscript to a peer reviewed journal.

Chapter 6 General Discussion. I wrote the draft of this chapter after discussing its structure and argumentation with my promotor and co-promotor and revised it incorporating feedbacks from my promotor and co-promotor.

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Yanti, Endang, Pri, Nia, Puput, Buyung, Widya, Tino, Andi, Uji, Nasyith, and Martono. Thank you for your support, encouragement, and a reminder for me to finish of what I started. Especially to Pak Surya Dharma, thank you for your support in getting my PhD application going and securing scholarship for my studies. I apologize that the supervision process did not work out as expected. Pak Subahi, Pak Was, Bu Tina, Bu Neni, and Bu Rena, thank you for allowing me to have some official leaves so that I could have time to work on my research.

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Wageningen, 21 May 2019

Zainun Misbah

About Author

Zainun Misbah was born in Bantul, Yogyakarta, Indonesia. After graduating from Faculty of Cultural Sciences Gadjah Mada University in Yogyakarta-Indonesia in 2002, he worked as an administration staff member in Mathematics Teacher Training Development Center in Yogyakarta. In 2004, he moved to Jakarta, the capital city of Indonesia, working as a technical staff at the Ministry of Education and Culture. Awarded by Stuned-NESO scholarship, he continued to study for pursuing his MSc in Faculty of Behavioral and Social Sciences, University of Groningen – the Netherlands in 2006-2007. He went back to Indonesia as a technical staff in the Directorate General of Teachers and Educational Personnel (Ditjen GTK), Ministry of Education and Culture, working on several projects dealing with teacher professional development.

In 2009, he took a short course in Competency-Based Learning hosted by MDF Training and Consultancy in Ede, the Netherlands. The two-week course motivated him to study further on competence-based education, and his application for PhD sandwich program in Education and Competence Studies, Wageningen School of Social Sciences was accepted. In September 2010 he started his PhD project. The sandwich model allowed him to keep working in the Ministry of Education and Culture while writing this thesis. He can be reached at zainun.misbah@kemdikbud.go.id.

List of publication:

- Misbah, Z., J. Gulikers, R. Maulana and M. Mulder (2015). Teacher interpersonal behaviour and student motivation in competence-based vocational education: Evidence from Indonesia. Teaching and Teacher Education, 50, August, pp. 79-89.
- Misbah, Z., Gulikers, J. & Mulder, M. (2018). Competence and Knowledge Development in Competence-Based Vocational Education in Indonesia. *Learning Environments Research*. https://doi.org/10.1007/s10984-018-9276-y

Contribution in a conference/seminar:

- Misbah, Z; Gulikers, J. T. M. & Mulder, M (2014). Teacher Interpersonal Behavior in Competence-Based Agricultural Secondary Education and its relation with students' competence. Poster presented at AERA Annual Meeting, Philadelpia, USA.
- Misbah, Z; Gulikers, J. T. M; Mulder, M. & Dharma, S. (2013, July). *Evaluating Competence-Based Education in Indonesia Agricultural Vocational Schools*. Paper presented at the Journal of Vocational Education and Training 10th International Conference. Oxford, United Kingdom.
- Misbah, Z; Gulikers, J. T. M; Maulana, R; & Mulder, M. (2013, July). *Teacher Interpersonal Profiles in Indonesia Competence-Based Agricultural Education and*

Its Relation with Student Motivation. Paper presented at 16th Biennial Conference International Study Association on Teachers and Teaching (ISATT). University of Ghent, Belgium.

- Misbah, Z; Gulikers, J. T. M. & Mulder, M. (2012, May). *Lesson learned from the Historical Development of Competence Vocational Education in Indonesia*. Paper presented at WASS PhD Day. Wageningen University, the Netherlands.
- Misbah, Z; Gulikers, J. T. M. & Mulder, M. (2012, September). *Competence-Based Vocational Education and Student Working Readiness: Evidence from Indonesia*. Poster presented at the Open Forum of Conference on Policy Transfer on Vocational Skill Developments Revisited. Zurich, Switzerland.

Zainun Misbah
Wageningen School of Social Sciences (WASS)
Completed Training and Supervision Plan

Wageningen School of Social Sciences

Name of the learning activity	Department/Institute	Year	ECTS*
A) Project related competences			
Research Methodology: From Topic To Proposal	WASS	2010	4
Techniques for Writing and Presenting Scientific Papers	WGS	2012	1.2
Education in Developing and Changing Societies, ECS 510806	ECS	2010	6
Writing Research Project Proposal	WASS	2010	6
Manuscript and PhD Meeting	ECS	2010 - 2014	1
B) General research related competences			
Introduction workshop	WASS	2010	0
'Competence-based Vocational Education and Student Working Readiness: Evidence from Indonesia'	Conference on Policy Transfer in Vocational skills Development Revisited, University of Zurich, Switzerland	2012	1
'Teacher-student Interpersonal relationship in Indonesia competence-based Agricultural Education'	16 Biennial International Conference, University of Ghent, Belgium	2013	1
'Evaluating competence-based education in Indonesian agricultural vocational schools'	The tenth International JVET Conference, Oxford University, UK	2013	1
'Evaluating Competentiveness of Agricultural vocational schools in Indonesia'	ICSEI Congress, Yogyakarta State University, Indonesia	2014	1

Name of the learning activity	Department/Institute	Year	ECTS*
'Teacher Interpersonal Behavior in Competence-Based Agricultural Secondary Education and its relation with students' competence'	AERA Annual Meeting, Philadelpia, USA	2014	1
'Teacher-Student Interpersonal Behaviour in Indonesian Competence-based Agricultural Education and Its Relation with Students Motivation'	WASS PhD day	2014	1
C) Career related competences/personal development			
Project and Time Management	WGS	2010	1.5
Organising School Leadership Programme: Benchmarking and Networking	Ministry of National Education, Indonesia	2011	2
Information Literacy for PhD	Library Service, WUR	2011	0.6
PhD Competence Assessment	WGS	2011	0.3
Scientific Publishing	WGS	2011	0.3
Atlas-ti: Hands on practical	WASS	2012	0.5
SEM With Lisrel	University of Indonesia	2013	0.6
Master class: Psychology of health and environmental behavior. Self-regulation and self-control	WASS	2014	0.5
CoS-SIS Seminar: Science for impact, focus on enabling conditions	WASS, PE&RC	2014	0.3
PhD Workshop Carousel	WGS	2015	0.3
Total			31.1

*One credit according to ECTS is on average equivalent to 28 hours of study load

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