Exploring vocational pedagogy and collaborative work-based learning of students as the manifestation of vocational teachers' workplace learning

by

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Statement of Originality

I, ZHAO, YANMIN, hereby declared that I was the sole author of the folio and the material presented in this folio was my original work except those indicated in three journal articles (I was the first author of included journal articles and Dr. James Ko was the second author). I further declare that I have followed the University's policies and regulations on Academic Honesty, Copyright and Plagiarism in writing the folio and no material in this folio has been submitted for a degree in this or other universities.

Abstract

This folio is a collection of three separate research papers which includes one theoretical paper and two other empirical studies and each contribution can also be read as a stand-alone article. The overall aims of the folio are to revise the proposed vocational teachers' workplace learning model and its practical application into teaching and learning in vocational education and training and to illustrate how vocational teachers enact vocational pedagogy developed from classroom-based learning. Moreover, the folio also further addresses vocational students' learning in the work-based collaborative learning environment. Following the revised theoretical model of workplace learning, the two empirical research studies reflect on occupational pedagogy and teachers' work-related knowledge and experiences in collaborative learning and adaptive instructions. The second paper mainly focuses on vocational teaching behaviours in facilitating practice-based teaching pedagogy concerning students' occupational learning, which implied on the practical importance of collaborative instructions in vocational pedagogy and students' participation in hands-on activities. The contribution of the third paper relates to the findings of the second paper, and the third paper contributes to vocational students' learning patterns and learning participation concerning collaborative learning environments and adaptive instructions through dialogic analysis of classroom observations. These findings implies on interactive work-based learning in vocational teaching and learning relating to professional education, the vocational curriculum, and knowledge and experience.

Key words: workplace learning model, vocational pedagogy, learner engagement, collaborative learning environment, adaptive instructions.

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Preface

This folio is prepared as part of the Doctoral Programme to include three journal papers. Paper 1 was published in Studia Paedagogica, paper 2 in the International Journal of Educational Management, and the manuscript of paper 3 was submitted to the International Journal of Academic Development. The publication details as below:

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Chapter 1 Introduction

1.1 The background and the overarching research direction

Vocational education and training is one of the essential components of the education system in mainland China. As a major supplier of skilled workers, the Chinese VET system is experiencing an enormous change in developing labour needs for local industry, which includes three levels of vocational education: junior secondary training schools, vocational senior high schools, and higher vocational institutions (Guo & Lamb, 2010). Usually located in rural areas, junior vocational training schools, and these schools provide students with necessary professional knowledge and skills to meet local labour needs. Specialist vocational high schools play a significant role in training students with specialised and technical skills, specialities in particular areas, and secondary-level skills for direct entry into the workforce. Higher vocational institutions mainly recruit students from general high schools and vocational high schools, which place emphasis on higher-level practice-oriented skills for industry and production. Therefore, various forms of vocational training are encouraged to meet the increasing demands of local economic development in different regions in mainland China.

The rapid changes in the era of globalisation driven by the economic forces of the 21st century have generated concern about the levels of quality and innovation in the VET (Catts, Falk & Wallace, 2011; Jackson, 2013; Sweet, 2013). The significant changes include implementing a work-based vocational education curriculum; linking vocational learning with labour-market requirements; and recontextualising both the curriculum and vocational workplace knowledge. These have brought about a call for new forms of vocational learning and teaching because the conventional forms of vocational knowledge and skills are no longer considered sufficient for the rapid changes in workplace environments (Fenwick, 2003; Göhlich & Schöpf, 2011; Hillier, 2009).

As a result, various countries across the world are updating their VET systems with the intention of improving vocational pedagogies and of renewing teachers' knowledge relating to the workplace and the characteristics of the vocational field. For example, VET teacher training systems in European countries reflect some of the core issues of VET teacher learning and training challenges such as continuous professional development to produce qualified vocational workforce (Misra, 2011). The transformation of conventional teacher education suggests emerging roles for both teachers and students regarding the new learning and working environments for students (Majumdar, 2011). Therefore, the overarching research direction of the three papers included is aiming at vocational teachers' workplace learning that influence their teaching pedagogies and students' work-based learning situations.

1.2 Theoretical development in three studies

The first paper as a conceptual foundation explains the theoretical development of the workplace learning model and its application in the Chinese context of vocational education. The second paper of vocational teaching pedagogy and student engagement goes beyond the initial mode but assumes a relationship between the two papers, which is the part involving the focus on the workplace learning of vocational teachers. Adaptive teaching and collaborative learning in vocational learning environments highlights the features of work-based teaching in vocational classrooms and further develops workplace teaching practice in the third paper.

The workplace learning model in the first paper emphasises vocational teachers' professional development and their occupational competence development in the teaching profession based on Illeris's (2003, 2009, 2011) learning model, which illustrates that professional learning within a professional identity implies the demands of lifelong learning in the context of professional learning organisations. Therefore, new focuses on professional

learning development and the teaching profession are connected to learning in the workplace. The extended workplace learning model develops a new theory of professional learning that refers to vocational teachers in leading or participating in a task group or dialogue with colleagues and other professionals for improvement of teaching practice in the workplace, namely, emphasising more the application and integration of practical knowledge in terms of work-based activities related to teaching contexts.

Following this, the second paper provides the specific context of vocation-oriented teaching and students' learning engagement. This paper continues to emphasise the theoretical aspect of work-based instructions and their applications within vocational teaching pedagogy and also reviews vocational teaching quality and effectiveness, aiming towards a common standard of professional teaching and learning. The third paper continues to provide a conceptual clarification of ways of adaptive instruction and collaborative learning in vocational learning environments. Vocational learning environments under the model of workplace learning play an important role in integrating theoretical learning and professional practice. Thus, in response to the theory of the workplace learning model described in the first paper, the second and third papers further apply the model within the context of Chinese vocational education using empirical evidence.

1.3 Practical impact of the three publications

From the practical perspective, the findings of the three papers have a significant impact on knowledge transfer between vocational teachers' integration of their work-based learning activities and workplace settings. Firstly, workplace learning for vocational teachers suggests that the nature of application-oriented vocational education requires teachers' practical knowledge (that acquired in the workplace through experiencing hands on learning) and skills to integrate with their teaching and training activities. Practically, vocational teachers' individual and peer work-related learning affect their professional competence development

by participating in workplace learning environments. Regarding transferring teachers' learning to teaching practice, vocational teaching pedagogies including work-based instructions in students' learning activities allow teachers to adjust staged instructions for the specific subject and to collaborate with teaching assistants in specialised subjects. In addition, students' learning engagement discussed in the second and the third paper offers valuable empirical evidence of practice-oriented teaching and learning that encourage students' active participation in their learning process.

1.4 The relationships among the three publications

The first paper analysed the theoretical framework of workplace learning concerning vocational teachers' professional learning and development. More specifically, it focused on the possible applications of Illeris's work-based learning models in the context of the Chinese vocational context. The key concepts of workplace learning discussed in the article are associated with the significance of learning practice, different aspects of learning situations, and social levels of learning. However, the second and third papers emphasise more the practical aspect of teaching practice and student engagement in the context of vocational pedagogy. These two articles provide in-depth insights into vocational learning settings and the application of practical teaching in vocational classrooms.

1.4.1 Guidance on practical teaching and learning

The first paper explained workplace learning theories and definitions of workplace learning from a theoretical perspective. In particular, workplace learning models (Illeris, 2003, 2009, 2011) provide a foundation for extending the learning framework in the Chinese vocational education context. The extended workplace learning framework pointed out individual and organisational aspects of practical learning for vocational education teachers and their application in vocation-oriented teaching and professional development. The first paper offered theoretical guidance on vocational instructions, collaborative teaching, and the

application of students' hands-on skills was analysed in the second paper. The second paper emphasised the relationship between pedagogical practice and students' learning engagement, work-based learning and workplace experiences both for vocational students and teachers associated with the learning framework mentioned in the first paper.

Vocational teaching practice and effective teaching behaviours were discussed in terms of facilitating students' learning engagement within vocational learning environments, as mentioned in the second paper, and the third paper further analysed the importance of the vocation-oriented learning environment for collaborative teaching and adaptive instructions in order to engage students' work-related learning. The extended workplace learning model in the Chinese vocational context, as explained in the first paper, provided theoretical positions in researching vocational teaching and learning along with students' learning environments. Papers two and three focused on the practice of teaching and learning among teachers and students in the context of Chinese vocational institutions and demonstrated empirical evidence on how effective teaching behaviours and adaptive instructions enhance students' learning engagement.

1.4.2 Leading the change of vocational pedagogy

The second paper investigates vocation-oriented teaching pedagogy on students' learning engagement, which further analyses work-based instructions and the application of collaborative teaching. The study also demonstrates the differences in vocational teaching behaviours that influence students' learning in the changing learning environment. More precisely, the third paper provides empirical evidence on how collaborative learning and adaptive instructions stimulate vocational students' learning in various training classrooms. Both of these two papers provide empirical evidence on students' engagement with work-based learning in various vocational learning environments, which shows that vocational

instructions and collaborative learning are more diversified in terms of adjusting students' practical learning.

The findings of the second paper show that certain vocational subjects in Chinese vocational learning environments allow flexible settings to facilitate classroom activities in supporting subject training and vocational knowledge construction. However, students' engagement in small-group collaborative learning is highlighted in the third paper in order to focus on students' learning activities, and these activities involve structured and adaptive instructions to engage students' practical learning. Although both papers include students' learning engagement in the context of a vocational classroom, different perspectives on students' learning are manifested through analysing vocational teaching behaviours and adaptive instructions.

1.4.3 Facilitating adaptive instructions in vocational learning environments

The third paper explores adaptive instructions regarding students' learning activities in changing vocational learning environments and students' collaborative learning in relation to the professional field. The findings of the second paper implied further research on vocation-oriented instructions to students' classroom learning engagement for the third paper. Moreover, the results of investigating the relationship between teaching behaviours and students' engagement suggest that vocational teachers' adaptive instructions are more important in improving vocational learning and teaching practice. In regard to the development of students' learning and occupational competence, adaptive instructions for vocational students place emphasis on activating vocation-oriented activities and encouraging built-in flexible teaching arrangements, as in the third paper.

On the other hand, the first paper highlighted a workplace learning model for vocational teachers in terms of their working and learning situations that implied teachers' transfer of vocational knowledge through integrating work-related activities in their teaching. As the

first paper mainly introduced the definitions of workplace learning and the work-based learning model, the other two empirical papers further developed the possible applications of the learning model in a range of students' learning engagements and pedagogical instructions. Thus, two empirical papers partially discussed workplace learning related to students' collaborative engagement and vocational instructions rather than focusing on the teachers' perspective on professional learning. The main focus of each paper is illustrated in the following three chapters.

Chapter 2 Paper 1 – Workplace learning in the professional development of vocational education teachers

Yanmin Zhao & James Ko

Abstract

Workplace learning is defined as variously and plays a pivotal role in the enhancement of vocational education teachers' practices. Based on a comprehensive desk-based review of the related literature, this article defines and discusses the concept of workplace learning and its contribution to vocational education teachers' continuous professional development. The article explicitly demonstrates that the existing theoretical frameworks guiding workplace learning are mainly drawn from different learning theories. Among these, Illeris's (2011) learning model is found to be theoretically sound and to provide a foundation to be extended to hypothesise about the relationships of various key concepts discussed in association with the workplace learning of vocational education teachers. Three lines of arguments have been identified for providing support to Illeris' model: (1) the significance of workplace learning practices, (2) individual and social aspects of learning situations, and (3) individual and social levels of workplace learning. In addition, based on Illeris's model and related literature on teacher professional development, the article proposes a workplace learning model for vocational education teachers and evaluates its implications for vocational education teachers' professional development, work identities, and transfer of knowledge into practice in the working situation in vocational education and training.

Keywords: workplace learning, professional development, vocational education teachers, workplace learning model

2.1 Introduction

Many organisations are still facing challenges in promoting employees' well- being. Despite their success at making economic connections, organisations often lack adequate psychological support for their employees and fail to provide sufficient opportunities for cultural and social exchanges. To deal with these challenges, organisations need to promote new forms of collaboration among workers, provide them with professional skills and knowledge, establish their work identities, and, above all, engage them in different types of workplace learning that enhance job satisfaction (Jacobs & Park, 2009; Tynjälä, 2013). Research on workplace learning and work-based learning has become popular in the context of vocational education and training over the past two decades (Fuller & Unwin, 2011; Illeris, 2003; Schaap, Baartman, & Bruijn, 2012). The study of workplace learning has evolved over the years from exploring tacit knowledge to building up explicit knowledge in learning science. Theories on workplace learning involve not only conceptual frameworks but also practical strategies to understand possible improvements in teaching and learning for vocational education.

The literature covers the quality of workplace learning related to content, guidance, and assessment and the quality of the connections between work-based and school-based learning. The existing guidance for workplace learning emphasises modelling and coaching in different workplaces, while guided learning strategies that are closely associated with everyday activities in the workplace are used as supplementary learning strategies through daily work practices (Billett, 2000; Mikkonen, Pylväs, Rintala, Nokelainen, & Postareff, 2017). Authors who have dealt with this issue have also discussed individual and organisational influences on guiding workplace learning, in particular, individuals' willingness to engage in structured and guided workplace training. According to Billett (2001b), for example, guided learning strategies for improving workplace learning have four

requirements: appropriate implementation of a workplace learning environment, suitable modification of a workplace learning curriculum for the particular enterprise, encouragement of teacher commitment and learner participation and those who guide the learning, and proper preparation of learning guides. The four requirements for guiding learning would shape workplace learning arrangements, help to refine workplaces as learning environments, and, more likely, determine the development of workplace learning, the quality of guided workplace learning, and the outcomes of workplace learning assessment.

The present article analyses the professional development of vocational teachers through workplace learning using Illeris's (2011) triangular workplace learning model. A workplace learning model is also developed by extending Illeris's workplace learning model for vocational teachers.

First, the article discusses the contextual definition of workplace learning. It is envisaged that this will facilitate the comprehension of the evolving definition of workplace learning as well as the working definition for vocational education teachers. Second, an effort is made to provide a brief analysis of Illeris' workplace learning model and its connection with various learning theories. Third, based on Illeris' model, a workplace learning model for vocational education teachers is proposed and discussed. The discussion highlights three dimensions of the model related to workplace learning identities, competence development, and the implementation of professional development for vocational education teachers in workplace learning. Our underlying goal is to conceptualise engagement in workplace learning activities that contribute to building learners' work identity and directing individuals to actively engage in workplace practices.

2.2 Workplace learning

Scholars around the world define workplace learning in various ways. Generally, workplace learning is depicted as a link between work and learning in human development.

From a theoretical perspective, Cairns and Malloch (2011) argued that the concept of workplace learning is related to three terms: work, place, and learning. Work is associated with what people do, and the process of engaging individuals in activities to complete tasks or reach expected outcomes (Cairns & Malloch, 2011). Place, in relation to work and learning, can refer to the physical or psychological spaces where individuals work, think, and learn (Hutchison, 2004). In particular, in the context of workplace learning place covers a wide range of notions and settings including physical and spiritual locations where individuals think they can learn and where they have social interactions (Cairns & Malloch, 2011). The term learning broadly comprises a range of activities which can be associated with an individual's work. Integrating work, place, and learning into a single construct is not straightforward, but more complicated than it seems.

As a pioneer in the study of workplace learning back in the 1990s, Stephen Billett (1994) defined workplace learning as a way of acquiring knowledge and skills in activities that are directly involved in a real task where learners are guided directly by a skilled mentor. Later, Billett (2002) further categorised workplace learning knowledge as propositional knowledge, procedural knowledge, or dispositional knowledge based on Anderson's (1982) division of conceptual knowledge and procedural knowledge. For Billett, the acquisition of conceptual knowledge must be achieved in the process of engaging in social practices and daily work, and the close interaction between individuals is a very important source of knowledge in the process of individual learning and the construction of knowledge. In this regard, Billet's concept of workplace learning knowledge is comparable to the theory of sociocultural constructivism's emphasis on the interaction between experience and environment in the construction of knowledge.

Workplace learning is often described as informal learning due to its lack of explicit pedagogical instructions (Eraut, 2004). Billett (2002) criticised this idea, however, stating

that classifying workplace learning knowledge or its learning environment as informal or unstructured is imprecise because norms, values, and practices within workplace activities can be highly structured and intentionally organised. For example, while the goals and practices of educational institutions may frame the activities in which students engage, the goals and practices of workplace learning environments also determine the nature and variety of workers' activities (Billett, 2001a, 2004). Learning is a negotiated and reciprocal process in which individuals' learning changes in different kinds of social practices. Billett concluded that learning in workplaces and the development of workplace learning need to be reconceptualised in terms of the continuity of participatory practices. In applying the concept of "communities of practice" to workplace learning, Hodkinson and Hodkinson (2004a, 2004b) reconceptualised "community of practice" to develop a wider understanding of the learning relationship between individual learners and organisational influences. In a case study exploring two teachers' workplace learning, the individual learners' dispositions were found to have a significant effect on their learning (Hodkinson & Hodkinson, 2004b).

From a more restrictive perspective, a workplace refers to a site or situation where work takes place. However, workplace learning should be understood from a broader perspective to include any site where there are opportunities to learn about doing the work and its improvement. Thus, workplace learning is not geographically bounded but located socially, where learning about work takes place. For this reason, Jacobs and Park (2009) defined workplace learning as

> *"the process used by individuals when engaged in training programs, education and development courses, or some type of experiential learning activity for the purpose of acquiring the competence necessary to meet current and future work requirements" (p. 134).*

Jacob and Park's definition of workplace learning also assumes that there should be a balance between learning and work such that an organisation has to provide individuals with opportunities for workplace learning in which the work-related benefits and goals are clear and understood. Hodkinson and Hodkinson's (2005) findings suggest that extensive learning environments can improve teacher learning opportunities and indicate that the likelihood of a strategy can increase these learning opportunities.

According to Barnett (1999), work has inevitably become one part of learning, and learning is accordingly also an essential part of work. That is, from an epistemological perspective knowledge is developed or learnt gradually by a worker from the work process, which is inseparable from the learning process. In highlighting the importance of vocational knowledge from a social realist perspective, Young (2008) argued that the links between tacit knowledge and knowledge from the workplace are the essential basis for vocational knowledge. Broad (2016) further suggested that vocational teachers can use their continuing professional development (CPD) activities to translate tacit vocational knowledge into classrooms, linking their learned knowledge from CPD with their pedagogy in their classrooms. Lucas, Loo, and McDonald (2005) acknowledged the difficulties of integrating subject knowledge (which is associated with vertical knowledge [in Bernstein's terms] that is not particularly related to specific contexts but a conceptual understanding in research communities) with practical pedagogy (which is associated with horizontal knowledge that refers to the specific contexts and situations). They apply sequential and concurrent models of integrating subject knowledge and practical pedagogy to explain teacher learning and teaching experience in the teacher training program.

Based on these conceptions and notions of knowledge, in this article, the workplace learning of vocational education teachers refers to the process wherein teachers actively participate in their workplace and learning situations to advance their professional

knowledge. Workplace learning includes formal training activities and informal learning activities that involve the interactions between vocational teachers and their working environment. In this working definition of vocational teachers' workplace learning, more emphasis will be given to situational learning in which learning is not just for acquiring knowledge and skills but also for developing the habits and skills of sharing knowledge in the context of vocational education and training. This emphasis on knowledge sharing is crucial for understanding workplace learning theories and models in the professional development of vocational education teachers, as discussed below.

2.3 Illeris's workplace learning model

Theoretical frameworks guiding workplace learning are often drawn from different learning theories, for example, Lave and Wenger's (1991) situated learning theory, Wenger's (2000) community of practice in social learning systems, Jarvis's (2011) adult learning model, and Kolb's (2014) experiential learning cycle. All of these models are constructed from social learning theory, which attempts to explain human learning behaviours in terms of continuous reciprocal interactions between cognitive, behavioural, and environmental influences: "most human behaviour is learned observationally through modelling: from observing others, one forms an idea of how new behaviours are performed, and on later occasions, this coded information serves as a guide for action" (Bandura, 1977, p. 192). Therefore, the generic model can be extended indicating a workplace learning for students highly related to an orchestration of teacher-student and student-student Interactions as suggested (Dillenbourg, 2002; Dillenbourg & Jermann 2006).

A model for learning in working life was developed by Illeris (2003, 2005, 2009) to illustrate the learning environment of workplaces and the learning process. He explained that workplace learning is a dynamic learning process built on previous life events and experiences in which the individual and groups use opportunities for learning in their

communities at the workplace. In linking with learning in social practice, Wenger (2000) viewed the concept of community of practice as a framework for thinking about learning in activities, conversations, or other forms of participation in social life. In the development of teachers' learning in the workplace, community of teaching practice in teachers' workplace groups informs learning in practice involving forms of mutual engagement between individuals and their communities. Comparing Illeris's (2005; 2009) workplace learning models and Wenger's (2000) community of practice (CoP) on informal learning in the workplace, another aspect of learning theory, the concept of experiential learning (Kolb, 2014) refers to the learners' involvement in activities in correspondence with real learning environments (Illeris, 2007; Tynjälä, 2008, 2013). Workplace learning is very much about experiential learning that provides links between individuals and their environments.

However, Illeris's (2005; 2011) workplace learning model (Figure 1) suggests that workplace learning at the individual level includes three main dimensions in a social learning situation. The content dimension consists of learners' knowledge, skills, understandings of the learning content, and attitudes toward learning. The incentive dimension contains learners' feelings, emotions, and motivations in the learning process. The interaction dimension encompasses learners' mutual communication and cooperation in the process of learning. This triangular learning model reflects deep theoretical foundations of workplace learning as the three dimensions form a learning triangle in an individual's work which is socially situated in society.

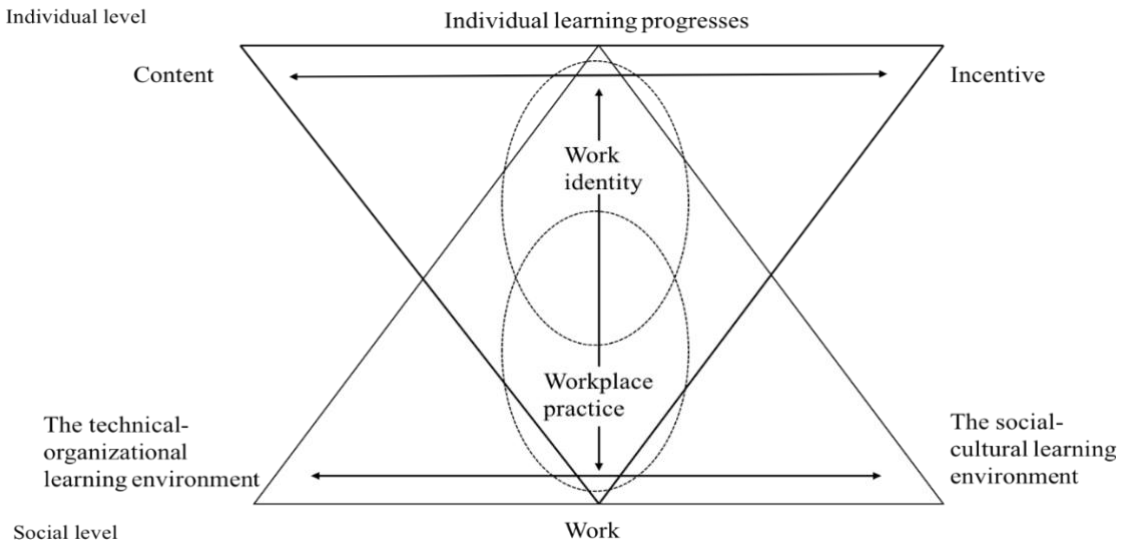

Figure 1 Learning in working life (Illeris, 2011, p. 37)

Illeris's dual-layer learning model is not only concerned with the general individual level of learning but also assumes workplace learning occurs at the individual's work, which is part of the workplace practices embedded at the social level. Learning in working life is important because it occurs within the interaction between workplace practices and learners' work identity, which is rooted in the technical-organisational learning environment and the sociocultural learning environment (Illeris, 2011; Jorgensen & Warring, 2003). The technical-organisational learning environment is defined as the requirements imposed on employees at the workplace, such as work content, labour division, opportunities for using qualifications, and possibilities of social interactions. The sociocultural learning environment, on the other hand, is concerned with matters related to social groups and processes in the workplace, such as traditions, norms, and values embedded in the working and cultural communities (Illeris, 2005, 2009).

Learning is significantly influenced by the contexts and learning settings in which it occurs, so contexts and settings are, by default, socially and culturally constructed. Regarding learning in the working life, there are two paths for workplace learning. The first path focuses

on learners' individual learning processes. For Lave and Wenger (1991) and Wenger (2000), the workplace is a focal point of situated learning where both the individual's work and learning process are part of workplace learning. The second path highlights the workplace as a learning environment embedded in a technical-organisational learning environment and a sociocultural environment. For some theorists, the technical- organisational environment of workplace learning is essentially part of the socio-cultural environment that contains all the artefacts of human culture because the sociocultural context is conceptually broader than the organisation (e.g. Tynjälä, 2013). Therefore, understanding the significance of cultural influence in the physical environment requires knowledge of space and time and possible interpretations of a range of different learning settings (Eraut, 2004).

2.4 A workplace learning model for vocational education teachers

Illeris's (2011) learning model is a synthesis of learning theories that have substantial implications for developing a vocational education teacher's workplace learning model. It deserves further attention as it is appropriate for understanding vocational teachers' workplace learning and professional development. For vocational teachers, more CPD is needed to strengthen their competence in their dual profession (Andersson & Köpsén, 2015). Examples of CPD for vocational teachers include that related to teaching and competence-based learning (Lloyd & Payne, 2012) and raise the quality of vocational teaching (Wheelahan & Moodie, 2011). For building a workplace learning model for vocational education teachers, Illeris' learning model provides a theoretically sound foundation that can be modified and extended to hypothesise about vocational education teachers' workplace learning.

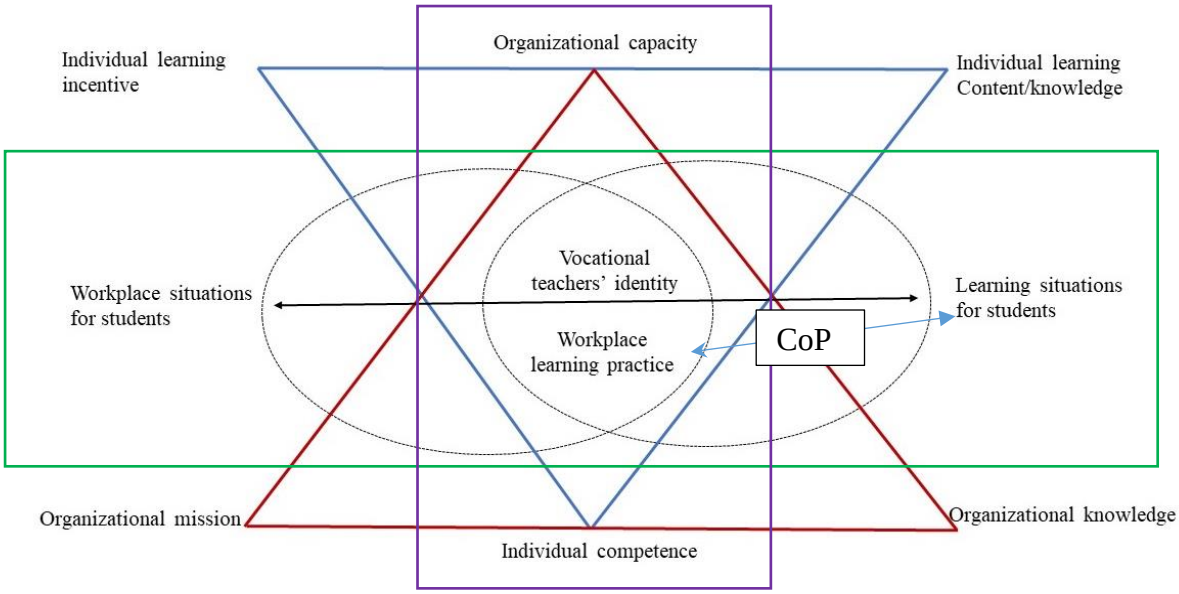

Figure 2 Model of workplace learning of vocational education teachers

Workplace learning model can be modified especially for vocational teachers' learning in the context of vocational education in terms of the rapid changes in workplace environments (Göhlich & Schöpf, 2011; Hillier, 2009). In Figure 2, the workplace learning for vocational education teachers takes place in the interaction between teachers' identity and learning practices. As shown in the central focus area of the model in Figure 1, the learner's identity forms the core of workplace learning because learning is a dynamic psychological process that involves an individual's work-life that defines the learner's work identity. Moreover, workplace learning exists in the interaction between workplace practices and changes in work identity, and this interaction also indicates the learners' work competence development manifested in the acquisitions of certain technical skills in the technical- organisational and sociocultural learning environment.

Second, just as Illeris's model in Figure 1 indicates that learning in work-life can be explored from individual and social perspectives, our workplace learning model for vocational education teachers also assumes individual and organisational aspects to learning. Similarly, work and learning situations are two different forms of expression in vocational

teachers' learning situations. Therefore, the model in Figure 2 specifies that individual teacher learning occurs in an overlapped condition between an individual learning situation and an organisation or workplace situation, depicted as two triangles specifying the three dimensions of each learning situation. The specific learning situation and context not only stimulate the occurrence of learning but also affect learning performance. The individual learning situation involves the individual learning incentive, individual competence, and individual learning content/knowledge, representing the immediate situation where vocational teachers can enhance their competence through CPD when they have a will to learn. The workplace situation, which usually manifests in cultural forms and social interactions, indicates the situation where the teachers driven by the organisational mission can strengthen organisational capacity by increasing organisational knowledge from their CPD.

Third, workplace learning also coexists at both individual and social levels. As Illeris (2005; 2011) has suggested, because learning is contextual and happens in the context of social interaction, human interaction becomes an integral part of learning through interactions with other learners. Regardless of the level of occurrence, vocational education teachers are at the central focus of this learning model as the agents of learning.

Finally, Figure 2 has an additional middle or classroom layer. This is intended to capture the fact that the conditions of vocational teachers' professional development are different from those of other types of teachers due to the nature of vocational teaching as a dual professional (Andersson & Köpsén, 2015), which indicates that indicates that teachers were teaching specialised subjects in vocational institutions and at the same time they were qualified in specific areas or working in the companies as engineers or other career professions. On the one hand, just like other teachers, their professional development aims to improve their knowledge and skills by affecting their attitudes and beliefs towards teaching

and learning (Desimone, 2009). Teachers apply new knowledge and skills obtained in their professional development to their work situations to improve their pedagogy (Wang, 2014). The modified elements highlighted vocational pedagogy that deal with the dynamic relationship between learning situations and workplace situations for students to ensure students' adequate applications of knowledge as skills for the work or vocation. However, vocational education teachers are also expected to participate in effective professional development with a strong content focus and active learning to prepare students for their future workplaces in the classroom. For this reason, vocational teachers have to connect workplace situations with classroom learning situations for their students. Students in vocational education have to acquire knowledge for a practical purpose. Therefore, this workplace learning model emphasises the middle part of the individual teacher's professional development, including work identities and learning practice on the path of vocational teachers' professional development to encourage active workplace learning.

After analysing our expanding model of a workplace learning model for vocational education teachers, we will examine some empirical evidence on the workplace learning, work identities, and competence development of vocational education teachers through professional development with respect to our conceptual framework.

2.5 Workplace learning for the professional development of vocational education teachers

As for the specificities of the professional development of vocational teachers, many researchers have focused on CPD that enables them to update and upgrade their professional skills that vocational teachers need to be experts in pedagogical approaches and their sector specialism . In their comparison of the CPD practices in such countries as England and Norway, Lloyd and Payne (2012) found that vocational teachers have more opportunities to improve vocational practices by sharing ideas in CPD activities. CPD for vocational teachers not only provides them with a space to reflect on issues more systematically in a structured

course but also helps them to integrate subject knowledge and practical pedagogy even when the subject knowledge is not particularly connected to the CPD. Researchers such as Lucas, Loo, and McDonald (2005) also saw some challenges in integrating subject knowledge with "how to teach" in teachers' training and learning. In distinction to general teachers' professional development, vocational teachers need to keep up to date with the trade which is the area they are teaching in order to transfer vocational knowledge from the specific occupation to classroom use and maintain and develop vocational education teachers' pedagogy and professional skills in the CPD (Broad, 2016; Lloyd & Payne, 2012).

Optimising the design of workplace learning activities and certifying innovative workplace learning organisations can promote vocational teachers' professional development in workplace learning. Meanwhile, to meet the requirements of professional development, Peng (2014) showed that vocational education teachers took part in formal teacher training programs to achieve learning objectives at different stages of professional development (novice teachers, competent teachers, backbone teachers, and expert teachers). However, when vocational education teachers acquire actual knowledge through practical work, their professional growth from this form of informal learning is often difficult to document or observe (Li, Ji, & Li, 2010). Workplace learning for vocational teachers takes place both formally and informally through building learning organisations, professional learning communities, and virtual teaching and learning platforms.

Therefore, Illeris's model helps to deepen knowledge of the professional development of vocational education teachers and conceptualise the benefits of vocational teachers' participation in learning in both the community of practice and the institutional environment. Case study evidence shows that learning at work emphasises various learning patterns and different forms of participation in both industrial societies and school-based learning communities (Fuller, Hodkinson, Hodkinson, & Unwin, 2005). The application of Illeris's

model to the professional development of vocational education teachers can draw on these teachers' learning processes with its distinction between the individual and social levels in CPD.

2.6 Work identities on the path of vocational teachers' professional development

The professional identities of vocational teachers are usually formed through participating in the workplace of their vocational specialism. The development of teacher identity is a dynamic process which involves the interaction of multiple parts including prior professional work experience, teacher education experience, current teaching practice, and teaching career plans (Olsen, 2008). This article only focuses on the formation of work identities of vocational education teachers in their workplace learning along with their professional development. For vocational teachers, their vocational identity is related to the specific vocational field, which requires that these teachers actively participate in a work-related community of practice so as to benefit from a high-quality professional identity in their CPD (Andersson & Köpsén, 2015). Tynjälä (2013) reviewed a large amount of literature on workplace learning and concluded that the formation of work identities is related to learners' active engagement in any learning environment.

Meanwhile, workplaces also provide guidance and support for individuals to understand the idea of workplace learning and engage in core activities (Billett, 2002, 2004). However, it is worthwhile to emphasise the significance of the individual's agency while discussing the formation of the identity of vocational teachers in their workplace learning. As Vähäsantanen and Billett (2008) argued, "the construction of professional identity, therefore, can be seen as an ongoing process in which individuals are active agents" (p. 3). Thus, individual teachers' agency in the workplace is more likely to shape their vocational and occupational identities through the teaching and professional practices in the workplaces. In relation to the model of Illeris' learning dimension triangles, vocational teacher's identity formation occurs as a result

of—and likewise impacts upon— the change and continuity of its learning environments. Individual vocational teachers negotiate their agency and modify their work identity formation. In other words, how vocational teachers perceive their professional identity, echoes how these teachers exercise their agency. Therefore, vocational teachers not only use their skills and knowledge in their workplace learning but also identify themselves with the kind of work which they are doing.

Accordingly, vocational practices for teachers are more prone to being a strong source of interest that is embedded in professional identity (Billett, 2000). A workplace learning framework emphasises the nature of workplace learning, describing how learning takes place at work and how the socio-cultural environment impacts learning at work (Illeris, 2005, 2011; Tynjälä, 2013). From a sociocultural perspective, Köpsén (2014) conducted a study of 22 Swedish vocational teachers focusing on how these teachers perceived their vocational teacher identity and found that vocational teachers had a close relationship with vocational students and tended to encourage their students to engage in social activities in order to guide students into their future working lives. Professional identities are negotiated through participating in work, and different personal strategies such as ongoing professional development and active participation are closely associated with the teachers' personal concerns, which are also bound up with their individual resources that can be adopted to understand how identities change through changing work practices (Vähäsantanen & Billett, 2008). Thus, reflecting on the learning model, vocational teachers with robust professional development strategies are motivated to remain committed to the teaching work and continue their teaching profession at the same organisation. Meanwhile, vocational teachers are also motivated to take on challenging tasks with appropriate training and support in their workplace learning and use professional development as a learning tool to achieve a better teaching career

2.7 Competence development in the context of vocational education

In relation to the workplace learning of vocational teachers' competence development, it is also important to discuss the three learning dimensions that constitute the learning triangle. In the content dimension, learners' skills and knowledge are about what they learn in dealing with life in workplaces (Illeris, 2011). The incentive dimension covers the mental energy and motivational forces that are required in learning engagement. Therefore, the content and incentive learning dimensions are integrated through the interactive process between individual learning and the social learning environment. On the other hand, the new skills and knowledge that have been learnt may influence emotional and motivational patterns. Therefore, the content dimension may change the incentive dimension patterns concerning mental energy mobilisation. The interaction dimension promotes individuals' engagement in social contexts, that is, individuals' ability, skills, and knowledge that are applied within various forms of social interaction (Illeris, 2003, 2005, 2011).

Regarding vocational teachers' individual workplace learning, the transfer of professional competence is affected by workplace learning environments. Individual, organisational, and workplace factors impact the process of learning transfer within workplace contexts (Davids, Bossche, Gijbels, & Garrido, 2016). The characteristics of workplace learning for vocational teachers are broad and diverse. Increasingly, more requirements have been imposed on vocational education teachers because of the rapid economic and social developments stimulated by globalisation and technology; vocational teachers have had to fine-tune the training objectives, training methods, training mode, and evaluation methods to maintain the effectiveness of vocational education (Li, Ji, & Li, 2010; Yu, 2015). In practical learning practices, vocational teachers in their workplaces are required to learn the theoretical knowledge of different professions, business production technology, and management (Wang & Deng, 2013). In learning situations, as shown in Figure 2, vocational education teachers

also need to acquire classroom teaching skills, understand vocational teaching methods, obtain practical guidance, and learn from colleagues, enterprise engineers, and technicians to improve their own professional skills.

Furthermore, vocational teachers' workplace learning is collaborative and interactive. Diversified teaching models in vocational education such as enterprise–school cooperation, work-integrated learning, and replacement internships have changed students' ways of learning, living spaces, and interpersonal communication, which compels school education to be more open and diversified. Therefore, vocational teachers' workplace learning also requires collaboration with enterprises to learn business management and the practical skills of guiding students to promote development at schools and enterprises and encourage mutual cooperation between teachers and students (Peng, 2014; Wang, 2014; Wang & Deng, 2013).

In addition, vocational teachers' workplace learning is situational and practical because the nature of vocational education is technically oriented education that requires vocational teachers to be "double-qualified" teachers, which means that teachers possess both practical and academic abilities in teaching and learning (Yu, 2015). Vocational teachers achieve this qualification through the practice of their work in workplace learning. Their learning is based mainly on solving problems inherent in vocational education, such as student management, curriculum development, internship, and other practical issues, to improve their teaching skills and teaching quality. Vocational teachers can also develop their practical knowledge and skills by participating in business training in enterprises and experiencing production management in their workplace learning situations.

2.8 Conclusion

In this article, a proposal has been presented to understand the potential of an effective workplace learning environment to understand vocational education teachers' learning in their professional development. In addition, a summary has been provided of the key

definitions of workplace learning along with its changing contexts and the new directions of emerging theories of workplace learning. Illeris's (2011) dual triangle workplace learning model has been expanded, analysed, and evaluated, in particular regarding its implications for vocational education teachers' transfer of work identities and their practices in working situations in vocational education and training. After reflections on Illeris's workplace learning model and related literature on learning theories, vocational education teachers' specific workplace learning model in the condition of the characteristics of their working and learning situations has been proposed. The proposed model for vocational education teachers' workplace learning highlights the interactions of vocational education teachers' work identities with individual and organisational learning situations and their competence development through integrating workplace practices in work situations. In summary, the article explored vocational education teachers' professional development through the dynamics of their workplace learning. The proposed model provides a theoretical framework for empirical studies to examine teachers' professional learning through the interactions between teacher identity and work practices and the experiences related to various learning dimensions of the workplace learning triangles in different environments.

Linking vocational teachers' work-based learning with students' learning engagement, Lucas, Spencer and Claxton (2012) offered some new thinking on vocational teachers' learning about working with suitable materials, learning about working with different occupational areas and learning about working with the new range of teaching methods. Therefore, the professionalisation of vocational teaching and learning as an essential element of vocational pedagogy strongly affects learners' engagement and teachers' pedagogic choices concerning the contextual understanding of learning transfer and workforce skills development which will be further addressed in the following chapter.

Chapter 3 Paper 2 – How do teaching quality and pedagogical practice enhance vocational student engagement? A mixed-method classroom observation approach

Yanmin Zhao & James Ko

Abstract

This paper aims to investigate vocational teaching behaviours in facilitating pedagogical practice concerning students' classroom engagement. A mixed-method approach with quantitative classroom observations and qualitative field notes was conducted at two higher vocational institutions in Guangdong province, south of China. Sixty lesson observations were rated combining with supplementary field notes from 20 teacher participants analysed through a comparative coding process. Means of dimensions of teaching behaviours and student engagement were calculated based on taking the averages of the means of items theoretically associated with each dimension. Through thematic analysis of observational notes, vocational instructions and students' engagement in vocational learning environments were more diversified in vocational teaching practice, which manifested that vocational teaching behaviours focused more on adjusting students' practical learning. The limitation is shown that the quantitative sample is small yet affords a greater depth of data for further discussion. This study develops its setting and orientation by applying the classroom observation instrument into the Chinese high vocational context and offers more in-depth insights and exploration of teaching practice characteristics in vocational classrooms.

Keywords: Vocational pedagogy, Teaching quality, Student engagement, Classroom observation

3.1 Introduction

A core aim of teacher education and continuous professional development is to build up teachers' capacities in pedagogy. International research has consistently shown that effective teaching calls for evidence from classroom observations on classroom practice and school improvement (Ko et al., 2014). High-quality teaching practices contribute much to students' learning achievements and teacher-student relationships in the classroom (Cornelius-White, 2007; Kyriakides & Creemers, 2008; Hattie, 2009). The teaching quality of preservice teachers is also important, although their teaching practices might not be high and mature. For example, pre-service teachers' teaching behaviours were found to affect student engagement in the classroom, regardless of variations in the class size they teach and their gender (Maulana et al., 2017).

It is reasonable to assume that vocational education's teaching quality is equally essential for regular nonvocational education. For example, the perceived teaching behaviours were found to vary among secondary education, upper secondary and vocational education, but the variations existed because of teachers' educational level, at least among male teachers (Fernandez-Garcia et al., 2019). Furthermore, the professional knowledge and practice and vocational teacher education patterns show a close relationship with the quality of professional reality of vocational teachers (Grollmann, 2008). Vocational teacher professionalism is a central concern to improve teacher training quality in the British context of vocational education (Hodkinson, 1998). In Taiwan, vocational high school teachers' professional development and teaching effectiveness were highly correlated with their teaching ability and students' achievement (Hsiao & Lee, 2010).

Evaluations of teaching quality in vocational schools are more complicated than that of teaching in nonvocational mainstream schools, and teaching evaluation may be different in vocational schools in terms of the broader and more diversified vocational curricula and

teaching models. Many vocational schools have yet to establish quality assurance mechanisms for improving teaching. In general, vocational curricula and teaching models are broader and more diversified than those in mainstream schools as they also include vocational and occupational skills training and workplace practice. However, vocational curricula in developed countries with a long history of vocational education, such as Germany, the Netherland, Australia and the United Kingdom, focus on measurable pedagogical behaviours of vocational practice and students' learning (Billett, 2003). And teaching behaviours of vocational teachers reflect not only their professional attitudes and personal ideas but also the practical tensions in competence-based vocational education (de Bruijn, 2012).

While policies and projects on vocational education tended to pay more attention to developing vocational teachers' training packages to acquire teaching expertise, there is a lack of scientific knowledge on effective teaching (Wu & Wang, 2008). For empirical research on teaching quality of vocational education teachers, the present study investigates teaching practices and their quality in vocational higher institutes, focusing on those who showed a stronger impact on learner engagement. We apply international observation instruments that were initially developed for studying nonvocational teaching to our study of vocational teaching behaviours. For triangulation, we also characterise the teaching characteristics of vocational teachers through an in-depth analysis of teacher-student interactions recorded in field notes as evidence of student engagement. Classroom observation and concurrent field notes are expected to characterise the teaching quality of vocational teachers and student engagement and allow comparisons of similarities and differences between vocational and mainstream academic education.

3.2 Literature review

3.2.1 Teaching quality and teacher effectiveness

Many reviews have concluded that effective teaching behaviours have a noteworthy influence on students' academic achievement (e.g. Hattie, 2009; Ko et al., 2014; Ko et al., 2017; Marzano, 2003). However, teaching effectiveness, or effective teaching, is still regarded as a malleable multi-dimensional concept in the education field. According to Ko et al. (2014), teaching effectiveness can be broadly defined and associated with student learning outcomes, teaching behaviours and classroom processes. For example, in Cornelius-White's (2007) meta-analysis on effective teacher-student relationships, teaching quality is referred to some or all aspects of teacher-student relationships, such as the relationship between positive teacher-student relationships and student outcomes. Teacher effectiveness is defined in terms of students' learning achievements, where high-quality teaching practice is expected to have positive influences on learning outcomes (Albekov et al., 2017; Kyriakides & Creemers, 2008). However, the definition of teaching effectiveness can also be narrowly referred to as observable teaching behaviours (Maulana & Helms-Lorenz, 2016).

Teaching quality or teaching effectiveness is static but fluctuates with the classroom context (Ko, Chen & Ho, 2015). It may change over time in a teacher's professional career (Day et al., 2006; Tang & Choi, 2009). A quasi-experimental investigation on teaching behaviours shows that student teachers regarding effective classroom practices such as effective direct instructions can improve pupils' engagement in pre-and post-training classroom observations (Veenman et al., 1993). Teaching quality in the teacher-student interpersonal relationship was perceived to be increasing throughout the school year (Maulana et al., 2013). In a longitudinal study, beginning teachers' teaching was perceived to be weak but improved overtime in three years, regardless of personal and contextual factors, such as certification status, gender and induction programmes (Maulana et al., 2015). When

career-long learning activities are successfully integrated into school-based teacher education programmes for student teachers, a strong relationship was established between participation in learning activities and effective teaching behaviours (de Vries et al., 2015). The development of effective teaching was evident in changes in teaching strategies and behaviours, from teachers' initial concerns with their ability to establish respect, trust and relationships with students, then with content adequacy, content explanation and the ability to mobilise resources and ultimately with the impact on student learning (van der Lans et al., 2018).

3.2.2 Vocational education and vocational pedagogy

Teaching quality for vocational education is important that vocational teachers have to employ a broad and continuously updated range of teaching methods for effective course content and materials, covering different occupational areas (Lucas et al., 2012). When vocational teaching is embedded in a broader learning culture, it involves cognitive and social interactions between the teacher and students, as well as between the students and their peers. Curriculum goals and content for vocational education are conceptualised as vocational knowledge that manifests as a practice from a sociocultural perspective and a practice of vocation or occupation (Billett, 2003). The sources of knowledge construction define vocational knowledge, learning, and manifestation originated from different workplaces. Supporting activities, such as student supervision, subject knowledge training and strategies teaching, can affect the actual teaching practices and the quality of performance of vocational teachers (Li & Rikers, 2012). Vocational education requires contextualisation of pedagogy in the content and process of teaching and learning with workplace activities for classes and subjects of vocational curricula. Vocational pedagogy is framed by vocational knowledge for vocational teaching and learning in work-related course structure (Barnett, 2006). Vocational pedagogy is thus "for delocating a discourse, for relocating it, for refocusing it" (Bernstein,

1996, p. 47). A pedagogic discourse of vocational pedagogy is recontextualised, in Bernstein's term, from its original academic mainstream school settings to pedagogic practices for vocational classrooms. Vocational pedagogy includes boundary-crossing discourses that incorporate disciplinary knowledge into vocational programmes. The boundary-crossing pedagogy requires teachers to familiarise with recontextualisation strategies in the available learning support materials and texts (Barnett, 2006). Therefore, the critical features of vocational pedagogy are distinctively sophisticated comparing to general pedagogy in terms of curriculum construction, coordination in the workplace settings and the delivery of learning programmes (Barnett, 2006).

3.2.3 Student engagement in vocational education

Engaging students academically is always challenging. Learner engagement is considered as a problem at all levels of education. Many studies have revealed that effective teaching behaviours have significantly impacted on students' classroom engagement (Hattie, 2009; Kyriakides, 2013; Marzano, 2003). Efficient classroom management and clear instructions are found more strongly related to student engagement (Maulana et al., 2017; Ko et al., 2017). Competence-based vocational education has changed teacher roles from transmitting knowledge to coaching students as sources of information, suggesting that vocational teachers should promote authentic learning tasks to engage students in a workplace-like situation to promote classroom learning. In considering to improve vocational teachers' abilities and effectiveness of teaching, Lloyd and Payne (2012) find that vocational teachers have to maintain their craft skills and subject training through continuous professional development to encourage learning engagement of vocational students.

3.3 Methods

To empirically explore the vocational teaching behaviours, we applied a concurrent mixed-method design that involved quantitative class observations and qualitative

observation field notes to explore the impact of vocational teachers' behaviours and the effectiveness of teaching practice. The International Comparative Analysis of Learning and Teaching (ICALT) observation instrument initially developed by Van de Grift (2007, 2014) was utilised in this study. ICALT is an international classroom observation instrument validated in various countries, including the Netherlands, Indonesia, South Korea and South Africa (Maulana et al., 2017). This instrument was chosen as it was widely employed for research in the Netherlands, Belgium, Germany and England, as well as in teacher training in the Netherlands (Maulana & Helms-Lorenz, 2016). It was applied into measuring teaching behaviour in secondary education across various national contexts including the Netherlands, South Korea, South Africa, Indonesia, Hong Kong-China, and Pakistan (Maulana et al., 2020). For example, the observation instrument has also been applied to secondary schools in Hong Kong and Shenzhen to measure and compare the effectiveness of teaching behaviours (Ko & Li, 2018). ICALT instrument is a useful tool to provide constructive feedback for teachers to develop complex teaching behaviours (van der Lans et al., 2018).

Teachers' pedagogic choices with effective teaching behaviours reflect how they specialise vocational pedagogy in the context by transferring knowledge, vocation-oriented learning, and skills from the workplace to the vocational classroom (Lucas et al., 2005). To encourage a stimulating flexible vocational learning environment, vocational training workshops and simulated subject training provide new opportunities for students with practical work-related skills, which indicates that effective teaching behaviours lead to vocational learning with practical training sources (Lucas et al., 2012). Regarding the teaching behaviours observed in the classroom, ICALT consists of 32 items falling into six observable dimensions of teaching behaviours and three items of a single dimension of student engagement: Safe and Stimulating Learning Climate, Efficient Classroom Management, Clear and Structured Instruction, Activating Teaching, Adjusted Teaching for

Learner Differences, Teaching Learning Strategy and Learner Engagement. Each domain contains several items that are rated on a four-point scale (1 mostly weak; 2 more often weak than strong; 3 more often strong than weak; 4 mostly strong). On the other hand, observational field notes drafted general questions and follow-up questions to ask teacher participants and students while conducting classroom observations.

3.3.1 Participants and data sources

The data in this study were collected from two private higher vocational institutions in Guangdong province in South China, which plays a leading role in transforming higher-level vocational institutions to meet the increasing demands of local labour markets. The participants were selected using purposive sampling techniques (Palys, 2008; Tongco, 2007) based on the representativeness of vocational teachers' participation of effective teaching and workplace learning and the close collaboration between schools and enterprises. There were 20 teacher participants, and each teacher was observed three times by using the ICALT observation instrument. Altogether there were 60 lesson observations in total.

Given that discourse practices of language teachers could elicit substantive, rather than procedural, student engagement (Nystrand & Gamoran, 1991), field notes were taken while conducting classroom observations to provide evidence of student engagement resulted from classroom practices (including discourses) (Kelly, 2007). There were 20 observation memos written with field notes.

3.3.2 Procedures of data collection

In the first phase of class observation, the researcher rated items related to six domains of teaching behaviours and observed participants' class activities and physical characteristics of vocational teaching. The researcher was also involved in activities and interacted with performed activities in the environment. The field notes were collected systematically in the form of participant observation memos for each teacher participant.

3.3.3 Data analysis

The data were analysed by using the descriptive analysis to calculate the mean scores between six domains of teaching behaviours and one domain of learner engagement mentioned earlier. For exploring the relative impacts of various teaching dimensions on student engagement, multiple linear regression was performed using SPSS 25.

Field notes data were analysed following the guidelines of thematic analysis (Braun & Clarke, 2006) that suggest "thematic analysis is a method for identifying, analysing, and reporting patterns (themes) within data" (p. 6). Initial codes were defined to tap into the key themes identified from seven domains of the ICALT observation instrument. In the process of data analysis, the common themes emerging from the observations and field notes were triangulated to make sense of vocational teachers' pedagogical practice students' learning engagement.

3.4 Findings

The results of quantitative data were based on the ICALT observation instrument on vocational teaching behaviours and the main findings according to the principle dimensions of vocational teaching and students' engagement in the classroom.

3.4.1 Descriptive statistics of vocational teaching behaviours

Means of the six dimensions of teaching behaviours and student engagement were calculated based on taking the averages of the means of items theoretically associated with each dimension. Table 1 displays the means, standard deviation, Pearson correlation coefficients of six dimensions of teaching behaviours and student engagement of the ICALT instrument, and the teaching practice and teacher effectiveness on teaching quality. Among the teaching dimensions, Safe and Stimulating Learning, Climate Clear and Structured Instructions and Efficient Classroom Management have a mean above the theoretical average of 2.5, suggesting that they may be stronger skillsets that define advanced vocational teaching

competence. Nearly all correlations are positive with significance at the 0.001 level. The most robust relationship is between Clear and Structured Instructions and Efficient Classroom Management (r =0.679), and Teaching Learning Strategy is strongly related to Clear and Structured Instructions (r=0.61). In contrast, Teaching Learning Strategy is very weakly associated with both Learner Engagement (r=0.02) and Safe and Stimulating Learning Climate (r =0.02). The strong associations with Learner Engagement among teaching dimensions except for Teaching Learning Strategy suggest that these dimensions might have a stronger impact on student engagement.

Table 1 Means, Standard Deviations, and Correlations Among Variables (N=60)

	Mean	S.D.	SLC	ECM	CSI	IAT	TLS	ALD	LE
Safe and Stimulating Learning Climate (SLC)	2.93	0.35	1						
Efficient Classroom Management (ECM)	3.16	0.35	.37**	1					
Clear and Structured Instructions (CSI)	2.84	0.35	.26*	.68**	1				
Intensive and Activating Teaching (IAT)	2.46	0.26	.28*	.51**	.58**	1			
Teaching Learning Strategy (TLS)	2.45	0.35	0.02	.49**	.61**	.36**	1		
Adjusted Teaching for Learner Differences (ALD)	2.1	0.31	.28*	.38**	.51**	.48**	.31*	1	
Learner Engagement (LE)	2.93	0.45	.39**	.48**	.54**	.58**	0.02	.37**	1

Note: **. Correlation is significant at the 0.01 level (2-tailed); *. Correlation is significant at the 0.05 level (2-tailed).

Table 2 summarises the regression results. The dimension Intensive and Activating Teaching was significant from the first step until the third step with the most substantial standardised coefficient, suggesting that it was the most crucial predictor of learner engagement, accounting for 12.89 per cent of the variance.

Clear and Structured Instructions and Safe and Stimulating Learning Climate were the second and third most significant predictors in the final model, contributing only small portions of the variance, 8.59 per cent and 6.86 per cent. The regression equation ($F(3, 56) = 14.732$, $p < 0.001$) obtained had an R square 5 0.664 and an adjusted R square 5 0.441. These results were consistent with bivariate correlation results in Table I, which indicated that *Intensive and Activating Teaching* had the strongest correlation with the dependable

variable, the other two teaching behaviour dimensions with decreasing strengths in correlation (r=5 0.58 and r= 0.48, respectively).

As *Learner Engagement* is more strongly associated with *Intensive and Activating Teaching, Clear and Structured Instructions* and Safe and Stimulating Learning Climate, students might have engaged and participated more actively in the lesson when the teachers frequently ask questions, present clearly and stimulate a safe learning classroom climate. Therefore, the following section will illustrate how vocational learning environment and clear instructions strongly associate with students' learning engagement according to the thematic analysis of observation notes.

Table 2 Multiple Regression Analysis Results on the Impact of Six Dimensions of Teaching Behaviours on Learner Engagement

	Unstandardised Coefficients		Standardised Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.513	0.452		1.136	0.26
Intensive and Activating Teaching	0.985	0.183	0.577	5.385	0
(Constant)	0.139	0.457		0.305	0.762
Intensive and Activating Teaching	0.676	0.214	0.396	3.158	0.003
Clear and Structured Instructions	0.399	0.159	0.315	2.515	0.015
(Constant)	-0.372	0.512		-0.727	0.47
Intensive and Activating Teaching	0.607	0.211	0.356	2.879	0.006
Clear and Structured Instructions	0.357	0.156	0.283	2.294	0.026
Safe and Stimulating Learning Climate	0.273	0.134	0.213	2.031	0.047

3.4.2 Flexibility in the vocational learning environment

Based on observational field notes along with some screenshots from videotaped observations, the findings show that the learning environment has special features for some vocational subjects, which are differentiated from general academic classrooms. The vocational learning environment featured flexible classroom settings such as training classrooms with various machines, group-arranged computers, classrooms with workshop settings to encourage a stimulating learning climate, as shown in Figure 1, 2 and 3. As Dillenbourg (2013) suggests that flexibility in the classroom refers to "the possibility for a teacher to change" (p. 490), teachers have the freedom to change pre-designed class activities to adapt to students' learning needs. On the other hand, the observation notes show that a training room with machines is most common for students who are majoring in mechanical engineering. For example, Figure 1 demonstrates that students need to operate machines for training on how to add refrigerants to automobile air-conditioning and how to use machines to perform model cut training. Students who are majoring in international trade use computers with installed software for e-commerce training (see Figure 3). For example, the teacher adopted Amazon.com, eBay, Alibaba as examples to guide students in their training process. For the practical training course, students use prepared materials for making sensor lights and alarms, as displayed in Figure 2.

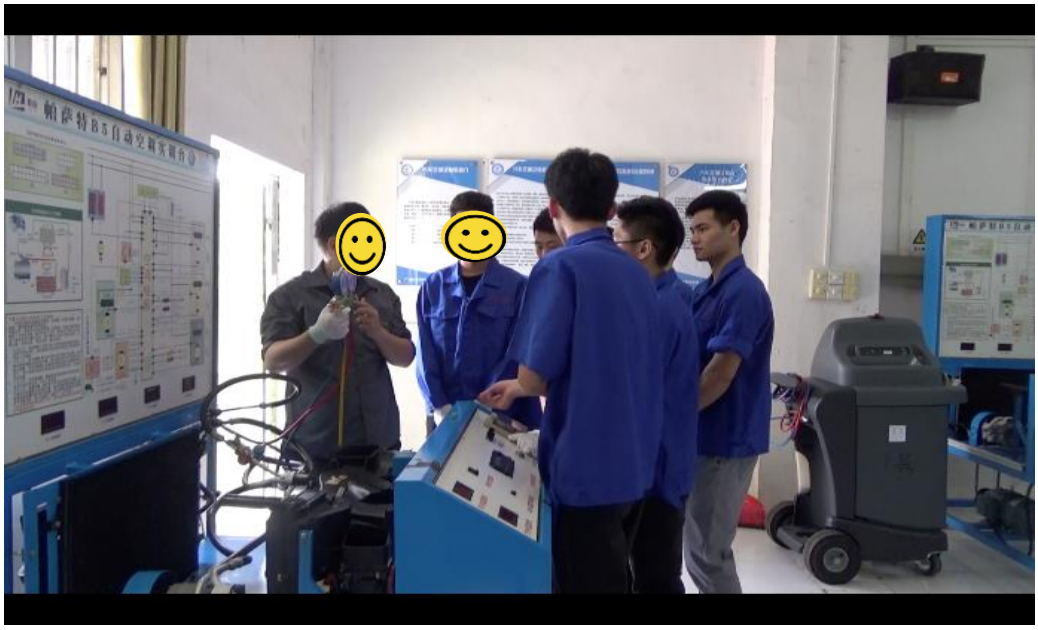

Figure 1 Staged instructions and student' engagement

Figure 2 Students' hand-on skill training

Regarding flexible classroom arrangement, the findings suggest that students in particular subjects have their classes along with workshops and computers such as 4–8 students as one group in online classroom discussions and workshop training space for mechanical engineering students as shown in Figures 1 and 3. The flexible classroom settings in vocational teaching contribute to a stimulating learning environment, which shows that more teacher-student and student-student interactions are achieved in classroom teaching

with diversified class activities: group presentations on product design role-plays on business negotiations and teacher-guided products assembly activities. Therefore, flexible classroom interactions allow teachers to have more practical scenarios to engage students in their collaborative activities (Dillenbourg & Tchounikine, 2007).

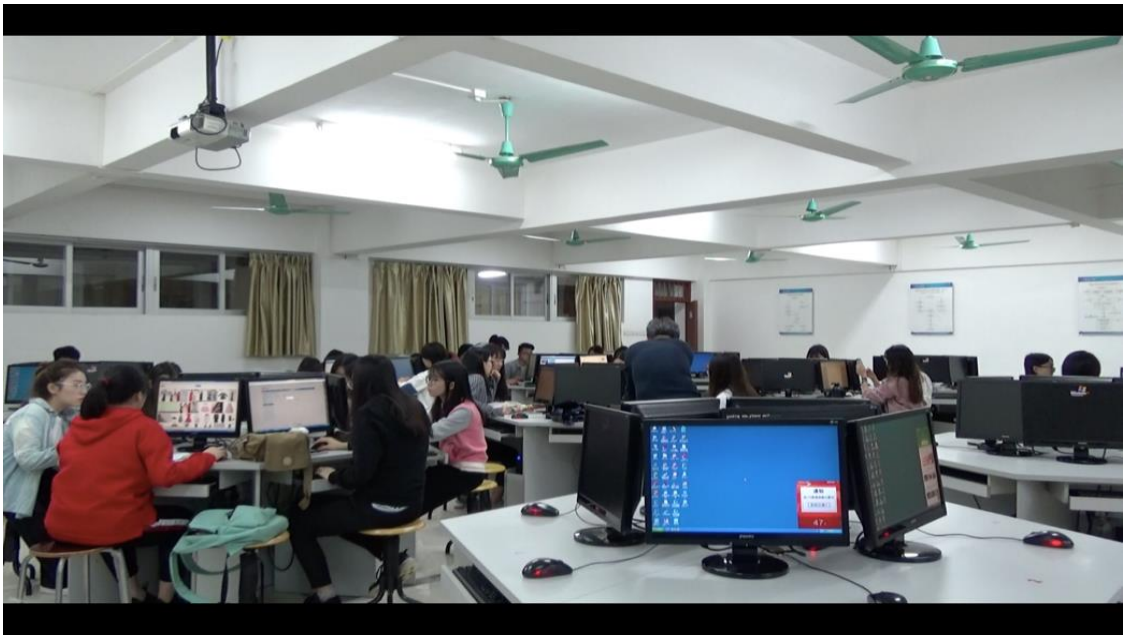

Figure 3 Students' e-commerce training with the installed software

3.4.3 Emphases on workplace experiences in instructions

To identify vocational teaching behaviours related to students' instructions, teachers tended to apply vocational knowledge while delivering clear and structured instructions, and vocational knowledge application including teachers' own work-related experiences is an important supplement in explaining the subject material and engaging all students in the lesson. For example, teachers usually apply their working experiences (vocational teachers normally have previous work experience or vocational qualifications when they enter into vocational institutions) in dealing with the letter of credit and foreign freight for the business-related classes. Teachers apply practical cases to remind students about cross-cultural awareness while conducting business negotiations in their class activities. During the presentation stage, teachers give clear explanations of how to use didactic aids to carry out

tasks such as the use of the Alibaba platform for searching potential customers and product promotion in the subject of international trade.

3.4.4 Staged instructions

Vocational teachers usually give students staged instructions in the subject of mechanical engineering as they need to explain the steps of machine operations in their training class. In the training class of automobile air-conditioning, as shown in Figure 1, vocational students are instructed in small groups so that teachers can regularly check whether students understand each step of instruction. Moreover, students have a graph chart on a board showing the process of adding car air-conditioning refrigerant in the training classroom to remind them of operational steps.

3.4.5 Collaborative teaching

Different from the general classroom teaching, Chinese vocational colleges have conducted a scheme of collaborative teaching to meet the requirements of the vocational teaching curriculum. Vocational teachers collaborate with teaching assistants or cooperate with enterprise staff to instruct students in practice-oriented classes and provide individual instructions for students. In co-teaching with enterprises, vocational teachers in specialised subjects invite experienced staff from companies to co-instruct students such as business relations in international trade, marketing for car insurance and automobile mechanic maintenance.

3.4.6 Applications of hands-on skills

In the specific subject of vocational content design, vocational classroom teaching is tailored for students to train their hands-on skills. For example, the installed software is specifically for students who are in e-commerce training, and teachers can design the training content such as the application of workplace examples while guiding students based on the software platform (see Figure 3). In designing a class of business writing, the teacher

designed the lesson collaborating with company staff to teach students how to conduct international business communications online worldwide.

3.4.7 Vocational learner engagement

From the perspective of group activities in probing vocational students' engagement in vocational classroom teaching, as demonstrated in Figure 1, 2 and 3, diversified group activities engaged students in various classroom learning. Students from the subject of electronic commerce training were grouped to have online discussions to share their opinions of using Internet-related tools for international and domestic business. Teachers applied Chinese WeChat to online classroom discussions to facilitate students' involvement in the process of trading and negotiations. For some other subjects such as mechanical or electronics engineering, students had hands-on activities to practise what they have learnt in theory-oriented classes, and they were involved in practice-oriented workshops to improve their skills in specialised areas.

3.5 Discussion and implications

The study identified the current situation of effective teaching behaviours of vocational teachers in higher-level vocational education in China. The findings showed the differences in the level of vocational teachers' teaching behaviours in each domain and proved that the changing vocational learning environment, vocational instructions and vocational learner engagement are characterised with flexible classroom teaching. Among others, adjusting instructions to inter-learner differences has the lowest mean average and strongly correlates with learner engagement. Although some research proves that differentiated instructions lead to better student learning performance (Reis et al., 2011), many other studies identified that differentiation in adjusting to inter-learner differences belongs to one of the complex skills of teaching behaviours, which implies that student teachers and experienced teachers need long-term interventions to develop this skill (Helms-Lorenz et al., 2013; Van de Grift et al., 2014).

According to Bernstein's theory of pedagogic discourse of recontextualisation (1996; 2000), the changing vocational learning environment is recontextualised in the vocational pedagogic discourse towards a specific vocational teaching practice. The Chinese vocational learning environment has its characteristics for certain vocational subjects, particularly its flexible settings with diversified classroom arrangements of activities, which facilitates vocational subject training and the learning of craft skills. Consistent with vocational learning materials and supporting activities, the vocational pedagogical environment manifests students' learning and subject knowledge training in terms of vocational knowledge construction (Barnett, 2006; Li & Rikers, 2012).

The flexible vocational learning environment allows students to engage in group-oriented subject learning and to be involved in the subject training process. Implementing flexibility in the classroom modifies teachers' pedagogical value of teaching scenarios in terms of designing interactive activities (Dillenbourg, 2013; Dillenbourg & Tchounikine, 2007). The findings suggest that vocational interactive classrooms and online interactive discussions designed by teachers promote students' learning engagement, and many researchers also propose that teachers' effective behaviours have a great influence on students' learning achievement (Hattie, 2009; Kyriakides, 2013).

Vocational teachers' instructions involved their own workplace experiences while giving students staged instructions. Teachers prepared simulated activities to guide students in their practice-oriented training to improve students' classroom engagement. According to Ericsson (2008), deliberate practice for improving teaching performance acts as an important part of designing activities to acquire vocational expertise. In the study of deliberate practice activities of Chinese vocational teachers, vocational lesson planning and teacher reflections are considered as essential activities for vocational teachers to improve teaching performance (Li & Rikers, 2012). Despite the significant changes such as vocational teaching and learning,

there are many challenges in improving the quality and the effectiveness of vocational curriculum and teaching practice.

Collaborative teaching offered vocational teachers an opportunity to cooperate with professional staff from companies in practice-oriented subject areas. Collaborative teaching and learning have been applied in vocational training and education, which feature a teaching situation with a joint activity structure with daily work tasks in the workplace. Research conducted in collaborative instruction proposes that teaching in the workplace specifically helps teachers guide their students in their apprenticeship learning (Tanggaard, 2005). Lenah and John (2016) advise that teaching and learning in collaborated groups encourage students' active participation in their hands-on activities. Students learn their communication skills through collaborative teamwork in certain work-related activities designed by teachers and company staff, which highlights that collaborative instructions in vocational pedagogy offer vocational teachers' new ways of thinking about teaching (Lucas et al., 2012).

In engaging students to take an active approach to learn, students took the initiative in their learning process. Students worked on their training reports after practical classroom training, which demonstrated that they participated actively in in-class activities. Therefore, effective learning activities were deliberately conducted by teachers to help students' self-regulated learning during the training class. This implies that the practical learning activities relating to teaching effectiveness have a great influence on students' active participation. Studies conclude that effective pedagogical behaviours encourage students' learning at all aspects of classroom engagement including asking follow-up questions and active group discussions (Hsiao & Lee, 2010; Kyriakides, 2013; Marzano, 2003).

3.6 Conclusion and limitations

This study provides a concrete understanding of vocational teaching and learning, which provides practical implications for the development of the skilled workforce in the area of

vocational education. Furthermore, the present study reveals that vocational teaching practice stimulates the interactions between students and teachers. The pedagogical practice is an observable teacher behaviour to measure student engagement and effective teaching using dimensional behaviour ratings (Ko et al., 2014; Helms-Lorenz et al., 2016; Maulana & Helms-Lorenz, 2016). Therefore, vocational teachers, with specialized teaching abilities combined with teaching strategies, emphasise teaching practice and student learning by creating a positive vocational learning environment.

In the specific context of Chinese vocational education, Chinese higher vocational education has emphasised vocational-oriented teaching design concerning the development of higher vocational education in the path of promoting collaboration between enterprises and vocational institutions to improve students' practical skills and workplace learning experiences. On the other hand, the demand of labour market force and the skilled personnel are pushing the change of teaching and learning from all perspectives, particularly, in vocational teaching practice and students' learning and occupational competence development.

Although this research may be limited for the number of class observations combining with field notes and the only one observer that were engaged in the study, the results offer relevant suggestions for vocational teaching practice and also for future research. On the other hand, the application of the ICALT observation instrument may need to be amended according to the specific context of the study. In the Chinese vocational education context, the main findings suggest that the changing vocational learning environments observed under the dimension of stimulating learning climate are not enough to cover the scoring categories within the instrument. However, the research results propose valuable indications for the further understanding of vocational and practical teaching on the professionalisation of teachers in Chinese higher vocational education. To know how vocational teachers are

improving their pedagogical practice, we need further research from the teachers' perspective of vocational learning. Thus, the results of the present research provide a fundamental base for vocational teaching behaviours about teaching practice. As we do not know precisely how vocational teachers' learning (both organisational and personal work-related learning) promotes teaching practice in vocational education, thorough interviews with relevant vocational teachers are necessary.

Chapter 4 Paper 3 – Student engagement in the vocational learning environment: collaborative learning and adaptive instruction

Yanmin Zhao & James Ko

Abstract

The study aims to explore vocational students' learning patterns and learner engagement in the changing classroom learning environment and teaching practices within Chinese higher vocational institutions. Four videotaped lessons are analysed to illustrate vocation-oriented lesson activities and learning dialogues in which students are engaged in the classroom. Based on in-depth qualitative dialogic analysis of the videotaped lessons, findings suggest that vocational teachers used informal approaches to enhance student engagement, for example, classroom practices such as small-group collaborative teaching of vocational skills and lesson activities connected to real-life situations, adaptive and structured instructions on students' learning activities, and featured flexible teaching arrangements in the vocational learning environment. These results suggest that collaborative vocational learning environments should always integrate students' career learning and instruction.

Keywords: Vocational learning environments, student engagement, collaborative learning, adaptive instruction

4.1 Introduction

Over the past decades, engaging students in a collaborative classroom environment has been constantly discussed in a variety of studies. A career-oriented learning environment enhances students' development of career competencies and real-life work experiences and fosters practice-based learning that influences students' participation in career-related dialogues and activities (Kuijpers et al., 2011). Vocational teachers encourage students to engage in workplace learning and assist the transfer of learning from the classroom to many other situations (Billett, 2001). By making vocational learning environments like workplaces, classroom-based learning emphasises on flexible activity-based training platforms to facilitate students' learning engagement (Zhao & Ko, 2020).

The present study aims to explore students' learning engagement in the collaborative learning and adaptive instructions under the vocational integrated learning environment and to address the importance of understanding vocational classroom dialogue by analysing qualitative class observations. Common themes were originated from international observation instruments that initially developed to study teaching behaviours in the non-vocational field, and the themes were categorised through in-depth classroom dialogic analysis to analyse the features of vocational learning engagement of classroom practice and teaching adaptations in the vocational learning environment.

4.2 Literature review

4.2.1 Collaborative learning in vocational classroom

Collaborative learning has been regarded as a complex phenomenon that can be analysed through individual and social levels (Baker et al., 1999). Dillenbourg (1999) defines collaborative learning in a broad way that is "a *situation* in which *two or more* people learn or attempt to learn something *together*" (p.2). The definition labels three dimensions of collaborative learning: the group size of the collaborative situation, performing learning

activities such as problem-solving and course material learning, and different forms of interaction such as face-to-face or computer-mediated learning collaboration. Collaborative activities in computer-based learning settings can facilitate classroom interactions, and the term collaboration simply refers to "the fact that students are working together on a task" (Littleton & Hakkinen, 1999, p.20). Collaborative learning in vocational education has incorporated online collaborative learning solutions to increase student learning and vocational skills (Slowikowski et al., 2018). Vocational students' collaboration while working in small groups can create a stimulating learning context where instructional activities are conducted to work on open-ended mathematics problems (Hoek & Seegers, 2005).

Many vocational subjects are based on teamwork and collaborative learning instruction. Thus, the learners need not only a variety of skills and knowledge in the professional field but also the development of personal skills specific to the workplace. Therefore, studies in vocational education have been based on the authentic needs of working life in order to support vocational learning better. In relation to increasing students' engagement and improving learning outcomes, various technological materials incorporated into online classrooms facilitate collaboration with instructors in improving students' innate skills and abilities (Dyer et al., 2015). Hämäläinen, Oksanen and Häkkinen (2008) propose that free-form collaborative learning games need tools or models to systematically facilitate learning situations and indicate that scripted game environments in the vocational context help the students' collaboration process in different phases. According to Dillenbourg (2002), collaborative scripts are a series of instructions that guide students to form groups and to interact with group members in order to solve problems together. More particularly, levels of scripting in directing specific activities set the conditions for collaborative learning in the different phase of collaboration (Dillenbourg & Jermann 2006).

4.2.2 Adaptive instructions

Dillenbourg (2013) refers to "orchestration" as a metaphor to indicate how the teacher acts as a conductor to demonstrate "how a teacher manages, in real-time, multi-layered activities in a multi-constraints context" (p.485). Adaptive instruction or individualised instruction is similar to orchestration in that the teacher monitors the real classroom situation and decides what kinds of adaptations are necessary for students and then performs the individualised adaptions to the classroom. An adaptation model proposed by Deed et al. (2019) suggests that the adaptive process in a flexible learning environment is complex and non-linear, which illustrates that teachers engage with the idea of space as an influence on teaching practice, and consider the relationship between teaching and learning space, and integrate the interplay between teaching and learning space. This is consistent with the view that flexible physical space enables greater collaboration in the teaching and learning processes and the interplay between student activities and classroom engagement (Dane, 2016). Although teacher adaptation may include changes in teachers' practical knowledge and its interaction with situated experience, teacher agency in enacting different ways to adapt classroom practices, or affordances of flexible learning environments for teachers to influence student engagement, our focus is mainly on vocational teachers' classroom practices in terms of adaptive transactions between teacher and context, instructions and learning materials.

4.2.3 Vocational learning environments

A number of studies have been focused on learning environments. For example, the classroom learning environment includes not only the physical space for learning but also the intangible classroom climate, which strongly influences students' learning outcomes (Fraser, 2001). Alfassi (2004) finds that the learner-centred environment promotes higher scores in academic achievement and a relatively higher motivation for learning. Personal learning environments place emphasis on students' learning process, which allows vocational students

to reflect their learning, to showcase their vocational skills, and to collaborate with peers (Valtonen et al., 2012). A vocational dialogue focusing on career guidance methods plays an important role in the relationship between the vocational learning environment and students' career competencies, which aims to foster students' career learning in some aspects of the learning environment (Kuijpers et al., 2011). The collaborative learning environment in vocational education has embraced e-learning courses oriented to the specialised subjects with structured training materials such as mechatronics (Slowikowski et al., 2018). Therefore, changes in a vocational learning environment are highly related to a flexible learning package for work-based learning and a virtual learning environment to provide fundamental technical knowledge for the integration of intelligent machines in the future working industry.

Flexibility in the vocational learning environment has been featured with its flexible classroom settings such as activity-based training platforms, computer-supported workshops and simulated software for practical training (Zhao & Ko 2020). A flexible vocational learning environment facilitates students' engagement in the process of training, as Dillenbourg (2013) suggests that teachers have the freedom to adjust class activities in order to adapt to students' learning needs. Other researchers illustrate some features of virtual learning environments such as the integration of new technologies and multiple pedagogical approaches, the flexibility of overlapping with physical environments, and the enrichment of classroom activities (Dillenbourg et al., 2002). Therefore, the interaction of the collaborative learning activity within its relevant environmental context provides a lens for analysing learning processes in the changing learning environments that students are engaged in within vocational education.

4.3 Research methods

A mixed-method design in this study integrates quantitative and qualitative methods of data collection as well as analyses since it is suggested that "using a quantitative study helps qualitative researchers define a population of interest based on specific research findings gathered from the quantitative study" (Hesse-Biber, 2010, p.65). Therefore, the study used two observation instruments: the International Comparative Analysis of Learning and Teaching (ICALT) instrument (Van de Grift, 2007; 2014) in terms of six aspects of effective teaching domains and one aspect of learner engagement; the Comparative Analysis of Effective Teaching and Inspiring Teaching (CETIT) instrument (Ko et al., 2019) in terms of five aspects of inspiring teaching.

4.3.1 Context and participants

Twenty vocational teacher participants of four different subject areas (mechanic engineering, electronic engineering, International trade and business English) were selected at two higher vocational colleges in Guangdong province, south of China. These vocation-oriented subjects have a close relationship with local, regional enterprises such as foreign trade companies and small- and medium-sized enterprises. Furthermore, higher vocational colleges in Guangdong province joined the scheme of industry-university collaboration to promote application-oriented teaching and students' vocational knowledge learning (Liu, 2016). Within the context of the demand of practice-oriented teaching and learning, vocational learning environment includes flexible spaces for students' learning, adaptive instructions, and interactive classroom learning, which encourages learner engagement in the subject teaching.

Each teacher participant has at least three years' teaching experiences. All teachers were observed three times during one teaching semester, and each observed class had around 25 to 35 students in one classroom. Therefore, 60 class observations (45 videotaped observations

based on participants' agreement) were conducted by using both ICALT and CETIT instruments.

4.3.2 ICALT and CETIT instruments

ICALT observation instrument has been widely used in Europe, Asia, and Africa. For example, it has been applied to improving effective teaching behaviours of pre-service teachers and measuring teaching behaviours and students' academic engagement in Netherland (Maulana and Helms-Lorenz 2016; Maulana et al. 2017). The ICALT instrument was deemed appropriate to assess students' engagement and adaptive instructions under the vocational learning environment as it consists six observable domains from teacher's perspective: a safe and stimulating learning environment, efficient classroom management, clarity of instruction, activating teaching, the adaptation to students' learning needs, teaching-learning strategies, and learner engagement from student's perspective. Each domain comprises of several indicators, and each indicator contains a number of items. For instance, the indicator of presenting and explaining the subject materials in the domain of clear and structured instructions includes items such as activating prior knowledge of learners, giving staged instructions, posing questions which learners can understand, and summarising the subject material from time to time. Each item was rated on a 4-point Likert scale (1=mostly weak; 2=more often weak than strong; 3=more often strong than weak; 4=mostly strong).

The CETIT observational instrument has similar features in terms of the domain of teaching behaviours comparing to the ICALT. The CETIT instrument covers 68 items in five aspects of inspiring teaching and employs 5-point Likert scale in rating each item (1=mostly weak; 2=more often weak than strong; 3= not observed (neutral); 4=more often strong than weak; 5=mostly strong). For example, they are five items under the theme of classroom collaboration such as encouraging students to work together, giving students' tasks to work in

groups, students' sharing their work in a task, making clear how students can help each other, and asking students to do demonstrations together.

4.3.3 Data collection and analysis

Each teacher participant was observed by using thirty-two descriptive statements of generic teaching behaviours in six observable domains of the ICALT and Twenty-six items covering five aspects of inspiring teaching in the CETIT. A sample of 60 observations was made up of three lessons of twenty teachers for evaluating the teaching practice and classroom interaction of a lesson. Based on mean scores and the percentiles of 60 lessons collected from two instruments, the four lessons were selected to conduct an in-depth qualitative dialogue analysis (Hennessy et al., 2015). Four video-taped lesson observations were used to explore the teacher-student interactions in the adaptive learning environment, teacher-student classroom interaction, and the change of students' learning environments that embedded in the vocational pedagogy.

A coding scheme for educational dialogue analysis (SEDA) developed by (Hennessy et al., 2015) consists of three hierarchical levels of analysis in a dialogic teaching and learning environment: communicative situations (CS) at a macro level, communicative events (CE) at a meso-level, and communicative acts (CA) at a micro-level. Therefore, the SEDA coding scheme was used to analyse both the teacher's and the students' dynamic interactional process throughout a lesson according to the following analytic procedures (see table 1 below).

Table 1 Chosen four areas of ICALT and CETIT for lesson analysis

Area code	Area name	Descriptions
S	Structured, clear, and purposeful instructions	The teacher presents and explains the subject material in a clear manner, gives feedback to learners, engages all learners in the lesson. During the presentation stage, checks whether learners have understood the subject material. The teacher encourages learners to do their best and teaches in a well-structured manner. The teacher gives a clear explanation of how to use didactic aids and how to carry out assignments. The teacher systematically uses material and examples from students' daily life to illustrate the course content and encourages students to make connections between what they learn with reference to their lives and to find different solutions for a problem. The teacher explained to the students the learning objectives and purposes of what they were learning.
C	Collaborative learning and adaptive instructions	The teacher encourages students to work together, gives tasks/assignments to work in groups, tells students how to share their work in a task, makes clear how students could help each other and asks students to do demonstrations together. The teacher also evaluates whether the lesson aims have been reached, offers weaker learners' extra study and instruction time, adjusts instructions to relevant inter-learner differences, adjusts the processing of subject matter to relevant inter-learner differences.
F	Flexible and activating teaching	The teacher adjusts his/her teaching pace for some students, changes his/her teaching methods spontaneously to suit some students' needs, gives students some opportunities to choose their preferred classroom activities, allows options for students in their own seatwork and options for students in their homework. The teacher stimulates the building of self-confidence in weaker learners, stimulates learners to think about solutions, asks questions which stimulate learners to reflect, lets learners think aloud, gives interactive instructions, and clearly specifies the lesson aims at the start of the lesson.
L	Learner engagement	Students are fully engaged in the lesson, show that they are interested in and take an active approach to learn.

In order to understand the general dynamics of the selected lesson(s), in-depth analyses of videotaped lesson transcripts were carried out to describe vocational CS that summarised

various dimensions of the ICALT and CETIT instruments (stimulating learning climate, structured and purposeful instructions, flexible and activating teaching, collaborative and adaptive learning, learner engagement). Then the CS was further segmented into a series of CE, i.e., each CS was segmented into different keywords, and each keyword was given a definition and a description. Analysis of classroom dialogic interactions is an essential step in identifying a certain CE. CA, as a series of observable teacher-student and peer dialogic interactions were analysed in more detail by using the coding scheme to code CA. Table 2 below shows an excerpt from a class dialogic analysis.

Table 2 Coding elements of four areas for dialogic analysis

Element codes	Keywords	Description
S Structured, clear, and purposeful instructions		
S1	Present and explain the subject materials	The teacher activates prior knowledge of learners and gives them staged instructions, poses questions which learners can understand and summarises the subject material from time to time
S2	Giving feedback	The teacher makes clear whether an answer is right or wrong while students are answering questions and why an answer is right or wrong. The teacher gives feedback on the way in which learners have arrived at their answer
S3	Engaging all learners	The teacher creates students' assignments or activities which stimulate their active participation. During the class, the teacher asks questions which stimulate students to reflect what they have learnt and makes sure that students follow the lesson and continue working, and gives students "thinking time" after asking a question and also invites students to participate who do not volunteer to do so in the lesson
S4	Checking learners' understanding of subject materials	During the presentation stage, the teacher asks questions which stimulate learners to reflect and checks whether learners understand what the lesson is about and whether they understand the subject materials provided
S5	Encouraging learners	The teacher praises vocational students who do their best and makes it clear that all students should do their best. On the other hand, the teacher expresses positive expectations about what learners are going to achieve in the lesson

S6	Well-structured teaching	The lesson is built up in terms of clear stages and transitions between stages. The lesson builds up logically, going from the simple to the complex. Vocation or work-related activities and assignments are connected to the materials presented during the presentation stage. The lesson offers a good variety of presentation, instruction, controlled practice, free practice, and so forth.
S7	Clear explanations	The teacher gives a clear explanation of how to use didactic aids and how to carry out assignments and makes sure that all learners know what to do in the lesson. The teacher explains clearly how lesson aims and assignments relate to each other and which materials and sources can be used.
S8	Purposeful and relevant teaching	The teacher encourages students to think deeply and makes challenging content enjoyable for students. The teacher systematically uses material and examples from students' daily life to illustrate the course content and encourages students to make connections between what they learn with reference to their lives. The teacher encourages students to find different solutions for a problem. The teacher explains to the students the learning objectives and purposes of what they are learning, and so forth.
C Collaborative and adaptive learning		
C1	Collaborative learning	The teacher encourages students to work together and gives tasks/assignments to work in groups. The teacher tells students how to share their work in a task and makes clear how students could help each other. The teacher asks students to do demonstrations together.
C2	Offering weaker students extra instruction time	The teacher gives weaker learners extra study time and gives weaker learners extra instruction time. The teacher gives weaker learners extra exercises/practice and gives weaker learners ‘pre- or post-instruction.’
C3	Adjusting instructions to relevant inter-learner differences	The teacher allows for flexibility in the time learners get to complete assignments, lets some learners use additional aids and means, gives additional instructions to small groups or individual learners
F Flexible and activating teaching		
F1	Flexible teaching	The teacher adjusts his/her teaching pace for some students and changes his/her teaching methods spontaneously to suit some students' needs. The teacher gives students some opportunities to choose their preferred classroom activities and allows options for students in their own seatwork. The teacher allows options for students in their homework.

F2	Stimulating learners to think about solutions	The teacher shows learners the path they can take towards a solution and teaches strategies for problem-solving and referencing. The teacher teaches learners how to consult sources and reference works and offers learners checklists for problem-solving
F3	Asking questions which stimulate learners to reflect	The teacher encourages learners to ask each other Qs and explain things to each other, asks learners to explain the different steps of their strategy, regularly checks whether instructions have been understood, asks questions which stimulate reflection and learner feedback, and regularly checks whether learners understand what the lesson is about
F4	Giving interactive instructions	The teacher promotes interaction between learners and interaction between teacher and learners
L Learner engagement		
L1	Students are fully engaged in the lesson	Students pay attention as instructions are being given, and participate actively in conversations and discussions, and ask questions
L2	Students show that they are interested	Students actively listen when instructions are being given and show their interest by asking follow-up questions
L3	Students take an active approach to learning	Students ask follow-up questions and show that they take responsibility for their own learning process. Students work independently and take the initiative themselves, and use their time efficiently

Table 3 Excerpt from a dialogic lesson analysis on automobile engineering about adding refrigerant

Agent	The teacher guides students on how to add the refrigerant to an automobile air conditioner	Area Code 1	Area Code 2	Area Code 3	Area Code 4
Teacher	We will add air-conditioning refrigerant today (students: um); firstly, as we said yesterday, this is a manifold pressure gauge (the teacher holds the pressure gauge on the right hand with a glove and uses his left finger to point at the manifold pressure gauge).	S1			
Teacher	Then the red represents a high-pressure tube or low-pressure tube?	S4		F3	
All students	That is a high-pressure tube.				L1
Teacher	Then we need to open the lid of the high-pressure valve on the tube first (the student and the teacher open the lid together, the teacher releases the	S6	C1		

	hand, while the student continues to twist the valve).				
Teacher	The teacher connects the blue high-pressure valve to the high-pressure place and screws it many times (the student asks if it is to ensure that the connection is all right; the teacher says: No, it is to ensure that it is closed; the student said: Yes, closed.)	S6			L2
Teacher	When vacuuming, be careful, the yellow tube is to vacuumise, right? (Students: Yes) Then we connect it on the vacuum indicator (while talking, the teacher screws the yellow tub to the vacuum indicator),	S7		F4	
Teacher	When we hear sound, the vacuum indicator is already working, then at the same time to observe (while talking, the teacher points at the blue and red high and low table with hands) high- and low-pressure meter, the pointer of these two tables will go down, right?	S4		F3	
All students	Right.				L1
Student A	Is it pumping refrigerant?				L2
Student C	Another student points at the red valve which the teacher is screwing and says: you have screwed it in the wrong direction	S2			L1
Student B	Yes, it is the refrigerant.				L1
All students	Where is the refrigerant after vacuuming?				L2
Teacher	In the air.	S2			
Teacher	That is the whole process of how to add the refrigerant; now it is your turn to do it again.	S3		F1	
Student A	No problem.				
Teacher	Now two students operate it together.	S3	C1		
student B	Should it be turned off before the connections?			F3	L1
Teacher	Yes, it should be all turned off before any connections.	S2			
Student C	Ok, all done.				

Teacher	After you have made all the connections, you have to double-check it whether it is loose or not.	S7		F4	
Student B	Yes, I have just tested it.				L2
Student A	Now it is adding not extracting.				L3
Student D	Is that finished if we fill three bottles of refrigerant?				L2
Teacher	Please open it first, when you hear some noises, and it is starting to extract vacuum out, right? This side should make it larger.	S7			
Teacher	Why is it leaking air just a minute ago? Just because there are some problems on the seal rings, here and there around the pipe accessories, because they are oxidized. You guys should look at the meter.			F1	
Student A	I am waiting for the change of high voltage meter now.				L2
Student B	I am listening to whether there is a change in the vacuum pipe.				L1
Teacher	Good, good.	S5			
Student A	Can you please turn it off? The next step is to screw it tight, and then the high voltage button should be off, and the low voltage button should be on.				L3
Teacher	No, …. when you keep the voltage, you don't need to turn it off. It should be off when it is accelerating.			F4	

4.4 Findings

Qualitative dialogic teaching analysis of four videotaped lesson case studies suggest that vocational teachers used informal and formal approaches to engage students in different aspects of classroom practice, such as small group teaching of vocational skills, core activities that connected to real-life situations, and students' collaborative learning on improving career competencies. The four-lesson case studies represent four different vocational majors that characterise students' collaborative learning and teachers individualised or adaptive instructions. In practice, there appears to be little difference

between the vocational lessons indicated regarding the collaborative learning environment and the vocation-oriented teaching and learning processes.

4.4.1 Students' engagement in a small-group collaborative learning environment

The automobile engineering lesson case study allows 4 to 8 students in a group to operate the machine during the lesson. The teacher-guided students to work together to practise how to add refrigerant for automobile air conditioning. The class was featured as small group teaching, which was different from the other three selected lessons. This class was also designed for co-teaching so that two teachers were guiding two groups of students while the other two groups were writing training reports or having their own practice within a group. For example, the teacher instructed students to do demonstrations within the group and clearly explained how students could help each other to complete the whole process of adding the refrigerant to the air conditioning. The whiteboard in front of each training machine in the classroom demonstrated a clear flow chart of operation process in order to support students when they were uncertain about the process. While presenting and explaining subject materials, the teacher reviewed what they had learnt in the previous lesson by asking students questions to activate their prior knowledge such as "what have we gone through in the last session? And can you please illustrate some steps that we have covered in automobile air conditioning?" The teacher applied various training related questions to engage in vocational students' hands-on skill development. These findings align with research conducted in other vocational fields that shows students' engagement in small-group collaborative learning (Alfassi, 2004; Kuijpers et al., 2011)

As for the small-group collaborative learning, the student simulation training activity in the cross-border e-commerce class included a built-in tabletop software for training apprentices. Activity-based group learning allowed students to improve their social interactions and self-management skills (Slowikowski et al., 2018). For example, students

learned how to optimize online shop surfaces based on the frequency of product searching and managed product sales and product stock status. During the activity, students in a group built a mock-up product promotion through online platforms, which fosters online collaborative training. On the other hand, the enterprise-collaboration online training platform accelerated students' practical learning process in the course of cross-border e-commerce and the standardized training content through the online training platform allowed students to have cross-border trading practice, sales skills, and customer service skills. Moreover, group-based training also enables students to understand the key points of operational procedures, such as overseas purchasing, cross-border logistics, customs clearance, and electronic payment cross borders. However, student-centred teaching methods in the electronic engineering class shifted the focus of the activity to students' hands-on skill training and their output-oriented teaching. For example, the electronic products made by students consist of different skill sets, which could be reached through cooperative learning and output-oriented teaching. Findings are supported with other studies in vocation-oriented activities for improving occupational skills (Littleton & Hakkinen, 1999; Slowikowski et al., 2018）

4.4.2 Adaptive instructions on students' learning activities

According to Dillenbourg (2013), extrinsic activities are the main learning scenarios in classroom life, and the core activities designed as adaptive with individualized instructions adapt the activities to students' learning. The pre-defined activities in the automobile engineering lesson allowed the teacher to adapt students' learning behaviours. For example, students who were falling behind in the pre-designed training activities were guided with extra instruction time by using the other training machines. Moreover, the teacher gave students flexibility in completing their class training activities and letting them use additional aids such as the flow chart board of operational procedures and a teaching assistant in

supporting them to handle the machines while the other grouped students were completing their after-training report assignments. This illustrated the flexibility of adaptive instructions in specialized vocational classroom activities and the focus on individual student's learning and instructions.

In adapting the activities in the cross-border e-commerce class, the technological platforms facilitated the teacher in the task of adapting students' learning content. For example, the teacher applied the e-commerce simulation in a training session and allowed students to simulate the whole process of completing a trade deal. In particular, the featured learning materials for cross-border e-commerce were designed independently according to different modules for the purpose of easy adaptations in the learning program. For example, the specific training content for international B2C cross-border e-commerce platforms was easily adapted to the students' needs in mastering a skill or competency at their own learning pace.

4.4.3 Structured and purposeful instructions to engage vocational students

In engaging vocational students' participation, the teacher gave students' staged instructions on how to handle the machine to train their practical skills. For example, the dialogic conservations in the automobile engineering lesson show that "the teacher: we will add air-conditioning refrigerant today (students: all right); firstly, as we said yesterday, this is a manifold pressure gauge (the teacher holds the pressure gauge on the right hand with a glove and uses his left finger to point at the manifold pressure gauge)", which indicates that, with clear explanations of the first step of the machine operation, students can easily follow the lesson and continue to carry on and practice by themselves after the teacher's instructions. In the lesson of foreign business and international trade, classroom dialogues are mostly like "the teacher: what does a formal business letter look like? What are the elements which should be included in the letter? What is the purpose of each element that is included in the

letter?" The teacher applied these kinds of questions to stimulate students to reflect on what they already know about foreign trade communication and check students' understanding of basic knowledge of international trade.

4.4.4 Built-in flexible teaching arrangement and activating teaching in vocational students' engagement

The flexibility was built-into the vocational teaching arrangement, which referred to the possibility of change while preparing class activities and the possibility of adjusting the teaching pace for some students to catch up the average students. For example, during the cross-border e-commerce training class, the teacher guided students to work on the computer platforms themselves and walked around to help students who were in need and then gave them individual instructions. Furthermore, students were allowed to sit in their preferred groups to perform classroom activities and to promote interactions between students in completing their training projects. In the process of activating students' learning in the class of international business trade, the teacher adjusted her teaching with the company staff's guidelines on specific business communications with foreign companies. For instance, the teacher allowed students to raise questions relating to business letter writing in workplace situations or the teacher and company staff stimulated students to reflect on their understanding of the content. Dialogic quotes on how to find potential customers: "The company staff: based on search results from the Alibaba platform, what do you need to analyze after you receive clients' enquiries? Students: their interests in products, their companies, their purchasing power and their previous searching on related products and so on. The teacher: what else do you think are some valuable pieces of information based on the search results? Students: trading data on the product, product price, the related picture for the products. The company staff: based on all the information collected from the platform, what information should be included in the email to the potential clients?"

4.5 Discussion

The purpose of our study was to examine vocational students' collaborative learning and teachers' adaptive instructions in the changing learning environment. The findings are informed by reviews of relevant literature that small-group collaborative learning encourages students' involvement in vocational learning activities. Vocational students' collaborative learning in small groups promotes a stimulating learning environment which helps students improve problem-solving skills (Hoek & Seegers 2005). Collaborative learning has been discussed in online learning situations and has been seen to improve students' vocational skills connecting with mechatronics education (Slowikowski et al., 2018). The findings from the cross-border e-commerce lesson analysis suggest that computer-assisted online learning activities encourage students' mutual engagement in learning activities through the enterprise-collaborated training platform. Moreover, the vocation-oriented automobile engineering class forms a collaborative learning environment to engage students in group-based activities. These are consistent with the view that a flexible classroom setting in the vocational learning environment promotes a stimulating learning climate and allows teachers to adjust pre-designed class activities in order to suit students' learning requirements (Dillenbourg, 2013; Zhao & Ko 2020).

Adaptive teaching in vocational classes featured individualized, structured, and purposeful instructions to adapt students' learning activities. The adaptive instructions in the vocational learning environment meant that teachers could arrange task-based learning activities according to different subject requirements such as technological e-commerce platforms or training machines for engineering students. This suggests that differentiated instructions in vocation-oriented classrooms are directed towards engaging students' learning in various subject-based activities. Although some studies have identified that differentiation in adjusting learner differences is one of the more complex skills among teaching behaviours

and student teachers and even experienced teachers spend a long time in developing this skill (Van de Grift & Helms-Lorenz 2013; Van de Grift et al., 2014), other research finds that students' engagement in diversified vocational learning environment allows teachers to focus more on adapting to students' practical learning and vocational training (Zhao & Ko 2020). On the practical level, however, adapting activities in the vocational classroom requires that teachers change the level of difficulty, such as adding or skipping some exercises whenever it is needed (Dillenbourg, 2013). Therefore, adaptive instructions in the vocation-oriented training classroom attempt to integrate learning environments while adjusting to both individualized and group learning activities.

We note that structured and purposeful instructions in vocational learning environment help students improve cognitive and practical skills. In this respect, teachers support students when the learning contents or course materials present problems in the acquisition of vocational competence. De Bruijn and Leeman (2011) suggest that adaptive instruction with regard to the learning materials requires that such flexible methods of instruction as digital and other self-instructive materials are available for students when they need support. An Australian case study focusing on teachers' adaptation to flexible learning environments indicates different adaptations to classroom practice such as the integration of context and teaching practice, the use of teacher expertise across multiple class groupings, and the decrease in students' direct instructions ((Deed et al., 2019). While we have focused on purposeful instructions that teachers adapted to students' class activities through small-group collaborative learning, it is acknowledged that the flexible physical learning space opens up further possible collaborations for students' activities and classroom engagement in the teaching and learning process (Dane, 2016) and also for online training activities incorporated into learning in the field of vocational education (Slowikowski et al., 2018).

Regarding the built-in flexible teaching and learning arrangement in the vocational classroom, the analysis of dialogues between teacher-student and student-student indicates the flexibility of adaptive instructions and students' learning arrangements in completing their projects. As it is stated by Kuijpers et al. (2011) that flexible vocational learning environment fosters the development of students' career competencies, students' vocational skills through collaborating with other students are emphasized in their personalized learning environment (Valtonen et al., 2012). The data was also supported that the growth of student achievement with individualized or fluid groupings was justified in the flexible learning environment (Deed et al., 2019). On the other hand, vocational teachers adjust their collaborative teaching based on materials or training platforms in specialized vocational subjects and give students flexible time in completing their training reports and classroom activities. This was evident that the flexible vocational learning environment allows teachers to modify interactive classroom activities (Dillenbourg 2013; Zhao & Ko 2020) and collaborative lesson planning and teaching were characterized by the flexible nature of the learning environment and the teaching and learning of open-plan settings (Deed et al., 2019).

4.6 Conclusion and implications

This study illustrates students' learning engagement and teachers' adaptive instructions in a flexible vocational learning environment, and group-based collaborative learning environments support differentiated teaching practice and multiple class groupings of vocation-oriented activities. Furthermore, the study also reveals that the flexibility in teaching stimulates vocational students' involvement in learning and promotes the interactions between students' learning activities. In addition, the findings suggest that adaptations in vocational instructions may change based on students' engagement of learning activities as well as the flexibility of teaching scenarios. This supports previous research which demonstrates that how teachers adapt their teaching practice relies on the possibilities of

receiving the flexible classroom environment and vocational instructions in engaging students are more likely characterized by the specialized subject. (Deed et al., 2019; Dillenbourg et al., 2002; Dillenbourg, 2013; Zhao & Ko, 2020).

Although the research may be limited for the number of the lesson been analysed, the findings offer the in-depth understanding of vocational students' engagement in the collaborative learning environment and the flexibility of adaptions including structured and purposeful instructions in the vocation-oriented classroom. The study emphasizes on vocational students' learning patterns and teaching adaptions in the specific context of Chinese higher vocational education, which suggests that vocational students' learning engagement and occupational competence development may be influenced by the collaborative learning environment and group-based adaptive instructions. Furthermore, the study contributes to the development of vocational learning theory and practice by enhancing our knowledge of student learning patterns, teaching practices, and their respective learning environments in the vocational education context. It also informs practitioners of the importance of vocational learning competence embedded in the delivery of vocational education curricula. Finally, vocation-oriented instructions involve teacher's workplace experiences while guiding students' training activities, which implies that vocational teachers' workplace learning experiences may help improve collaborative learning activities and adaptive skill-based instructions in vocational classrooms.

Chapter 5 - Discussion and conclusions

5.1 Comparing the results of the three publications

Each of the three journal articles offers a different perspective. The first paper is mainly a theoretical overview of workplace learning definitions and models, and the possibility of the extended model is applied within the context of Chinese vocational education. The results of the other two empirical papers mostly focus on learner engagement through different dimensions of teaching behaviours and collaborative learning environments.

5.1.1 The extended workplace learning model

The extended workplace learning model for vocational teachers in the first paper is an important tool that helps understand teachers' learning and professional development. The model indicates the individual and social perspectives of learning in working life, which suggests that workplace learning is contextual and teachers' participation in acquiring practical knowledge improves their teaching pedagogy and professional skills. Therefore, the paper paid significant attention to the path of teachers' competence development of their professional learning in the triangle model of workplace learning. Accordingly, vocational teachers' continuing professional development leads their training and learning needs in order to keep up-to-date with the specific occupation, and the extended model conceptualises learning at work with various learning patterns and forms. However, the paper limits its scope to a specific learning model for vocational teachers in the context of vocation-oriented teaching and learning. The other two papers are complementary to the workplace learning model discussed in this paper.

Illeris's (2003, 2009, 2011) workplace learning models provide a conceptual foundation for understanding the formation of teachers' working identities along with teacher professional development. Meanwhile, teachers' professional identities are associated with teaching work and their ongoing professional learning development through different

dimensions of the workplace learning model. In the dimension of workplace learning for vocational teachers, work and learning coexist in the interaction between practical teaching and work-related learning. In particular, vocational teachers apply work-related knowledge and skills to connect workplace situations with students' classroom learning situations. Therefore, the first paper analysed the conceptual framework of the extended workplace learning model and its application in the context of vocational teaching and learning with respect to vocational pedagogy and students' learning engagement.

5.1.2 Vocational instructions and students' engagement

The results of the second paper analyse observation of teaching behaviours and field notes of students' classroom learning which provides empirical evidence for effective vocational teaching pedagogy. Students' learning engagement is strongly associated with structured vocational instructions and stimulating learning climates, which suggests that vocational learning environments and clear instructions may have a stronger impact on students' engagement. On the other hand, the paper also indicates the importance of flexibility in the training, such as flexible classroom settings with machines for mechanical studies students or classes along with workshops. Flexible featured training classrooms for specialised subjects stimulate the students' learning climate and allow teachers to have more practical scenarios to engage students in various activities.

There are some key findings that highlight the importance of instructions in vocational classrooms, such as staged instructions, work-related activities, and collaborative teaching with company staff in the second paper. As vocational instructions emphasise practical cases in workshops or training activities, teachers give staged learning guides to improve students' application of their hands-on skills. Thus, vocational expertise is acquired through deliberate training activities that have an influence on students' active participation. The paper also points out the challenges of improving the effectiveness of vocational teaching practice and

the curriculum, such as school-enterprise collaborative teaching programmes and the assessment of collaborative teaching. However, the second paper limits its specific context of classroom observations to the Chinese vocational education setting, and the pedagogical practice from teachers' perspective should be analysed through further research on vocational teaching behaviours and learning environments.

5.1.3 Collaborative learning environments and adaptive instructions

The third paper is a further study followed by the lesson observation results from the second paper, which is based on four-lesson case studies in order to conduct in-depth lesson analysis regarding the collaborative learning environment. Small-group collaborative learning is the main focus in training activities, including online training for students who are majoring in e-commerce. Similarly, the second paper also indicates one of the key findings on the flexibility of students' learning environments that allows teachers to arrange group-based training activities. Therefore, both papers highlight vocational learning environments with featured activity-based training platforms and group-based collaborative learning. The dialogic analysis of videotaped lessons indicates that adaptive instructions for students' learning activities help integrate the learning environment while adjusting for individualised vocational training. Compared to the findings of vocational instructions on students' learning engagement in the second paper, this research suggests that adaptive teaching allows teachers to add or skip training activities according to students' learning performance.

In contrast to the first paper's discussion of conceptual models, the other two papers pay more attention to students' learning engagement rather than to the teachers' perspective of work-related learning in their continuing professional development. Collaborative learning environments and adaptive instructions contribute to vocational students' learning engagement in the development of occupational competence, as discussed in the third paper. Although this paper has a limited number of class observations, it is informative of

practitioners of vocational teaching in the delivery of course design and curriculum arrangement.

5.2 Implications of the research

Learning at work is an important issue for vocational teachers and students, and vocational institutions and enterprises are actively encouraging re-engaging in learning in their workplaces in order to achieve competitive employees. It would seem that work-related learning varies greatly according to the workplace learning environment and available educational training technologies. The research highlights the need to understand vocational teachers' learning for their continuous professional development in the changing contexts of work-based learning. Research findings presented in the first paper suggest that teachers' workplace learning provides possibilities for knowledge transfer from theories to practice for vocational students' learning and training. The paper (Zhao & Ko, 2018) had seven citations, which revealed practical implications on the implementation of workplace learning in vocational teachers' professional development. In the study of bridging knowledge and action in the workplace, Acar-Ciftci (2020) evaluated the scope of work-based learning model from the individual level and showed that pre-service teachers' professional learning associated with various class observations and practices in accordance with the types of learning during their internships.

The conceptual workplace learning model extended from Illeris's (2003, 2009, 2011) learning model focuses on the individual and social aspects of learning situations in the context of the organisation, which implies that the learning and training activities conducted for vocational learners can be characterised by work-related learning conditions and vocational and organisational structure of the vocational institutions. Research shows that workplace guidance on vocational students strongly relates to their prospects of developing expertise in future training workplaces (Mikkonen et al., 2017). Self-directed learning as a

practice of workplace learning is considered flexible to enhance individual learners' competence development in the context of learning at work (Lemmetty & Collin, 2020).

On the other hand, the relationship between work and learning is a reflection of both the organizational, and work, context, and the specialities of vocational learners. The proposed workplace learning model for vocational teachers provides a framework for empirical studies to promote professional learning in the workplace and to improve practices in the teaching profession (Zhao & Ko, 2018). Bouw, Zitter and de Bruijn (2019) conduct a systematic review of the boundary between school and work and cross-contextual learning environments in preparing students for vocational practice, and they highlight that school-work connection should be based on alignment, incorporation, and hybridisation. Meanwhile, workplace learning facilitates school-based vocational training and integrates school-based learning with practice settings (Billett, 2003, 2004; Tynjälä, 2008). From a recontextualised perspective of workplace learning, conceptually-structured vocational learning practice reduces the gap between theory and practice, which further develops learners' on-going reconstruction of knowledge and professional development (Guile, 2019).

Regarding vocational teaching in students' classroom engagement, the research findings of the second paper suggest that vocational instructions and student engagement are associated in terms of learning environments and teaching practice (Zhao & Ko, 2020). The adoption of different teaching methods and instructional media should be emphasised in the curriculum for the guidance of teachers' pedagogy-related knowledge in teaching (Guo & Pilz, 2020). Vocational knowledge and instructions are manifested as a practice emerging from different supporting activities that are made to relate to various workplaces, which indicates that the content of vocational teaching and learning within workplace activities should be contextualised in curriculum construction through coordinating with workplace settings (Bouw, Zitter & de Bruijn 2019; Guile, 2019). Conceptually, teachers' application of

occupational knowledge and experiences into teaching practices highlights the importance of on-going vocational teacher training and continuous professional development (Loo, 2012).

The second and the third papers discuss the vocational teachers' instructions involving their work-related experiences and collaborative teaching with professional company staff, which implies that vocation-oriented programmes should focus on students' existing work-related skills through learning workshops and essential activities. Edokpolor and Dumbiri (2019) recommend that adequate instructional resources foster effective teaching and learning in vocational programmes that help equip students with professional skills to pursue lifelong learning. The second paper findings imply that vocational teachers' integration of work-related knowledge and skills in classroom settings encourage students' learning engagement, and the changing learning environment in the third paper stimulates vocation-oriented instructions in order to promote students' practical skills and occupational practices. In this focus, the transition between knowledge acquisition and its application requires work-related activities for students to acquire and apply their know-how knowledge experiences (Loo, 2019).

In addition, workplace learning for vocational teachers is situational and practical because the nature of vocational education is technically oriented education that requires vocational teachers to be "double-qualified" teachers, which means that teachers possess both practical and academic abilities in teaching and learning (Broad, 2016; Fejes, & Köpsén, 2014; Zhu, 2018). Vocational teachers achieve the qualification through the practice of their work in workplace learning, and their learning is largely based on solving problems inherent in vocational education, such as student management, curriculum development, internship, and other practical issues, in order to improve their teaching skills and teaching quality. Relating to the need of involving occupational activities, teaching of occupational courses requires updating relevant areas of work-related vocational pedagogy that teachers adjust

their approaches to meet the needs of students' workplace requirements and to match the teaching and learning for the future new professions (Loo, 2018).

5.3 Directions for future research

Recognising the different orientations of the three articles helps to find a common understanding of work-based learning, vocational teaching pedagogy, and adaptive instructions in vocational learning environments. The first study proposes the vocational teachers' workplace learning model and the dynamics of professional learning in their continuing competence development. Vocational teachers also develop their practical knowledge and skills by participating in business training in enterprises and experiencing the process of production management in their workplace learning situations. Therefore, further research to study the application of the workplace learning model in the broader context is needed, particularly from the perspective of students' work-related classroom training through e-learning resources. Further research to explore workplace learning as a component of teacher professional development in supporting vocational teaching practice is also warranted. However, the other two papers highlight the importance of vocation-oriented instructions in students' learning engagement alongside an awareness of vocational teachers' work-related learning in terms of the development of teaching pedagogy. There will be future opportunities to study further the potentials of assessing the effectiveness of vocation-oriented pedagogy on students' learning at a quantitative scale.

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