The Influence of Project-based Learning on Nursing Students' Core Competencies: A case study in China.
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ABSTRACT

Vocational education provides students practical skills which will be beneficial for their future career. Project-based learning (PBL), as an instructional approach, was introduced into China's vocational education in 2000. Seven core competencies were defined in Competency Inventory for Registered Nurse (CIRN) and are applied to monitor the standard of nurses. This study aims to reveal how PBL influences nursing students' core competencies and to discuss the implementation and future improvement of it.

In order to answer these research questions, this case study was conducted in one vocational college in China. Qualitative method was employed and the data was collected from six participants in this college by interviewing them. The data were both inductively and deductively analyzed.

The findings show that nursing students have positive and negative impression of the implementation of PBL. The direction of how to improve PBL was categorized into two parts: teachers' role and teaching environment. Five components from CIRN were found to be enhanced through PBL: critical thinking, clinical care, leadership, interpersonal relationship and ethical practice.

This study provides a deeper understanding of PBL's implementation from students' voice and their views towards the influence of PBL on core competencies. Moreover, this study can contribute to better improve PBL in vocational education. Further researches such as a large scale quantitative study in this college or collecting data from other provinces are suggested to support the depth and generalization of the findings in the whole Chinese vocational education.

Keywords: project-based learning, nursing core competencies, CIRN, vocational education.

CONTENTS

1 INTRODUCTION

With the society's great economic development and the progress in modern science and technology, the requirements for vocational education have entered into a newer and higher stage. To better meet increasingly drastic societal trends regarding talents, knowledge and technique, vocational system reform must be enforced, especially where practical skills are in great demand, and general education admission is under fierce competition. The experts and scholars (Guo, 2015; Yan, Zhou & Chao, 2015) in education continue to research, explore and practice various methods; project-based learning (PBL) method is one of these.

Having both theoretical and practical characteristics, PBL was introduced into China at the beginning of the 1990's, as a way of promoting the enterprise-led projects with students' on-the-spot counseling. PBL, when used well, was concluded to be an effective teaching method in the study of "Project Teaching Practice" in Great Wall Cable Factory (State Economic and Trade Commission, 1999). In the year of 2000, a piece of article "The Teaching Methods of Foreign Vocational Education" introduced project-based learning method into china's vocational education (Yang, 2000).

Project-based learning has been widely used in vocational colleges, and this study is going to reveal PBL specifically in nursing field. The aim of vocational education is to provide students with professional and practical skills that will be beneficial in future working life (Lin & Liu, 2012; Zhou, 2012). In traditional classrooms, students passively achieve their learning goals under the guidance of textbooks and teachers. PBL in nursing offers students practical skills in a relatively open environment, aiming to learn the required clinical skills (Yan et al., 2015).

Supported with constructivist learning theory, learning by doing theory, and multiple intelligence theory, PBL is an instructional method where students are encouraged to construct their own understanding by cooperation and communication (Von Kotze & Cooper, 2000; Bell, 2010; Lei, 2007). The theory of

learning by doing supports PBL in evoking students' interest and motivation (Bas & Beyhan, 2010). The effective cooperation in PBL cultivates students' multiple intelligence such as verbal-linguistic and logical-linguistic skills (Hanney & Savin-Baden, 2013).

PBL is student centered, providing students the opportunities to learn by doing the projects that interests them (Krajcik & Blumenfeld, 2006). Massive use of practical problems help students gain much work-related experience, which they will never be able to learn from the textbook alone (Markham, 2011; Blumenfeld, Soloway, Marx, Krajcik, Guzdial & Palinscar, 1991). Moreover, the cooperation in PBL increase students' adaptability and competitiveness in future career (Habók & Nagy, 2016). Professional competence can be developed in PBL and students are capable of learning pertinent knowledge and practical skills (Xu, 2007). Within project-based learning method, students are driven by asking questions which are closely connected to their own interest, participating in designing, making schedules, modeling and laying out their ideas to group peers.

In the year of 2003, core competency of nursing was first introduced to the field of nursing in China (Ministry of Health). Afterwards, nursing core competency in China was defined as the combination of knowledge, skills and attitudes in clinical practice (Liu, Kunaiktikul, Senaratana & Eriksen., 2007). Seven components were formed in Competency Inventory for Registered Nurse (CIRN) (See Appendix 1). The following components were found to be enhanced in this case study: critical thinking, clinical care, leadership, interpersonal relationship and ethical practice. Some of the findings from previous literature, about PBL's influence on these core competencies supports the results of this study.

Qualitative method was employed in this study to reveal people's experience and feelings towards certain topics (Denzin & Lincoln, 2005). Participants' own views, experience and stories about PBL and core competencies can be explored in qualitative research (Creswell, 2012). Six participants were chosen from Hope vocational college (name changed to protect the identities of the participants), and the criteria included their academic performance, willingness to talk and prior experience of PBL class. The case of this study is the views from

participants on the implementation and future improvement of PBL, and their ideas of PBL's impacts on their core competencies. General interview guide approach was used in this study to ask follow-up questions according to their responses to the decided open questions (Gall, Borg & Gall, 2003). Research question one and three were analyzed inductively; research question two's data was deductively analyzed based on the Competency Inventory for Registered Nurse (CIRN).

The aim of this study is to reveal how PBL influences nursing students' core competencies and discuss the implementation and future improvement of it. There are previous studies focusing on separate aspects of core competencies, so there is a need to examine PBL's influence on nursing students' core competencies in a more comprehensive way. This study will contribute improving the effectiveness of carrying out PBL in vocational colleges. It is very crucial to conduct this study as there is very few studies examine how PBL affects nursing students' core competencies as a whole.

2 PBL AND NURSING CORE COMPETENCIES

2.1 Definition of a project

From the perspective of education, a project — as a noun — is defined by Merriam-Webster (2017) as a task or a problem which is usually run by a group of students for the purpose of study. A more precise and direct definition from Oxford Dictionary (2017) is that a project is carried out by an individual or co-operative group to achieve a specific goal. From these two authoritative dictionaries shown above, the primitive sources in defining a project have their common grounds. A project can either have the goal of presenting a result upon a planned process which could be a piece of research on a particular subject, or it also can reflect the entire process, along with project members' involvement and support.

In the economic and administrative field, a project reveals a rather mature and complete meaning. PMI (Project Management Institute, 2017) adopts that a project is a very detailed process aiming to realize a single goal. A project requires people from different departments or fields, working together, to achieve assigned target (e.g. sales objective). It's a one-off event. The similar definition is noted by Harrington and McNellis (2006), a project is the effective process aiming to have its own product in a short period of time.

In the matter of general education, a project offers the whole class a thorough and supportive environment in which every member is involved in, with a form of small groups to work on some related topics (Katz, Chard & Kogan, 2014). William H. Kilpatrick, known as "Mr. Project Method", illustrated the idea of a project as a way of "wholehearted purposeful act carried out amid social surroundings" (1918, p. 321). Thomas, Mergendoller & Michaelson (1999) suggested that a project is a number of relatively complicated tasks on which challenging problems are based, involving learners' activity in designing, deciding and surveying with final reflections on real project work and an achievement report. A well executed project makes learners strike out and learn new skills and information on their own in extra-curricular time which gives them

the incredible opportunity to start learning to be an autonomous person. Zhong (2002) argues that a project aims to address a range of issues in teams within a definite time. So a project in education could be defined as a set of comprehensive learning tasks in a certain period, which makes use of various resources and aims to finish the project that is specific and valuable. The essence of a project in education is learning tasks and — as a carrier driving learners to be involved in practice — not to be obsessively to seeking for results (Thomas, 2000). The "project" once was regarded as one of the most suitable teaching methods in vocational and other field of education (Knoll, 1997). Hence it is very necessary to research project-based learning in the field of vocational education.

2.2   Project-based Learning

A person needs to have a strong interest in what he or she is trying to learn in order to gain the curiosity to ask further questions and strengthen his or her knowledge of the subject. As Dewey (1913) states, interested students commit to learning, and then it can be effectively carried out in schools. Project-based learning gives students the opportunity to learn by doing, and helps them obtain a deeper understanding and the idea for innovation (Krajcik & Blumenfeld, 2006). With project-based learning methods, students are driven to ask questions which are closely connected to their own interests. It is noted by Blumenfeld et al. (1991) that students themselves — as the center of learning — acquire and extract meaningful content knowledge through project-based learning. Therefore, PBL is a student-centered teaching method. What researchers such as Blumenfeld et al. (1991) have shown is that project based learning is more concerned with complicated tasks where higher intellectual engagement is needed.

Xu (2007) defines project-based learning as a teaching method which can develop students' professional competence, and help them to acquire pertinent knowledge and skills throughout the whole of the project. Wolk (1994) indicates that PBL provides a planned and purposeful activity with specific content knowledge. Bell (2010) holds the view that cooperating with group members, students will be further familiar with critical thinking in general. Critical think-

ing, creativity, cooperative skills, these abilities cannot be taught in the text-book, the best way to learn is to practice (Markham, 2011). Thomas (2000) believes that students are able to learn content knowledge and skills in an open and student-centered teaching process, called project-based learning, where real problems are well-designed.

Real problems and well-designed teaching tasks have been strongly emphasized in PBL (Markham, Larmer & Ravitz., 2003). Bell (2010) describes PBL as an access which improves learning and teaching with more practical methods; through PBL, students' interest towards studying arises with teachers' guidance and assistance. According to Markham (2011), PBL encourages students to know and understand the actual use of knowledge in the implementation process, so that they can solve every problem in the practical work.

By focusing on the authentic problems, Bell (2010) indicates that students can become motivated and self-governing learners. Project-based learning starts with students' doubt or curiosity about some current problems, then inquiry — the important blasting fuse — naturally follows (ibid.). Besides the motivation of learning, through open-ended problems, students present some ideas and suggestions towards the authentic, real-life projects with initiative participation, positive thinking, deep learning and comprehensive analysis (Blumenfeld et al., 1991).

Similar inquiries or interests, as Bell (2010) would say, encourage students to find partners working together. Since they have the same goal so the motivation to learn can be enhanced. According to Bransford and Stein (1993), PBL creates a good cooperative environment where students can investigate, engage in and take advantage of school equipment to accomplish a mutual goal via group work in comprehensive study. In the 21st century information society, cooperative and creative skills are vital for students to raise their adaptability and competitiveness in workplace (Habók & Nagy, 2016). Because of this, cooperative teamwork is more important than ever.

2.3 Theoretical foundation of PBL

Project-based learning has theoretical foundations rooted in constructivism, learning by doing and multiple intelligence (Grant, 2002; Bell, 2010; Dewey, 1913; Thomas, 2000; Greeno, 2006). Project-based learning is an engaging instructional method that provides learners autonomy to construct their own meaningful learning with the theoretical support from constructivism (Grant, 2002; Greeno, 2006). In PBL, students retain more information because they essentially learn by doing, to which many educators have ascribed for enriched learning (Bell, 2010; Dewey, 1913; Blumenfeld et al., 1991；Larmer, Mergendoller, & Boss, 2015). PBL as a student-centered approach, works well with multiple intelligence theory. The activities in PBL cultivate students' varied intelligences and they are also allowed to actively use their varied forms of intelligence (Bas & Beyhan, 2010; Ozdener & Ozcaban, 2004; Giles, Pitre, & Womack, 2003)

2.3.1 Constructivist Learning Theories

Piaget (1973), as one of the most well-known and influential representatives in constructivism, seeing learning as a process of learners' active constructing and building of new ideas and knowledge based on their previous experience. During the learning process, human beings are not learning or recording passively. Brooks and Brooks (1993, p. VII) describes constructivism as "a theory about knowledge and learning" which is subjective not objective to construct meaning. As von Glasersfeld (1989, p. 182) points out that "knowledge is not passively received but built up by the cognizing subject".

Piaget's two famous concepts — assimilation and accommodation — exactly presents the process of how learning occurs (Piaget, 1973). Learning happens when learners try to recall previous knowledge as a schema, then assimilating or accommodating the new knowledge to create a new balance (schema). They may give up what they have already known and rebuild a new scheme.

Sewell (2002, p. 24) identified a deeper understanding of constructivism, which is not the result of teaching, it is the process and result of how students

deal with the new knowledge. Four ways of understanding new information are carefully presented by Sewell.

1."delete" what they've already known,

2."modify" the previous knowledge in order to understand the new ones,

3."modify" the new knowledge to match the existed knowledge,

4."reject" the new information (ibid.).

It can be seen from the definitions that project-based learning lays emphasis on group working, cooperation, communication and so forth, these concepts are also reflected in constructivism theory (von Kotze & Cooper 2000; Bell, 2010; Lei, 2007). In project-based learning, students are encouraged to connect their pre-existing knowledge with current project themes, and the ways they learn are more interactive and dynamic (Prosser, Ramsden, Trigwell, & Martin, 2003).

2.3.2   Theory of Learning by Doing

The well-know American psychologist and educator John Dewey (1916) published his most influential book *Democracy and Education,* and proposed the idea that education and learning are social and interactive processes. He noted that the notion of "Learning by doing" means that teaching process occurs with activities, and the learners obtain knowledge through "the interactions with the real environment" (Dewey, 1916, p. 239). Dewey focused great importance on the cultivation in the ability of thinking, and put forward the five steps of critical thinking (Rodger, 2002, p. 851).

1. Identify a problem which has produced confusion and doubt (who, what, when, why, how, where).

2. Engaging in the problem requires students to analyze the problem through observation and own understanding or experience.

3. Assuming several problem solving solutions using brainstorming.

4. Evaluating the possible methods by using majority voting and ranking to narrow down the alternatives.

5. Testing and checking the solution to see whether it is right or wrong

The real context in PBL can arise students' interest and motivation which could evoke all of their active participation. Core elements of "learning by doing" -

theory serve Project-based learning in inspiring teaching and learning by doing, researching, investigating and testing (Bas & Beyhan, 2010; Krajcik & Blumenfeld, 2006; Blumenfeld et al., 1991). This is to develop and promote every student's ability of critical thinking, information collection and analysis.

2.3.3   Theory of Multiple Intelligences

The perception of multiple intelligences was written by Howard Gardner (1983) in his book *Frames of Mind: The theory of Multiple Intelligences* and since then has dominated a large number of schools, educational institutions and academic researcher. The traditional way of testing intelligence (IQ) has its limitations because it only involves linguistic and logical-mathematical abilities. Instead, Gardner (1989, p. 4) viewed intelligence as "the capacity to solve problems or to fashion products that are valued in one or more cultural setting". Therefore, he proposed that nine intelligences need to be considered. They (Garner, 2000) respectively are musical-rhythmic and harmonic, visual-spatial, verbal-linguistic, logical-mathematical, bodily-kinesthetic, interpersonal, intrapersonal, naturalistic, existential.

Gardner and Hatch (1989) emphasized on the nature of a variety of intelligences. Schools focus more on students' verbal-linguistic and logical-mathematical intelligence (Gardner, 2000). However, not everyone possesses the same level of intelligence, some may be better in bodily-kinesthetic, others are more good at using language (verbal-linguistic). Gardner (2000) argues that we should treat every individual student equally because they are waiting for teachers, or parents, to find out their own shining point and cultivate this intelligence.

The combinations of these varied intelligences determine how students learn and what results they could achieve in the end (Gardner, 2000). Project-based learning sets a positive learning environment where teachers guide students to achieve or maximize their unique and excellent intelligence with its own strengths (Bas & Beyhan, 2010; Green, 1998). Also PBL lays emphasis on mutual and effective cooperation where students' verbal-linguistic and logical-

linguistic skills are greatly improved (Hanney & Savin-Baden, 2013; Mergendoller, Maxwell & Bellisimo, 2006; Mioduser & Betzer, 2003).

2.4 Characteristics of Project-based learning

As a teaching method combining theory with practice, PBL can further unlock students' potential, and help them to improve problem-solving abilities and other core competencies (Markham et al., 2003; Bell; 2010; Blumenfeld et al., 1991). There are some characteristics of PBL according to the scholars (Danford, 2006; Zha, 2003; Thomas, 2000; Von Kotze & Cooper, 2000; Graham, 2010): multidisciplinary resources, student autonomy, constructivism, cooperation, authenticity and realism.

Multidisciplinary resources

One key feature of project-based learning is that students are allowed to find the problems from multiple views (Danford, 2006; Harmer, 2014). This multidisciplinary knowledge can, based on free construction of teaching content and project theme, be integrated into the final project. Project-based learning, makes the integration of different disciplines into reality. Thomas (2000) also hold a similar view that PBL may create thematic topics from more than one disciplines. Within projects, students are able to use multiple source of information to understand the conceptual framework and foundation in disciplines (Danford, 2006).

In PBL the students make good use of the rich and varied teaching materials, putting them into real workshop scenarios (Blumenfeld, et al., 1991; Bell, 2010). Diversified and comprehensive resources connected with future development in career life, have many practical applications both in school studying and real-life. These resources include but are not limited to textbook content and they are used in more diversified ways.

Student autonomy

Autonomous and cooperative learning is one of the most striking features of PBL, in which projects play a dominant role with teachers having a guiding position (Zha, 2003). Mailloux (2006) gave autonomy a general definition, that is, the freedom to choose when and how to do a task. Holec (1981) describes autonomy as the ability to construct one's own learning. Students' learning autonomy has been developed and enhanced in this practical learning process, where they conduct all the research and collect information on their own, the teacher is only acting as a facilitator (Blumenfeld et al., 1991; Thomas, 2000; Stoller, 2006; Danford, 2006). For the PBL process, teachers are also required to track and scrutinize the development of the project, make suggestions and offer emotional support (Thomas, 2000). But there exist some pitfalls in teachers' role, for example, they might not be able to break out of traditional teaching role (Danford, 2006), or not control the flow of information (Marx, Blumenfeld, Krajcik & Soloway, 1997).

Constructivism

Thomas (2000, p.3) describes project-based learning as a process of "constructive investigation". Through project-based learning the students will come to possess the ability to listen to others in order to gain valuable feedback and raise their own feedback to others in a constructive and advising manner. Project-based learning constructs a social environment where students inquire a problem, build new understandings and make resolutions (Kubiatko & Vaculová, 2010; Thomas, 2000). PBL is seen as a "construction site of learning", which emphasizes on involving every project member's idea to co-construct the application of new-learned information or skills (von Kotze & Cooper, 2000). The well-noted educator, Dewey (1913) describes learner-centered education as a process of reconstruction of knowledge. Project-based learning creates an environment where students realize that prior knowledge is insufficient in new tasks. Therefore, they need to assimilate new information and rebuild their original knowledge structure based on what they have already known from their own field (Dewey, 1913; Krajcik, Blumenfeld, Marx & Soloway, 1994).

Cooperation

Cooperative learning emphasizes the mutual engagement of learners rather than single person as Yang (2002) points out. Von Kotze and Cooper (2000) proposes that making effective use of group work is the key point of PBL. Teachers move away from the cramming method of teaching, and offer students more opportunities to discover and solve problems. Students cooperate with other peers, argue about some critical issues in order to figure out the truth, which is also very essential in their future careers. These interactions between team members could happen in "transferrable skills" such as communicating, discussing, planning, processing and concluding (Hanney & Savin-Baden, 2013, p. 8).

Authenticity and Realism

Based on Graham's (2010, p. 9) research, "authentic content" is the key factor of project-based learning. PBL courses tend to investigate an authentic project through a driving question, where students are cooperating together to find a solution (Kubiatko & Vaculová, 2010). Danford's (2006) research illustrates the importance of authenticity of a project, which focuses on complex real-world problems. In addition to the difficulty of designing an authentic project — that is related to the real world — it is also very hard to design an authentic assessment to evaluate the success of the project (Marx et al., 1997).

"Projects are realistic, not school-like" (Thomas, 2000, p. 4). Projects in PBL do not happen in a school setting. This gives students a sense of reality, not through conventional studying, but instead through their working requirements and settings (Yang, 2002). They concentrate on cultivating learners' comprehensive abilities by implementing some practical activities which raise students' interests. At the beginning of a project, teachers are responsible of presenting the problem and initial questions as a real life scenario (Kubiatko & Vaculová, 2010). These life-related projects stand in the center of project-based learning (Thomas, 2000; Hanney & Savin-Baden, 2013).

2.5   Project-based Learning and Problem-based Learning

There are all kinds of "-based" methods which could be listed out, however, all these instructional approaches own an emphasis and can be traced back to "learning by doing" theory from Dewey (1916), who was an early proponent of this notion (Larmer et al., 2015). The variety of similar-sounding approaches in current education field might look very different in practice, such as case-based learning, place-based learning, game-based learning, service-based learning and so forth.

BIE (Buck Institution of Education, 2017) believes that project-based learning is broad genera, and acts as a "big tent" model for other "-based" method. That is because there is an "extended project" in all these "X-BLs", whose formations can vary largely. For example, the "extended project" can either be a tangible product, a performance, a solution to solve real-existed problems (authentic or simulated), or a deep-investigation on an open-ended question (BIE, 2017).

Problem-based learning has the same acronym with project-based learning- PBL, that is the reason why many teachers are confused about these two concepts. Nevertheless, there is only very subtle variations and little conceptual differences between these two, their differences are only related to the style and scope (Larmer et al., 2015). Problem-based learning is regarded as a "subset" of project-based learning (BIE), this is illustrated in figure 1. Larmer et al. (2015) argues that any kind of project will start with a problem, inquiring questions are then formed during the process.
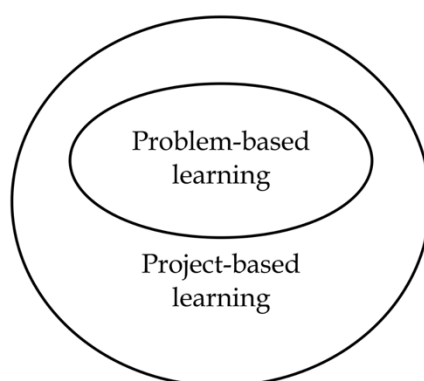
FIGURE 1. Project-based learning and problem-based learning.

Project-based learning and problem-based learning are student-centered instructional approaches that provide students opportunities to integrate theory with practice under teachers' facilitation, emphasizing students' independent study and collaboration. They both aim to lead students to achieve a shared goal (Perrenet, Bouhuijs & Smits, 2000; Mills & Treagust, 2003; Savery, 2006; Krauss & Boss, 2013; Larmer et al., 2015). Project-based learning carries more subjects compared to problem-based learning, and has a focus on the "application" of knowledge; however, problem-based learning directs to the "acquisition" of knowledge. Moreover, in Project-based learning students follow general steps and have more control over the process, compared to problem-based learning where students follow specific steps and have less control (Larmer et al., 2015). Sometimes, there is no clear line between these two PBLs, and they are usually complementary and combined with each other. Anyway, they both are engaged to enhance learners learning through "doing" process.

2.6   The Implementation of Project-based Learning

By understanding the design process, teachers have an overall grasp on how PBL can be applied into their teaching practice. The process of implementing PBL refers to the activities that are ordered into stages and then carried out in chronological order. Kilpatrick (1918) believes that the process consists of four steps: purposing, planning, executing and judging. Based on these and the nine steps of project-based learning (Stix & Hrbek, 2007), I summarized them into six steps for the implementation of project-based learning which are adaptable and practical both in vocational education and general situations as shown in Figure 2.
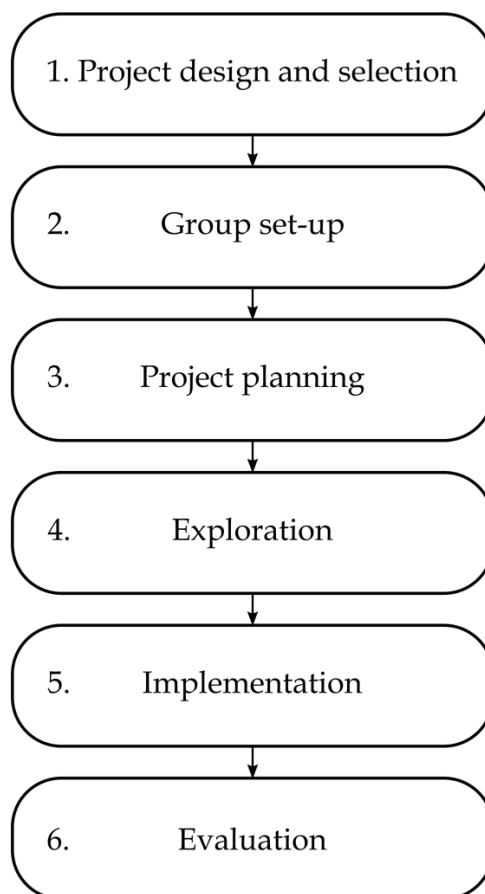
FIGURE 2. The implementation of PBL in six steps

2.6.1   Project design and selection

Themes for the projects should be agreed between teachers and students (Stoller, 1997; Allen & Stoller, 2005). In order to achieve a successful implementation, the support from management level and faculties are regarded as very important factors (Du, Su & Liu, 2013). Donnelly and Fitzmaurice (2005) add that educators should be careful to pilot and retest those projects to ensure the tasks are achievable within the defined time schedule.

Teachers begin by defining the important concepts in the course, collate and summarize the related content knowledge, then put forward one or several project tasks. Students' learning phases, interests and ability levels should be taken into the consideration during selection process, combined with teaching targets, content, school establishment and existing teaching situation (Xu, 2007).

However, students may encounter uneasiness because of this unfamiliar new teaching method. It is also suggested to ask senior experienced students to show how to ease the uneasiness in students as tutors (Kahn & O' Rourke, 2004).

After the selection stage, a driving question is helping teachers and students relate proposed projects to the conceptual learning (Barron et al. 1998). Through full discussion of the embedded problem, teachers and students will determine the final results and forms of the project activities (Stoller, 1997; Stix & Hrbek, 2007). Just as Zhang (2013) argues, selecting an appropriate project not only decides the final outcome of PBL, but also affects students' acquisition of knowledge, skills development and employability.

2.6.2 Group Set-up

Group work is supposed to be the most important and challenging phase in PBL (Von Kotze & Cooper, 2000). What aspects influence students into forming different groups? Researchers have found out that group members with similar manifestation of social skills (homogenous) — such as cooperating, leadership and problem-solving — are more satisfied with what they are doing and are more efficient than students with dissimilar manifestation of social skills (heterogeneous) (Notari, Baumgartner & Herzog, 2014). Therefore, full understanding of every student and group work training (task assignment, discussion) are necessary for teachers to provide suggestions upon logical and effective grouping. From students' perspective, the constitution of group might relate to similar self interest (Lehmann, Christensen, Du & Thrane, 2008) and personal characteristics (Cheung & Chow, 2011).

Some management roles should be assigned (Meehan & Thomas, 2006). Cheung and Chow (2011) suggest that the selection criteria should be based on the years of study and skills needed in the projects. Individual students have to take active participation in the group with specific tasks and roles (Stauffacher, Walter, Lang, Wiek & Scholz, 2006). In Stauffacher et al.'s (ibid.) study, one tutor (teacher) — who knows very well the applied PBL method — should be present in every group. The role for students are completely different from tra-

ditional expectations in school, instead, students occupy a dominant position in PBL (ibid.). The four rotating main roles existing in an efficient student group were discussed by Stauffacher et al. (2006). They respectively are workflow co-ordinator (project decision making), logistic office (administrative work), edi-tors (final report writer), content management (sorting, updating files and re-sources) and other minor roles.

Project itself plays an important role in supporting the group's perfor-mance (Poole, 1985, as cited in Ilze & Bonnie, 1998). In order to promote collab-oration within a group, Barron et al., (1998) emphasized that unless everyone understands and achieves the objectives in every stage (planning, data collec-tion, etc.), the whole group cannot move on to the next stage. Bostrom, Anson and Clawson (1993) illustrated that facilitation activities coming from group members and shared by every participant will maximize the success and out-come, these activities (name games, opening arts activities, etc.) directly "facili-tate" the work effectiveness of group members (Bostrom et al., 1993). Lou and MacGregor (2004) also found out that low efficiency groups could benefit from high efficiency groups through online mentoring, enabling teams to collaborate highly efficiently. In project-based learning teachers and group peers are the most accessible mentors offering guidance and feedbacks. Mentees (students or groups) would greatly benefit from their mentoring.

2.6.3   Project Planning

Reasonable plans should be made to ensure the smooth implementation of the proposed project after its theme has been decided. Teachers are responsible to explain and introduce the project they have chosen to help students have an overall comprehension prior to practical project implementation (Zhang, 2013). The plan needs to illustrate how to implement the project, what resources should be allocated and students participation etc. The plan is aimed to make a specific instruction before actual operation. According to the nine steps of pro-ject-based learning, students are taking the main responsibilities of project planning, data collection, and discussing to search and store up background information they need, which could be the first step in project planning (Stix &

Hrbek, 2007; Du & Han, 2016). Also, students and teachers should reach a final agreement upon the presentation (e.g. video, oral presentation, report) of the project's result (Alan & Stoller, 2005; Thomas, 2000).

Kahn and O' Rourke (2004) emphasize that necessary resources such as time deadlines, workshops and relevant readings are provided to satisfy students' needs and inquiry. Teachers have the right to modify project plan on the basis of real teaching situation and time limitations to ensure the completion of the project. For example, it may be necessary that teachers, after considering the effectiveness of the teaching process, rearrange the project into several subprojects (Zhang, 2013). The teachers are taking the main charge of preparing students towards gathering the demanded information. For example, if students are going to conduct an interview, the teacher should take a look at their interview planning, questions and data analysis (Alan & Stoller, 2005; Stix & Hrbek, 2007).

2.6.4   Exploration

Students take advantage of what they already know and use every technique to explore more related information based on the present project. Stauffacher et al. (2006) stressed the importance of keeping students motivated and persistent when they are facing some challenges or difficulties that they have never encountered before. In a sense, teachers may be confronted with a huge amount of work, offering students a timely guidance. Their role as a "facilitator" (Kahn & O' Rourke, 2004, p. 5) requires teachers to have a relatively rich knowledge and practical competences, because they are supposed to guide students to apply their existing knowledge into practice to cultivate their problem-solving skills. Stauffacher et al. (2006, p. 265) hold the same view that "Ownership is the key term when it comes to the motivation of students. The most crucial aspect here is the choice of the case".

Except for the appropriate project, sustaining students' interest could also be influenced by the learning environment where a sense of security and comfortable surroundings are pervaded around which can reduce tension and stress to some degree (Green, 1998). A highly motivated group of students ben-

efit from positive competition among groups and proper reward system (Graham, 2010; Botha, 2010)

2.6.5   Implementation

After first identifying who takes which particular role, and what means of cooperation are used, groups can move to the phase that excites all the members, well prepared and organized collaborative project implementation work, which develops both knowledge and skills. Stix & Hrbek (2007) name this step as "Students create their projects", which is managing and analyzing the resources (e.g. data) they received to complete the final project (Allen & Stoller, 2005, p. 13; Du & Han, 2016, p. 1081).

With great efforts from all group members, and the aim to enhance students to generate vocational competence and comprehensive abilities (Zhang, 2013), the knowledge and skills obtained during the implementation of project can be presented in the forms of research report, videos, PowerPoint and so forth (Allen & Stoller, 2005). In this process, appropriate presentation is one of teacher's first considerations. Because stimulating students' desire towards studying, will prepare them for future education. Realizing the transformation of teacher's role into a facilitator at a proper time plays a significant role in guiding students to accomplish the project in due time (Du & Han, 2016).

2.6.6   Evaluation

Thorough examination and assessment are made in this key point, which is very different from traditional teaching. The content of evaluation consists of all the steps from project design to project presentation. Project evaluation summarizes students' learning outcome and progress in project-based learning (Zhang, 2013). Kahn and O'Rourke (2004) developed the idea that the assessment system should keep the same pace with enquiry and abilities developed in the process. From Frank and Barzalai's (2004) research result, the assessment criteria discussed between teachers and students, and demonstrated at the beginning, is preferred. It helps students to self-evaluate during the process on problematic issues.

The study carried out by Barron et al. (1998) indicates that students develop a range of skills and feedback their progress to teachers, which is called formative assessment. This kind of assessment help students to realize the mistakes they make in the learning process (Blumenfeld et al., 1991; Du & Han, 2016). Teachers are required to observe the project activities carefully, to give precise and direct feedback and then conduct an individual evaluation of each group member, forcing them to reflect on what knowledge they have learned and what difficulties they have encountered (Zhang, 2013). Stoller (1997) encouraged teachers to lead students to think about the actual meaning of the project and what would be different if they have another chance to conduct the same project next time. SWOT analysis — a structured planning method: strength, weakness, opportunities and threats — is strongly suggested by Hanney and Savin-Bade (2013, p. 13) to cultivate problem-solving, "critical thinking" and "self-evaluation".

Another suggestion promoting the effectiveness of evaluation is the use of summative assessment, where the end result of the project is largely stressed. Nevertheless, the final grade is not the most important thing in project-based learning. In the final stage, there should be one leading person to present and summarize what the group has done concerning the project, after that other group members are also allowed to ask questions and evaluate the shortages (Zhang, 2013; Botha 2010). Through this self-evaluation and mutual evaluation in groups, teachers realize what could be improved in future projects, and students will be aware of their own advantages and disadvantages (Stoller, 1997).

2.7   Competence and Competency in Nursing

It is confusing to define competence in nursing, however, the importance of making a clear explanation in this practical profession may be fairly obvious (Khomeiran, Yekta, Kiger & Ahmadi, 2006). Benner (1984) defines competence as a "continuum", starting with someone who is new to field or activity, then to become competent or expert in a profession. According to While (1994, p. 526), competence could be described to be more related to "what people can do than

what they know". Locsin (1998, p. 52) defines that competence has two parts in nursing, one is the "intrinsic quality" which is the basic theory studies, the other one is their performance in real world nursing situations.

Because competence has no universally accepted definition and cannot be measured. Pearson, Fitzgerald &Walsh (2002, p. 36) continues describing competence "as a set of characteristics or attributes" underpinning competent performance, including one's own expertise and limitations. McMullan et al. (2003), sums up that competence is related to a certain task and more like a description of actions, behaviors or performances.

Nursing competency is the ability to carry out a task which requires nurses to finish tasks in a more varied real-life situation (Benner, 1982, as cited in Khomeiran et al., 2006). Similarity, according to McMullan et al. (2003, p. 285), competency and competencies are "person-orientated", regarding the potential characteristics and qualities that indicate the effectiveness or advanced performance in a job.

Competence and competency both originate from the French word 'competence' meaning a skill, or capability. There is a faint difference between competence and competency, as Woodruffe (1993) illustrates, competence is something a person could perform during their work or what the job requires; while competency is the behavioral support for your performance. It is also sometimes suggested that "competence, competency, capability and performance are being used interchangeably" (McMullan et al., 2003, p. 285). To summarize, when describing general ability, competence is preferred; while using competency to describe a person's ability to carry out a certain task.

2.8   Nursing Core Competencies in China

There are various definitions of core competencies in different field throughout the world. International Council of Nurses (ICN) put forward the framework of nursing core competencies in 2003, and defines it as:

> knowledge, understanding and judgement;
> a range of skills cognitive, technical or psychomotor and interpersonal;
> and a range of personal attributes and attitudes. (Alexander & Runciman, 2003)

Core competencies are the essential abilities needed to attain job requirements (Chen, Tang & Wang, 2011). In 2003, China's literature *Three-year higher vocational education in nursing - the principles of scarce skill-based talents training*, first introduced the notion of core competency (Ministry of Health). This study clearly proposed the idea of the basic competence a nurse should possess, consisting of evaluating capability, communication skills, the ability of hygiene guidance, capability to operate computer and practical competence in applied English. Core competencies embody how nurses accumulate systematic knowledge, skills and capabilities and take them into practice (Fan & Xi, 2010). Nursing core competencies are closely related to personality characteristics (Li & Zhang, 2011; Wang & Zhang, 2011,). Li and Zhang (2011) found out that there's a relationship between the development of nursing core competencies and group atmosphere, claiming that the smoother group members work, the better their core competencies progressed. Riley, Smyer and York (2012) noticed that age could be related to core competencies. Additionally, age and working experience are in positive correlation with core competencies (Numminen, Meretoja, Isoaho, & Leino-Kilpi, 2013).

Yan and Shen (2014, p. 201), Wang and Yu (2007, p. 638) summarized the definitions and characteristics of core competencies into the following:

1. "Uniqueness". Core competencies are accumulated through long-term studying and practicing, and the requirements of the profession and conscientiousness make nursing core competencies have its own uniqueness.

2. "Synthesis". As a multi-faceted competency, nursing core competencies is a mixture or combination of accumulated knowledge, experience and skills.

3. "Gradualness". Nursing is a demanding profession, and it will take time to enhance core competencies. Nurses need to master multi-discipline knowledge, and apply these theories into practice.

Based on the ICN Framework of Competencies for the Generalist Nurses developed in 2003, Liu et al. (2007) and Liu (2008) define core competencies in China as the combination of knowledge, skills, attitudes in clinical practice. These consist of seven domains in Competency Inventory for Registered Nurse (Appendix 1): "critical thinking and research aptitude, clinical care, leadership, interpersonal relationship, legal/ethical practice, professional development, teaching-coaching". (Figure 3)
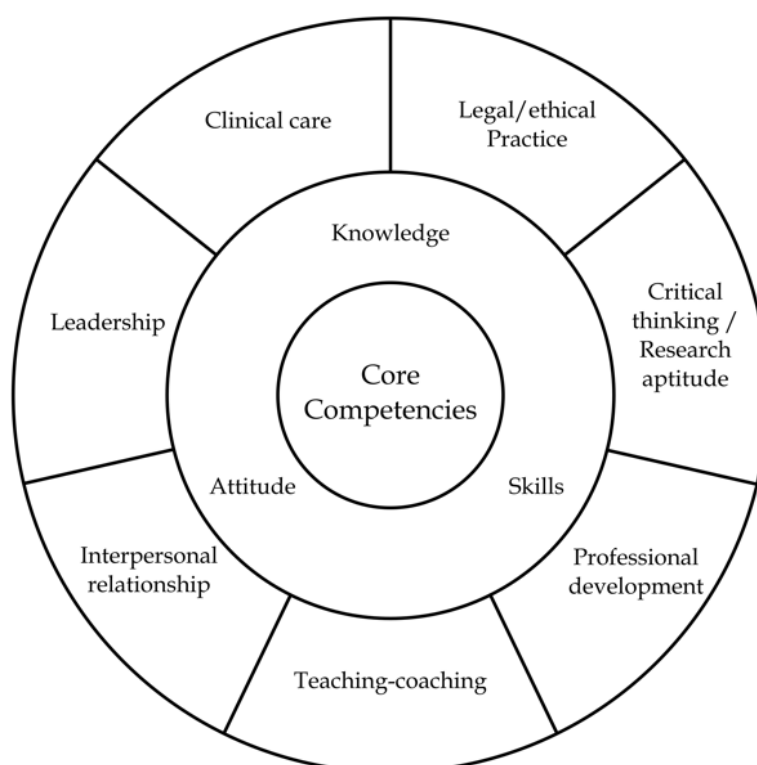
FIGURE 3.Competency Inventory for Registered Nurse. (Liu, 2006, p. 693)

With rapid changes in the medical field, advanced nursing education is becoming more and more international. The demand for qualified hospital nursing staff is increasing, so the challenges on the nursing education are tremendous (Wang & Yu, 2007). Nursing core competencies include all the main capabilities that all nurses should have as prerequisite so as to adapt to the job as quickly as possible, and benefit the patients (Yan & Shen, 2014). To sum up, the core competencies in the study is defined as the combination of knowledge, skills and personality attributes in a long process of accumulation.

2.9 PBL and Core Competencies in China's Nursing Education

PBL has been studied in the Chinese vocational school context. Usually these studies have been carried out by setting up a regular class, that took the traditional teaching approach, and another experimental class with project-based learning method. After the experiments were finished, students were required to fill out questionnaires, tests and interviewed according to a schedule. The main results from previous studies are summarized in the following sections.

Academic performance

Li, He, Liu & Wu (2014) utilized LASSI-HS (Learning and Study Strategies Inventory) to separately test students' study strategies' before and after the interventions in regular class and experimental class. He found out that project-based learning is a great help in enhancing students' effective study strategies and reducing application of unfavorable study strategies. The result of applying project-based learning methods can be associated directly or indirectly with study strategies of students, and it has a positive effect on helping student learn to learn (ibid.).

Qi (2011) has carried out an experiment to test students' academic performance, showing that in the training course for basic nursing process and skills; PBL enhances students' mastering of textbook knowledge, moreover, it promotes students to employ knowledge flexibly. The majority (75%) of students who were involved into this experiment believed that PBL has a significant advantage over traditional teaching approach.

Deep and critical thinking

PBL plays a significant part in promoting students motivation towards learning, this further leads their minds to enter into a deeper level of thinking. The influence on students is very large and far surpass the confines of the classroom and school (Li et al., 2014; Lei, 2007; Su, 2016). Cui (2015) believes that PBL fully reflects student centered teaching principle and that students' clinical thinking abilities can be promoted and will yield the maximum benefit.

Independent-learning and self-management

Students' independent-learning and self-management receive large benefits from PBL because they are likely to experiment more in a real nurse-patient environment to apply their previous theory knowledge (Guo, 2015). During the whole process of PBL, every group member has to play a role and cooperates with each other to complete the symptoms treating which allows them to manage their project plan independently (Cui, 2015).

Enthusiasm, initiative and knowledge exploring

Shi and Huang (2013) state that compared with traditional teaching method, PBL could primarily evoke students' interest and initiative, thus enhance their skills to address clinical issues and focus more on capabilities for caring of patients. In project-based learning, clinical problems present a true and complete picture of real situations by the means of role play and learning to think from the perspective of the patient, which develops students' ability to use the knowledge actively and cover the shortages of traditional teaching approach, and enhance students' interest in studying (Yan et al., 2015).

Shifting students' attitudes from passive receiving to active involvement can be achieved through PBL, by using selected clinical questions in building authentic clinical scenes (Yan et al., 2015). This will keep the student's minds fresh and encourage active thinking throughout the learning process (Xu, 2016). The initiative is also embodied in the knowledge exploring, where students have the right or freedom to present their ideas in the classroom — students are not only sitting strictly and listening (Xu, 2016; Lei, 2007). The way of imparting knowledge has changed into an investigation where students and teachers seek knowledge as equals with mutual respect. Through internet surfing, library research, consulting clinicians and teachers, students are able to master more targeted nursing skills and inspire in them a love for learning (Huang, 2001; Cui, 2015).

Innovation

For example, in a study by Cui (2015) the students had to perform a wide variety of tasks in order to finally outline and direct the nursing treatments primarily at main symptoms. These tasks included not only self study from textbooks and studying the source, development and evolution of the diseases, but also material analysis and finding and accessing all related information as well. All this was found to strengthen the sense of innovation and focus on festiveness of the learning (ibid.). Many scenarios and dialogues are based on students own theoretical knowledge and understanding which cultivates students' innovation through practical experience (Yan et al., 2015).

Confidence and competitive consciousness

After Huang's (2001) four months' observation between regular class and experimental one in surgical nursing, gynecotokology and basic nursing, he expounds the positive influence of PBL on the forming of students' competitive consciousness, the growing of confidence in completing tasks, and the enhancing levels of students' initiative. In project designing and discussion, students are encouraged to present ideas or put forward questions in the class, whose confidence and language skills are accordingly enhanced (Zhu, 2014). In order to better finish the project, students have to try their best to acquire pertinent knowledge to be the best among the groups, which also raises their competitive spirit (Xia, 2012).

Nurses' soft abilities

Patients are likely to receive care and treatment in a more relaxed, comfortable and pleasing environment by means of nurses' enhanced soft abilities — proper professional smile, good manners and etiquette, and outstanding communication skills. Lin and Liu (2012) stresses the importance of developing nurses' soft abilities so as to standardize the service, strengthen the service consciousness, improve modern nursing quality and win the trust and respect of patients. In role play performances, students are more likely to experience patients' pain and develop a deep conscious of responsibility as a nurse, which will also drive

them to keep learning to carry out appropriate nursing treatment in the future studies (Zhu, 2014).

Problem-solving skills

Inside real hospitals there often arises emergency situations that require nurses to find and solve problems as soon as possible. To improve student's problem solving skills in these difficult situations full application of PBL should be considered as this teaching method is appropriate for field practice (Luan, 2012). In Zhou's (2012) experiment, the majority (90%) of students thought their creative and problem-solving skills were enhanced. The questions of "How to do?" and "How to do better?" are bolstered and the old concept of "what is it?" is found to be less influential, these are all linked up to project-based learning and which lays stress on developing students' ability to solve problems, this leads to satisfying teaching results (Yang, 2016).

3 RESEARCH QUESTIONS

In response to the growing requirements of the health care system, the demand for excellent medical talents is steadily climbing each day. In China, there is much burden laid on the nurses and they play an important role in assisting doctors in administering clinical care. So the nursing core competencies should be emphasized and developed in nursing students to prepare them for future job requirements. PBL is a method aiming to provide students practical skills and it has been employed in teaching nurses for a long time. While there are some studies (Xia, 2012; Huang, 2001; Cui, 2015) focusing on how PBL affects single aspects of core competencies, no studies were found on how PBL affects core competencies as a whole. The purpose of this study is to answer the following research questions:

1. How is project-based learning implemented in vocational college?

2. How does project-based learning support and enhance core competencies?

3. How should project-based learning be improved?

4   IMPLEMENTATION OF THE STUDY

4.1   The Context of the Study

Hope Vocational College is a public full-time college, involving many majors such as medical health, financial management, tourism, mechanic and electronics. There are two training patterns conducted with the credit system in this college, one is 3 years' study for high school graduates (2-years learning + 1-year internship), the other one is 5 years' study for junior high school graduates (4-years learning + 1-year internship). In this study, I focus on the students who are in the 3 years' nursing program. Currently, there are 381 teachers and more than 10,000 students studying in this college.

The college has five teaching departments – Nursing department, Electrical and Mechanical department, Economic management department, Tourism department, New energy material department and general course faculty. This college's motto and its core ideas of education are "people oriented, truth seeking and innovation, and harmonious development" (College website). This can be further illustrated by stating that educational service is the aim, students' employment is the guidance, and innovation is the way to improve the education quality and to be socially oriented and to better serve the local economy.

This college has established cooperative relationship with universities and colleges, enterprises and institutions and hospitals. Besides, it has two teaching hospitals and a factory where students can have internships and practical skills training courses.

4.2   The Participants

For the purpose of this study, six participants were chosen from Hope vocational college as PBL had been applied in the nursing department. All participants provided voluntary consent to take part in the study. At the beginning of selecting the participants, I contacted the Dean of the Faculty of Nursing. With the help of her, I received some teachers' contact information. After briefing the

basic information about the research aim and questions, these teachers were willing to have some of their students involved in the study. Finally, I had received 15 students' contact information with the help of the teachers. After having a brief pre-conversation with these students on QQ (China's WhatsApp), I selected six of them to be the final participants. I chose participants who have high academic scores in their classes and were willing to talk. In addition, they all have had experience of project-based learning courses. I selected three interns as they already had practical experience in nursing and they can reflect on the questions according to their internship (Angela, Barbie, Cale). Three junior students with no practical experience were chosen to study the effects of PBL on their core competencies as internship might affect that (Daisy, Echo, Fai). Their views might also differ from the more experienced students. Because there are more girls than boys majoring in nursing, I chose two females and one male from each student group. The following Table 1 lists out the general information of the participants.

TABLE 1. Information of the Participants in the Research

Participants	Angela	Barbie	Cale	Daisy	Echo	Fai
Age	19	19	20	20	20	21
Gender	Female	Female	Male	Female	Female	Male
Major	General nursing	Foreign nursing	Dental care nursing	Geriatric nursing	Midwifery nursing	General nursing
Years of study	1.5	1.5	1.5	2.5	2.5	2.5

4.3   Research Methods

In the handbook of qualitative research Denzin and Lincoln (2005, p. 3) describes qualitative research as "a situated activity that locates the observer in

the world." Qualitative research focus on the data that is not easily interpreted in numbers and its focus is the meaning of people's experience, feelings, thoughts towards certain topics. Creswell (2012, p. 44) comments that unlike the traditional definitions of qualitative research which emphasizes on "interpretive, meanings". Denzin and Lincoln defines qualitative research with focus on "the ability to transform the world" (2005, p. 3).

Beginning with research problems stressing on social and human problems, by collecting data with purposes to find out the deep understanding, opinions and experience, qualitative approach helps researchers to form coding, categories and themes in inductive or deductive data analysis (Creswell, 2012). Findings and discussions present both the participants' understanding and researchers' interpretations towards research problems (ibid.).

In a qualitative research, open-ended questions designed by the researcher referring to research questions are more preferred rather than questionnaire or other well-developed instruments (Creswells, 2012). Attempts are taken to deeply comprehend the meaning of participants' answers instead of proposing opinions the researcher brought in or from other literatures (ibid.).

The reason of conducting a qualitative research for this study is that the research questions are complex and need to be answered from the multiple angles of understandings and experiences. It is noted (Creswell, 2012) that if we want our participants to share their stories and experiences, qualitative research should be conducted.

Case study research, along with phenomenology, ethnography, grounded theory research and historical research (narrative research), are the main qualitative approaches (Johnson & Christensen, 2008). Unlike the experience study in phenomenology, the cultural aspect in ethnography, the theory development in grounded theory research, and the history context in historical research, case study aims to understand "the particularity and complexity of a single case within important circumstances" (Stake, 1995, p. xi). Case study can be applied to answer explorative, descriptive and interpretive research problems (ibid).

In Stake's book *the Art of Case Study Research* (1995), there are three different types of case studies, they respectively are, intrinsic case study, instrumen-

tal case study and collective case study. In instrumental case study, understanding the general situation instead of the specific cases is the main characteristic. That is to say, researchers attempt to test and develop the theory, with interest and emphasis less on the particularity and more in the generalization of the case. Collective case study is also called multiple-case study, which emphasize more on the representation of relevant characteristics in several cases rather than in one single case. However, the collective case study might demand a sacrifice in the depth of investigation which was replaced by the breadth of research (ibid).

Intrinsic case study is very popular in educational field for two purposes. One is to study cases as a whole and understand the inner relations. The other one is to analyze a single case so as to understand the universality of the phenomenon(ibid.). The intrinsic case study was adopted in this research, from the perspective of students, to analyze the current implementation of PBL, the interaction between PBL and nursing students' core competencies and future improvement of this teaching approach in the case of a vocational college.

4.4 Data collection

Interview is a data collection method from the questions asked by interviewers, answered by interviewees. Compared to questionnaires, interviews are more powerful for researchers to explore the deeper meaning of the narrative data (Kvale & Brinkmann, 2009). Cohen, Manion & Morison (2007, p. 349) define interview as a "flexible tool for data collection, enabling multi-sensory channels to be used: verbal, non-verbal, spoken and heard."

Three types of interviews are often employed in education field (Gall, Borg & Gall, 2003). The first one is informal conversational interview, as the most natural and flexible one among the three interviews. The researcher discusses the themes that interest them, with the interviewees and the following questions rely on the interactions between them in the interview process (ibid.). Second, is the standardized open-ended interview, which is extremely structured with open-ended questions. The third type of interview is 'general inter-

view guide'- approach; whose key feature is that it is usually organized by pre-determined open questions and researchers may interchange the way of posing questions. The researcher needs to try his or her best to keep the interview on track when the interviewees drift from the research questions (ibid.). This study used the 'general interview guide'- approach to ask follow-up questions based on interviewees' responses to the predetermined open questions.

Interview is an interpersonal communication process, and it is very significant to build a comfortable and friendly relationship between interviewers and interviewees (Johnson & Christensen, 2008). I contacted the interviewees beforehand by QQ (China whatsapp) chatting, introduced who I am, the reasons of conducting this study, and informed them that their answers were anonymous especially when talking about their opinions towards schools, teachers, and classmates, thus building trust and credibility. Besides, I remained neutral during the interview to ensure that the interviewees' answers will not be affected. Through the advanced interactive process, they knew their positions in this study and the importance of their answers. The interviews were carried out through QQ video chat and were recoded in my iPad. The interviewees answered from their dormitories in private.

An interview with open-ended questions was adopted in this study because researcher's intern experience, the basic understanding of vocational college students, and advisory opinions from their teachers. When conducting an interview in a friendly atmosphere, students are more willing to express their ideas comparing to written surveys, so I can analyze the deeper meaning. The design of the interview questions was based on the research questions and literature review, and they were reviewed and revised after feedback from my supervisor. For this study, interview was found to be the most appropriate way to collect data. In this study, there are 11 pre-constructed open-ended questions (Appendix 2). Questions 1-5 focus on answering research question one "How is project-based learning implemented in vocational college?". Questions 6-9 aims to answer research question two" How does project-based learning support and enhance core competencies?". As the research question 2 was initially designed as "How does project-based learning support and enhance professional compe-

tence?" so the interview questions were focused on professional competence instead of core competencies. However, their answers to these questions would not be affected by the choice of terms, as it makes no difference to them. Research question 3 "How should project-based learning be improved?" is answered by question 10-11.

4.5   Data Analysis

Qualitative content analysis is a flexible research method to analyze text data (Cavanagh, 1997). There are other research methods used for text data analyzing, such as ethnography, grounded theory, phenomenology, and historical research (Hsieh & Shannon, 2005). Text data is also known as narrative data (Taylor-Powell & Renner, 2003) and might be in verbal, print, notes, transcript, texts, field notes etc. The essence of qualitative content analysis is "to provide knowledge and understanding of the phenomenon under study" (Downe-Wamboldt, 1992, p. 314).

The simple definition (Babbie, 2001, p. 304) nicely summarizes qualitative content analysis as "the study of recorded human communication" and "a coding operation to transform raw data into a standardized form" (ibid., p. 309). Moreover, Hsieh and Shannon (2005, p. 1278) defined qualitative content analysis as "a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" These definitions illustrate that in qualitative content analysis data is processed through systematic coding and ends with standardized themes or categories in a particular context. The most important goal of data analysis is to reveal people's thoughts, feelings and behaviors regarding the research questions(ibid.).

There are two main approaches of analyzing data based on valid interpretation. One is named inductive coding, and the researcher categories the codes directly from the transcript; deductive or preexisting coding is the other one, in which the codes are generated before or at the beginning of the research (John-

son & Christensen, 2008). In practice, many researchers combine inductive and deductive codes when examining the current data (ibid.).

This study integrated these two analyzing approaches. To answer the first and third research question, the data were analyzed inductively. The data for the second research question was analyzed deductively based on the Competency Inventory for Registered Nurse (CIRN).

In this study, the data was analyzed based on the Taylor-Powell and Renner's (2003) five steps and I moved forward and backward within the process. Getting to know my data was the first step and it required me to listen to the tape recordings several times and transcribe them. After that, I read and re-read each transcript and assigned a pseudonym to each interviewee (Angela, Barbie, Cale, Daisy, Echo, Fai). When I was reading my data, all words, lines and phrases, I paid attention to them as they might be useful for further analysis.

The second step was to focus the analysis, there are two approaches commonly employed: "focus by the question or topic, time period and event" and "focus by individual or group" (ibid, p. 2). In this study, I focused on the research question so I always had them besides me. With focus on how all participants responded to each question, I put all the data from each question together with colorful marker.

To categorize information was the third step and it consists of two ways to categorize narrative data. The first and third research question employed emergent categories (inductive) where I listed out all initial codes and highlighted similar topics with same color. Preset category (deductive) was employed to analysis the data concerning the second research question. I had a list of core competencies components in CIRN and then I searched for the data for these topics (ibid.). The data analysis diagrams are presented in Appendices 4-6.

Step four is to "identify patterns and connections within and between categories" (ibid). After having worked with the initial coding frameworks, I then looked for overlapping or similar categories and they were resorted into more general categories. Finally, I found out that five components (critical thinking, clinical care, leadership, interpersonal relationship and ethical practice) in CIRN were discovered in this study (see Results).

The final step is to interpret these to findings. I brought all the analysis results together, including quotes and descriptive examples to illustrate what has been revealed in this study. I worked with duplicate transcript and the original one was stored safely. All the interview recordings were destroyed after the analysis.

5   RESULTS

5.1   The implementation of project-based learning

In order to answer the first research question, interviewees were asked to de-scribe their experience, knowledge and views, understanding their roles in pro-ject-based learning. Also they were asked to compare project-based learning with traditional lecture approach to obtain the similarities and differences. Based on their answers, the coding was conducted and the data was analyzed and sorted through into two key categories of PBL's implementation: positive aspects and negative aspects (See Appendix 4).

5.1.1   Positive aspects of PBL

Interviewees pointed out the positive sides of PBL which were categorized into four aspects: modern teaching method, team cooperation, motivation and teacher-student interaction.

Modern teaching method

Two of the interviewees mentioned the positive function of PBL in improving and speeding up the understanding of content knowledge when they compared PBL to traditional lecture approach. With the enhancement of learning interest, the academic results in human anatomy of Echo were improved. Project-based learning provided students with a strong theoretical background and practical experience in understanding and digesting subject knowledge at the same time, which greatly enhanced the learning efficiency of professional clinical knowledge and skills.

> *"At the beginning, I felt the teaching method in some lectures were similar to high school. I found that the textbook content was slightly dull and difficult to comprehend. But in the PBL class, we learnt the textbook content and carried out the operations at the same time. In this way, I remembered the content knowledge more easily and clearly after class." (Angela)*

All of the interviewees indicated that they preferred to have classes in more active and fresh way. They believed that the abstruse words in medicine books could be made vivid and easy to understand in PBL classes by scene simulation, classroom discussion and operating in real environment.

Besides the enhancement in understanding of textbook content knowledge, Barbie mentioned that the teacher utilized extra time to conduct a discussion about several similar diseases relating to the main disease. Network searching was drawn upon heavily to broaden the multifaceted knowledge of nursing concepts and *"most of the materials were found by themselves"*. Daisy mentioned that there was a necessity to improve students' knowledge structure and broaden the views of knowledge in nursing teaching.

> *"When the teacher assigns the tasks, she usually asks us to look up for the recent nursing interventions and the progressive nursing concepts concerning certain diseases." (Barbie)*

> *"My teacher tells us that the disease symptoms are very limited in textbook and are typical cases. However, in real clinical work, it is not as typical as it shows in textbooks. He is a very experienced doctor in a hospital and has pretty rich clinical experience. I really like his PBL class and his way to widen the scope of knowledge." (Daisy)*

When asked about the way and process of PBL teaching, five of the interviewees —unbeknownst to the others— compared PBL with 'lecture'-approach in high schools. They realized the teaching method in high school is *"passive and rigid"* and *"maybe every student dislikes it"*. In contrast, PBL attracted students' initiative and active participation, thus leading to new ideas.

> *"I am tired of my high school teachers. They vigorously spoke bottom to go but I was always absent-minded in the class. After I had PBL in basic nursing course, I wish every teacher could carry out the class like that. You know, I am not passively memorizing things, and will be more interested in studying. "(Barbie)*

Because PBL is student-centered, interviewees thought that they could have more time to raise questions and bring forward feedback from/to teachers and classmates. Daisy stated briefly that they were not allowed to interrupt teachers

in class before, but now the teacher encouraged them to propose questions and settle the problems at any moment, as they were *"talking and discussing most of the time in class"*. Compared with previous lecturing approach, interviewees felt that their opinions received more attention which greatly increased their study interest.

> *"We could create the practical scenes as we wanted, the teacher didn't choose them for us." (Fai)*

> *"Teacher Alma likes to pose many open-ended questions to us, and asks us to think…" (Angela)*

Team cooperation

Interviewees emphasized that group working encouraged them to build up intercommunication among students and their social circle was extended, they enjoyed to work in groups and made new friends. Teachers considered the strength and weaknesses of each student before assigning the work in groups as described by two of the interviewees. Group members accepted the responsibilities to improve cooperation and devoted their energy to complete the task.

> *"I feel like that we communicate more often than before, and get familiar with each other. My group leader also created a QQ group for better exchanges of ideas." (Barbie)*

> *"At the beginning of grouping, the teacher usually groups the students who haven't worked with each other before. This encourages us to communicate and collaborate. Now we often play meet together after class." (Angela)*

The scene simulations based in legitimate medical environment contributed to build up the connection between study and various problems which might occur in real-life. According to the interviewee, *"In CPR (Cardiopulmonary resuscitation), many people need to cooperate with each other to complete the operation"*. Echo indicated that, there was an assigned task where every member in the group represented the roles of the patient, family members of the patient, doctors or nurses. Competition among groups bonded everyone tightly together and *"diverse opinions"* helped them *"learn from each other"*, which made them work hard to get a good result.

"Teacher Bahar often hold a simple operation competition; the outstanding group will get bonus marks in regular grades which can influence our final score." (Echo)

"Filling our mind with visions and ideas, we put forward some fancy thought in our group. In the process, our imagination and the ability to solve practical problems gained strength. Also it deepened the relationship among my classmates." (Barbie)

Motivation

Four of the participants mentioned that they are more motivated to studying in PBL class and also *"some classmates are actively taking part in discussion"*. Team competition and team cooperation improved students' learning efficiency and enthusiasm. Fai stated that he was greatly inspired by the encouraging words that the teacher praised him for doing well on the final presentation and that he had a sense of accomplishment afterwards. Moreover, a flexible bonus point system— used by on teacher — urged students to cultivate day-to-day study accumulation.

"When I see other group members trying so hard to study. To be honest, I am greatly inspired" (Angela)

Because of sufficient and independent learning schedule in PBL, students' self-study ability could be fully realized. Just as Cale described his self-study experience of making a PowerPoint presentation where he attempted to compose a more exquisite one for group work.

"I was in charge of designing PowerPoint for the presentation. But you know, this was my first time to use PowerPoint and I only knew very basic skills. So I ask the teacher for assistance, but she does not know it very well either. I have to teach myself from books and online tutorials... "(Cale)

Teacher-student interaction

Project-based learning classes were not teacher-centered, students took a very important role in learning and working together as mentioned by all interviewees. Traditionally, the teacher would leave the class immediately and leave stu-

dents having no one to ask questions, as described by Cale below. Because of a more open learning environment, they *"could confront our teacher in class"*. Echo stated that a more active interaction with teachers was entertaining to a great extent.

> *"Our teacher invited a male teacher to enact a pregnant, that was funny and interesting…"* *(Echo)*

> *"In the past, attending to classes was basically listen to teachers, keep listening, listening... The teacher left immediately after class. Now we could have more opportunities to communicate with them which was very good and helpful" (Cale)*

5.1.2   Negative aspects of PBL

Apart from the positive aspects of PBL from interviewees' perspectives, there were four negative aspects summarized from the interviews. These aspects respectively were: inadaptability to PBL, weak co-working ability, lack of leadership and poor attitude.

Inadaptability to PBL

Fai mentioned about his inadaptability to PBL. He thought that PBL demanded high personal abilities and added a lot of invisible pressure to succeed. However, traditional lectures largely reduced his initiative to study independently so there were less demands for him.

> *"Although I know PBL is somehow helping me in studying and I benefited from this teaching method, most of the time, I am more used to traditional lectures…It's easier…Because PBL requires a very high personal ability and increases the burden on me." (Fai)*

Weak co-working ability

There were not many opportunities for students to work in groups in previous traditional lectures. When it came to frequent group work in PBL, as Echo stated, there were some students that had no opinions on a matter or felt embarrassed to speak out at meetings. Under these circumstance, there was a need for someone to break the ice at the awkward meetings.

"At the beginning of grouping, I do not know why we do not talk that much. Maybe, it is because we are unfamiliar with each other or too shy to express our ideas. I am the only one who would like to speak up. There was an awkward silence at the meeting, you know it is very embarrassing when we need to exchange ideas". (Echo)

Conversely, disagreements among talkative and active students could lead to a prolonged debate and unnecessary conflicts. According to the interviewees, "*the most difficult part of task allocation is that everyone holds their own views stubbornly*". The allocated tasks would be delayed and this caused difficulties to keep up and to accomplish the project.

"There were two people in my group who had worked together in the student organizations before. I did not know why, they always squabbled over the project for a long period. Maybe they had conflicts before. "(Angela)

Two interviewees referred to the conflicts in discussions because the time arrangements did not match every one's ideal so "*the result was not satisfying*". Perhaps the most serious consequence of such a conflict was that the group work would be behind schedule.

"It is always difficult to find a time all members could meet. Some need to go back home or some have other stuff to do…" (Cale)

Lack of leadership

Although the importance of team cooperation had been emphasized in the implementation of PBL, deficiencies in group leadership still existed. Because of unclear labor division and insufficient supervision, group leader had a weak effect on promoting cooperation, such as "*he has done the majority of the job*".

"Sometimes, the leader seldom holds meetings or asks us questions. I am lazy to speak as well. He doesn't know about the advantages and disadvantages of group members." (Cale)

Inefficient meetings led to unproductive work such as *"too many group meetings"* where interviewees *"didn't feel any important decision had been made"*. It caused distrust as the group members thought the group leader only asked for results without caring about the process.

Echo described that when they started to discuss the project, everyone made some suggestions and the atmosphere was very congenial. However, she became reluctant and unwilling to continue, because other group members heavily relied on her to finish the project.

> *"…. once, I felt like I was the only one doing the project. I stayed up late to finish it in the end. I was very depressed…."* (Echo)

Poor attitude

Some people were absent from group work or class and *"paid lip service to their excuses"*. *"They are not active enough and are addicted to a lazy life",* these lazy habits had a negative impact on their working efforts. Additionally, *"Some people were not helping at all when we messed up"*.

Not all the students were very responsible to the project, Fai criticized her group members for being sloppy and having a slapdash attitude.

> *"The group leader assigned responsibilities to everyone, but we did not check it at all. The teacher found the problem."* (Fai)

Two of the interviewees mentioned how some people would avoid responsibilities during the whole process of PBL. This reveals the current situation that some students still have low learning initiative as *"no one wants to do things"*.

> *"I was the only one to do the project planner, because they all said they were not good at making schedules"* (Echo)

5.2   PBL and nursing core competencies

This section is going to answer how PBL influences nursing students' core competencies on account of their understanding and experience. Interviewees'

answers were categorized deductively into five big components as they were shown in CIRN (See Appendix 1): critical thinking, clinical care, leadership, interpersonal relationship and ethical practice.

5.2.1 Critical thinking

Two interviewees pointed out that their evaluating skills and reflective ability have been enhanced during or after PBL class, exactly corresponding to the component in CIRN - critical thinking. The ability of information searching had been improved as two interviewees mentioned, which corresponds to the component in CIRN- critical thinking. In addition to these, two interviewees talked about how their creative ability was brought into fullest realization by the help of PBL.

Enhancing evaluative and reflective ability

Barbie was unwilling to participate in discussion before. However, PBL inspired her interest in learning and it led her to think deeply about the reasons and the results. She called this change as a growth of her thinking. By the enhancement of reflective ability, she was pleased to be able to put forward purposeful suggestions to her classmates. Daisy indicated that PBL gave her opportunities to criticize what the teacher told and to reflect what she had learnt, instead of completely agreeing. They both expressed the ideas of liberating their thinking, instead of having no ideas of their own.

> *"I find out that I enjoy asking questions right now. You know, before I was afraid or unwilling to open my mouth. In the group discussion, now I will think why he proposed such a question, if I were him, what would I ask? I regarded this change as a growth of my thinking. And I am happy that I am able to put forward purposeful suggestions to my classmates." (Barbie)*

> *"I was only listening to the teacher carefully and not thinking if the knowledge she imparted was right or wrong. But actually she also makes mistakes, doesn't she? For example, in the cardiac resuscitation operation, she could not answer my questions or made a mistake in the process. If I was still in high school, I would never think teachers were wrong. But PBL gave me more opportunities and time to think over and over again especially when we were designing the project, instead of completely agreeing. "(Daisy)*

Improving the ability of information search

As Barbie described, during PBL class her group aimed to achieve the best performance by data collecting, project designing, scene creating and role playing. All the related information was gathered by the group members themselves. Echo emphasized that her Internet search and information summary skills have been improved as the knowledge imparted was not completely from textbook.

> *"Before I had nothing to do after lectures, now when our teacher carried out a PBL class, we had to collect information, find the problematic situations and make a nursing plan in accordance with the project by ourselves. Every group tried their best to achieve optimal performance in the end." (Barbie)*

> *"I think my Internet search and information summary skills have been improved. Our project is about the performance of patients' admission and discharge. Of course, at that time we did not go to a hospital to have a real experience. Now I have had as I am in the hospital now. But during the PBL class, my main job was to search for the real cases concerning patient's' admission and discharge, summarizing them to present to my group members." (Echo)*

Increasing creative ability

Every participant has designed clinical cases and nursing scenes according to different project plans. In particular, Angela illustrated that their group would construct the characters and stories in different sites of accidents to better apply and utilize the knowledge they have learned.

> *"I always followed teachers' steps carefully to study before. Now there are tasks we need to organize by ourselves. I think this is training our ability in creative and independent thinking. "(Cale)*

> *"Every time in PBL, we wrote, directed and acted by ourselves. When we carried out the performance, there was a group member as a voiceover. Our characters could be doctor, head nurse, nurses, patients, family members, friends, and strangers etc. We were trying to have some different features in our simulated performance. We would set some specific sites of an accident, such as student dormitory, outdoors." (Angela)*

5.2.2 Clinical care

Interviewees stated one important part of PBL class – clinical equipment, helping them to be familiar and proficient with clinical operations. This category truly corresponds to the component "Clinical care" in CIRN.

Knowing clinical equipment well

PBL offered Daisy more opportunities to know clinical equipment well. Because of her familiarity, she had a very smooth and successful internship. It is because the close connection between theories and clinical nursing work, and the teaching content —that is refined from authentic cases — in PBL, that allowed students to work in real situations with real clinic equipment *"what have been using right now in the hospital"* as Angela described. However, she further indicated *"still we do not have all the equipment needed"*.

> *"My career plan is going to be an instrument nurse. I think PBL gives me more chances to get close to the equipment, like simulation operating room. I could be familiar with the equipment and try them out. I also think that the PBL benefited my internship in using clinical equipment." (Daisy)*

> *"One teacher took us to our affiliated hospital to observe the real nursing work. I think we should be really good at using the clinical equipment from now on. You know, nurses need to react quickly for all kinds of sudden events, such as spine board. "(Cale)*

Increasing operation proficiencies

In PBL attention is paid to everyone's participation and performance. Operations should be practiced multiple times until students feel that they have integrated theories with practice well and finally they apply it toward the formulation of their own personal practical skills. Barbie shared her gladness of conducting stomach tube to nurse her grandma which largely benefited from her repeated practice in basic nursing. Echo also acted with confidence in hypertension nursing because of her practical operating experiences, and she received high praise from the head nurse.

In basic nursing, I was familiar with the procedure of inserting stomach tube and I had practiced it many times. Later on, I completely utilized this skill for my grandma. She had a serious digestive problem so she could only drink liquid. I exchanged the tube for her every time. You know, I was so happy that I could do something for her." (Barbie)

"I remembered there was one project about hypertension nursing. Teacher Calla was very strict and responsible. Under her guidance and my repeated practice, I could say that I was very good at nursing patients with hypertension. And the head nurse also praised me for my proficiency in hypertension nursing." (Echo)

The ability to settle practical problems

With teachers' guidance, students completed different tasks in groups and this exercised their ability in problem finding, analyzing and solving. According to the interviewee, many projects were related to their clinical operation which positively affect their abilities to work in the future. Barbie pointed out that her group always came up with terrific ideas and carried them out, in the process their imagination was encouraged and their ability to address practical problems strengthened. Students' active thinking had been fully exercised by theoretical study, literature research and skilled operation. They need to put their heads together to reach the right solution of difficult problems.

"Filling our mind with visions and ideas, we put forward some fancy thought in our group. In the process, our imagination and the ability to solve practical problems gained strength. Also it deepened the relationship among my classmates." (Barbie)

5.2.3   Leadership

Three participants indicated the development of team awareness in the process of PBL, and it reflected one of the components in CIRN- Leadership. Doctor-patient communication ability was categorized from the interview data of Echo and Fai, where they emphasized the function of role-play scenarios in PBL which gave them advance practice.

Team awareness

It also would afford them the chance to *"challenge each other but also learn together"* from the experience of others by cooperation and exchange as Angela explained. Working together forced teams to communicate better, share more personal information and *"realize what team spirit is"*. Everyone was playing different roles in the group, some were good at leading, some were good at creating a positive environment as Echo described her experience.

> *"I learnt the importance of teamwork in PBL. I could not complete the tasks alone; I had to cooperate with other classmates. "(Daisy)*

> *"As a nurse, teamwork is the most basic. We need to work in the clinical department in the future. I am always good at enlivening the atmosphere so as to create a positive environment."* *(Echo)*

Doctor-patient communication ability

Facing angry and/or distressed patients, who may even shout at the nurses, is a big challenge for a newbie during internship as Fai experienced. If they had not any training of coping with the crisis and psychological adjustments, they will have sense of disappointment. Echo emphasized the basic skill of a nurse to address critical incidents and how the ability to harmonize the doctor-patient relationship is now increasingly important.

> *"In breast feeding, groups were provided infant model for nursing practice. I played the mother, and other group members played family members and nurses. We designed the scene where the mother had a breast distension and she had a quarrel with her mother-in-law. The mother was down in spirits and unwilling to breast-feed the baby. In this case, our job as a nurse was to engage their communication and resolve conflicts."* *(Echo)*

> *"I am full of enthusiasm and have high expectations for nursing career. During the internship, the patients may yell at you for no reason. I think the need to improve relations between hospital and patients is extraordinarily urgent."* *(Fai)*

5.2.4   Interpersonal relationship

Three interviewees expressed that their language expression ability had been strengthened in PBL class as it required them to present their projects in multi-

ple ways and the group discussion improved their communicative skills. Furthermore, this category corresponds to the component "Interpersonal relationship in CIRN. Two participants pointed out that their social competence has been enhanced in PBL class.

Language expression ability

In groups, students discussed and chose a representative from each group to present their project solution. Everyone was supposed to present their thoughts concerning the merits and defects during the implementation process. Students composed the cases and used multimedia to display them. Through these activities, their confidence and the ability of language expression would be improved as Angela mentioned. She further expressed that she was *"not that nervous now when facing patients or their family members"*. Fai indicated the importance of proficient verbal and written communication for nurses as they need to face different kinds of patients everyday.

> *"I had more chances to speak out my ideas. My oral expression ability was enhanced and I had the courage to make a presentation in front of all classmates" (Angela)*

> *"Nurses should be good in verbal and written communications because you are facing patients every minute and every second" (Fai)*

Social competence

PBL emphasizes cooperation and the teamwork runs through the whole learning process. It cultivated students' cooperative spirit and in the meantime enriched their social circle as Barbie described. The social competence could benefit students' campus life and helped them to *"realize the importance of sense of belonging and take the initiative with people"*. Interviewees learnt to find their position in the group by active social interaction. When faced with a dilemma, they also sought for teachers and classmates' assistance.

"I have to say that I have made a lot friends in PBL classes and my circle of friends has been ex-
panded. I think this will be very important for my college life and also be helpful for my future
career." (Barbie)

"When I encountered a problem, I would not keep it hidden. Instead I would open my heart to
my classmates and teachers. Actually everyone was very friendly and helpful." (Echo)

5.2.5   Ethical practice

Three participants gave their views and these points were categorized in a
broad component in CIRN ethical practice. Two aspects were elaborated below
and supported by their answers, they respectively are the attention to the needs
of patients and emotional needs.

Attention to the needs of patients

Daisy described their project work of nursing orthopedic patients, where they
satisfied their physical needs and took patients' largest needs into their consid-
eration. This kind of humane care could reduce anxiety in patients and build
confidence in rehabilitation, thus establish a trust relationship between patients
and nurses.

"I remember there was a project "how to nurse orthopedic patients" in basic nursing. Normally,
the patient was restricted in movement and incapable of self-care in daily living and suffers dis-
comfort. One student in my group played as a patient with spinal injuries who was restricted to
bed. He could not go to the toilet or shower his body by himself. This kind of project was close to
real nursing work and I had encountered similar cases in my hospital. As a nurse, I need to give
patients enough care and assistance and satisfy their basic physiological needs of daily life.
"(Daisy)

Emotional needs

They had the realization that patients "*should be treated as 'kids', and need much*
care". Cale thought that nursing students should maintain a positive attitude
during everyday nursing tasks, and this would not only present a personal
quality, but also affected patients' feelings. Daisy mentioned the importance of

humane care in positive and effective treatments while patients could have anxiety and fear when they were facing sudden or serious diseases.

> *"In the simulated operating room, teacher Ece had emphasized the importance of humane care for an instrument nurse. The nurse not only takes the responsibility to inform the surgeon of matters needing attention, but also gives the surgical patient humane care…. Humane care in operating room is to help patients to know the critical information for the safe conduct of the operation, to help them be prepared in the best way to face surgery, and to strengthen the confidence and courage to defeat disease." (Daisy)*

5.3 Improvement of PBL

Interviews were required to express their views on how to improve project-based learning based on their experience and understanding. The data was analyzed and categorized into two big parts: teacher's role and teaching environment (See Appendix 6). From the perspectives of the interviewees, their opinions pointed out the current issues in PBL and the direction of future improvement in a vocational college setting.

5.3.1 Teacher's role

All interviewees gave their views about their teachers in PBL which were categorized into four parts: deficient supervision, insufficient guidance, limited clinical experience and lack of motivation measures.

Deficient supervision

Two interviews mentioned that teachers' supervision efforts should be strengthened in PBL, especially for students who had low self-control ability in daily study as Cale described. Echo delivered a negative message of some students' nonparticipation and noncooperation and had a desire of teachers' supervision at the proper time. She emphasized the supervision should not be ─ serious and strict ─like in traditional ways─limiting students' ability to voice their opinions. Even though students take a higher responsibility of their studies in PBL ─ in comparison with traditional lecture approach ─ teachers still

need to provide adequate supervision and professional counsel during the process. Otherwise, students' learning and work initiative may be influenced by lack of proper supervision.

> *"I think that the teacher should pay more attention to the students who have low self-control ability. When we had group discussion in class, some students had low enthusiasm in classroom participation. And some students were playing with their mobile phones without joining us. Of course it affected everyone's mood. But as a classmate, I did not think it was good to mention their bad performance directly." (Cale)*

> *"It always troubled me that some people could not perform the tasks as I assigned, Sometimes I think teachers' proper supervision could help, but not like the very serious supervision you know. As I explained before, they pushed all the tasks back to me. I had no idea what to do. I went to the teacher for help but she said that I need to learn how to design tasks. I did, but they did not do them. What should I do? "(Echo)*

Insufficient guidance

Cale stated that the teachers should offer sufficient guidance at proper time when there was a contradiction within a group that they could not solve by themselves, otherwise "*the atmosphere among us became weird, the teacher was definitely needed to spice things up*". Echo also mentioned about her experience of asking guidance from the teacher, but not receiving enough useful guidance. Because of the difficulties in medical operation, Angela mentioned that the operations should have been demonstrated many times before their turn to operate independently. Teachers should be close to students with whole efforts to understand them, to help bring the discussion around the topic, and to offer reasonable advice and guidance in PBL. In this case, by reducing the sense of distance, students could have less pressure in the tasks and make much progress.

> *"The teacher should move around the classroom constantly while we were having a group discussion. Because some people were not talking about the topic. I sometimes felt stressed if we were not progressing smoothly. I knew that in the end, no matter what, we had to make out a solution or presentation." (Barbie)*

Limited clinical experience

Two interviews expressed their wishes of having teachers with rich clinical experience. In a PBL course, teachers should integrate their own clinical cases into the design and operation stage. Daisy described that because of limited clinical experience, some teachers could not react quickly when coming across sudden accidents in operation. She also stated that a teacher with clinical experience is very important in PBL courses and that would future impact her operation skills as an intern. Moreover, students felt more appreciated when the teacher shared their experience and the closeness between them helped students to engender a sense of acceptance.

> *"My gynecotokology teacher is the chief physician in our affiliated hospital. When she gave lessons, I felt I was not having the boring theoretical text book. But it seemed like I was listening to the story. She shared with us many practical operation experiences. So I wish other teachers could have more clinical experience and brought us the very practical knowledge on the frontier of nursing "(Angela)*

Lack of motivation measures

When it came to the attention the teachers paid to students, it was far from enough, especially when students needed motivation during different stages or after their mood fluctuated. Just as Fai described he would like to have someone to share to or to receive encouragement from teachers, when he improved. Moreover, because of the abstraction of medical knowledge, teachers should design proper projects based on different class and students' merits, to deeply motivate them and guided them to gain achievement.

> *"Although I didn't have difficult tasks to do in my group, I still improved. You know, I wish I could have someone to share my happiness or received praise from teachers. Honestly, I wish the teacher could encourage me more" (Fai)*

> *"For abstruse medical knowledge, I feel I am less capable than other students. I wish the teacher could give me more encouragement. If the teachers could design projects according to our merits, we could achieve more easily." (Angela)*

5.3.2 Teaching environment

Three interviewees felt that the lack of resources and infrastructure were negatively impacting their studies. Moreover, there is a need to combine traditional lectures with PBL to better benefit their study and operation. The projects in PBL class should be shared within teachers' circle and this will lead to the best outcome for learning.

Weak infrastructure and resource

PBL has a high requirement of teaching equipment. From the interview we could see that the college need to have sufficient clinical instruments and an up-to-date library for PBL implementation. According to the interviewee, *"there were fewer clinical instruments than group members and we could not operate for long".* Daisy indicated that some advanced equipment which they were using in current hospitals were lacking in this college. Barbie described the needs for updating the resources in library, such as books, articles, Internet equipment.

> *"School needs to improve the hardware facilities in PBL, that is to say, the clinical instruments were no longer satisfying our needs. For example, we need more realistic human models while carrying out emergency care. We need to simulate the training of CPR and artificial respiration. The depth of chest compression and more human like response of the human models could benefit our learning and operation." (Daisy)*

Combining PBL with traditional lectures

Traditional lectures emphasize teaching and is centered on a textbook. It provides students the clear basic theoretical frame, conceptual content and key points. Normally, it is easy and convenient for students to look up, review and summarize theoretical knowledge in traditional ways. This is why Fai mentioned that he preferred the traditional approach as it gave him less burden. However, he also stated that it would be effective and interesting if the teacher combined traditional lectures with PBL to some extent.

> *"As I said before, I preferred to have traditional lectures. Because it did not exert pressure to me. I think traditional ways give me very clear theoretical frame of the medical knowledge. The*

teacher explained and analyzed the key and difficult points in more details compared with PBL. However, I have to say PBL is more fun and attractive. I wish the teacher could combine lectures and PBL together into a more diversified approach. That would be very interesting and effective." (Fai)

Project sharing

Cale indicated that different teacher carried out different teaching method in different classes. However, he believed that teachers should often communicate and share the interesting teaching methods. Usually — for most teachers — designing the project independently is not an easy task, the same applies to implementing the project and guiding the students during it. Therefore, cooperation among teachers is a good way to ease these difficulties.

"I know the teacher in A class carried out 'the nursing of patients with shock' as a PBL course in the course of Surgical Nursing. I heard it from a friend in A class. However, when we had the same course, our teacher did not use the same method. Instead, she was talking the whole session and it was very boring and ineffective. Why don't teachers communicate and share the teaching method together?" (Cale)

6   DISCUSSION

6.1   Examination of results

I carried out this study to answer the three research questions by interviewing nursing students to find their views about their PBL-classes, these questions were nicely answered by analyzing the data from their interview. 1) Participants' views on PBL's implementation. 2) PBL's influence on nursing students' core competencies. 3) Participants' ideas of improving PBL in the future.

6.1.1   Current PBL's implementation

The six participants freely and openly shared their knowledge and experiences on the implementation of PBL. These were sorted into two aspects, positive and negative. Their positive opinions about PBL's implementation were categorized into four parts: teaching method, team cooperation, motivation and teacher-student interaction. Participants indicated that student- centered PBL — a diversified learning process — provided them wider knowledge and made content knowledge easier to understand. Comparing to traditional lectures, they held the view that the use of PBL attracted their initiative and active participation. This is consistent with Bell (2010) PBL, as a practical method, increases students' learning interest. Under scene simulations and group work, they were encouraged to build up intercommunication among peers. Having students work and cooperate together makes them lose their shyness or nervousness that often happens in traditional learning and this will give students high motivation and increase their interest in learning. Besides, they receive training on how to connect theoretical knowledge with various real problems happening in hospitals, such as dealing with the conflicts between doctors and patients. This corresponds to the statement (Markham, 2011; Blumenfeld, et al. 1991; Bell, 2010) that the usage of real world problems in PBL encourage students to use varied materials to solve the problems within real scenarios.

Negative aspects of PBL's implementation were presented in four parts: inadaptability to PBL, weak co-working ability, lack of leadership and poor attitude. While independence is an important and positive feature of PBL, participants also described how they were unable to adapt to the high demand for independent working skills, posed by PBL. Besides, taciturnity and obstinacy lead to a prolonged debate and unnecessary conflicts in PBL groups. There had not been many chances for students to work in groups in previous traditional lectures, the deficiencies in group leadership appeared in PBL class because of unclear labor division and inefficient meetings. The group leader's authority was not backed by the teachers, as in one group the leader did the labor division, but his/her group members did not do anything and the teacher didn't back the leader up. The deficiency in leadership is consistent with Qi's study (2011), in which she found out that almost half of the students held the view that they had not analyzed all the information carefully, that the discussion sessions lasted too long, making them tired, or that the group members were not working together very smoothly and effectively. Although participants expressed that the various and fresh teaching modes of PBL motivated their learning initiative, not all students were very responsible to the projects, some still had low learning initiative, or occasional absence from group work.

6.1.2   PBL's influence on nursing core competencies

Remarkably, PBL was found to influence nursing students' core competencies in the following aspects: critical thinking, clinical care, leadership, interpersonal relationship and ethical practice. Scholars (Li & Zhang, 2011; Lei, 2007; Bell, 2010) indicated that students' critical thinking ability can be promoted and yield decent benefits in PBL, this is consistent with interviewees' quotes. In this study, three factors for critical thinking were found out. Firstly, the interviewees mentioned their evaluative and reflective abilities had been strengthened by putting forward purposeful suggestions to cohorts, thinking deeply about the reasons and results, and more opportunities to criticize what they have learnt. This corresponds to the statement "make decisions that reflect both knowledge

of facts and good judgement "which is part of the core competency of critical thinking (CIRN). Another statement in critical thinking "use different ways to search for information" (CIRN) was achieved by project designing, clinical cases searching, scene creating and role playing. Lastly, three participants stated that they tried their best to utilize knowledge they had learnt to build up creative simulated scenes, thus their creative ability has been reflected and increased during PBL class. The increase of creative ability corresponds to the statement by Krajcik and Blumenfeld (2006) that PBL helps students to obtain a deeper understanding and the idea of creation.

Another element in clinical care "Utilize technological advances to improve nursing and health care" (CIRN) was also found to have been improved. First of all, more opportunities were offered in PBL for students to know clinical equipment well. Participants' internships were positively influenced by the familiarity with using clinical equipment. Also, they would enter into the role of a nurse emotionally and skillfully, with the knowledge gained in PBL class. Shi and Huang (2013) argued that PBL could improve students' skills to address clinical problems with proficiency in clinical knowledge. In addition, their operation proficiencies have been increased by their participation and performance. Thirdly, the ability to settle practical problems, including problem finding, analyzing and solving, received training during the process of completing different projects in PBL.

Team awareness — "act to develop an atmosphere for teamwork and cooperation", and doctor-patient communication ability — "coordinate the relation between nurses and all related personnel" — are two factors of leadership in CIRN, these were found to be increased in this study. Frequent teamwork cultivated students' cooperative consciousness, offering them chances to share their point of views and forge a closer relationship. According to Bransford and Stein (1993), PBL creates a good cooperative environment where students can engage in to accomplish a mutual goal. The ability to tackle the problems between doctors and patients has been enhanced through the use of role-play scenarios in PBL. This is consistent with Lin and Liu (2012) and Guo (2015) who claimed that providing a real nurse-patient environment will improve students'

nursing quality and win the trust and respect of patients to better handle the situation.

Language expression ability and social competence were categorized from the interview data, which belong to the core competency of interpersonal relationship — "express facts and thoughts in writing in a clear and organized way" in CIRN. Three interviewees illustrated that they improved their language expression ability when presenting their projects in multiple ways and during group discussions. Additionally, by cooperation and teamwork, students' social circle was enriched, which could benefit either their school life or future career. Zhu's study (2014) also supports the enhancement of confidence and language skills in PBL.

The nursing core competency of ethical practice was found to be enhanced by directing the student's attention towards the physical and emotional need of the patients, by the use of role-play during PBL-classes. The results are corresponding to the statements in ethical practice "Take responsibility for one's own performance" and "respect the patient's/client's right of choice and self-determination in nursing and health care" (CIRN). PBL class can not provide students all practical situations happening in hospital, but it can reduce their stress in dealing with clinic cases (Green, 1998). Nurses should satisfy patients' basic physical and emotional needs in daily life and this was practiced in PBL class. Acting as the patient's, students were given the opportunity to feel what the patients feel and later can provide patients proper emotional assistance. This is consistent with Lin (2012) and Zhu (2014)'s findings, students can experience patients' pain and further provide proper emotional care in PBL.

However, two components from CIRN were not found in the data and they are "professional development" and "teaching coaching" (See Appendix 1). This was expected in this study. Because these components are more practiced during actual work in hospitals.

6.1.3   Improving PBL

When analyzing the data of how to improve PBL in the future, all participants did not provide abundant data. They answered the research question from two parts: teacher's role and the teaching environment. Teachers' deficient supervision and insufficient guidance in the implementation process of PBL were mentioned and need to be improved in the future. This is consistent to the statements (Danford, 2006; Marx et al., 1997) that teachers may not be able to breakout their traditional roles and to transform to facilitators. Although PBL is student-centered, teachers still need to maintain their supervision effort, especially for the students with low learning initiative. Besides, teachers should offer enough guidance in the demonstration of clinical operation. It is a necessary to increase teachers' clinical experience as the basic idea of PBL is to teach practical skills. Two participants mentioned that some teachers were lacking clinical experience and this would influence students' operating skills. As Kahn and O' Rourke (2004) illustrated that teachers should have a rich knowledge and practical competences so as to better guide students. However, there are more than 40 students in one class, teachers cannot take every one's merits into consideration to better organize PBL class and they cannot motivate the students who needed in time.

The teaching environment plays a significant role in PBL. It was discussed from three perspectives: weak infrastructure and resource, combining PBL with traditional lectures, project sharing. PBL requires a high quality teaching infrastructure and resources, because it is a teaching method emphasizing practical skills. Lack of advanced clinical equipment and inadequate library resources were found to adversely affect the student's learning, as they could not practice real world skills or access relevant medical information in order to complete their assignments. According to Du, Su and Liu (2013), the support from faculties are regarded as very important factors. Also, students' interest and motivation can be influenced by the learning environment (Green, 1998). One participant mentioned his unfamiliarity with PBL and the burden it gave to him, combing PBL with traditional lectures could solve this dilemma. In addition, teachers could share their projects and cooperate with other teachers to reduce

time to prepare a PBL class. Proper cooperation would greatly ease the strain in the PBL classes place on the college infrastructure.

6.1.4   Conclusion

In PBL, students have more time and opportunities to evaluate and reflect the knowledge they have learnt. Searching for real clinical cases, not only increase the breadth and depth of their nursing skills, but from the perspective of information searching, students have broadened their horizon of nursing field. Hence, the core competency of critical thinking is supported.

In the process of PBL, by providing real practice places or simulated clinic environments, students are more capable of administering clinical care. Therefore, students can enter into the character as a nurse in advance by concretizing abstract theory and skills, and they can gain the necessary nursing experience in the process of completing project tasks. Afterwards they would be ready emotionally and skillfully take on the job as soon as possible. The core competency clinical care is much improved in PBL.

Group work in PBL cultivates students' cooperative consciousness and ability. Through role-play scenarios in PBL, it lays a good foundation for nursing students to do well in doctor-patient relationships and avoid medical disputes. The core competency of leadership is mostly promoted in the group work during PBL. It is clear that the core competency of interpersonal relationship receives much training in PBL by the abundant interactions.

Through PBL educators can create an environment that enables the students to act as the patients. These enable students to process the feelings of a patient who is suffering from psychological uneasiness and physical sickness. The simulations and real operations in PBL provides students chances to have training on core competency of ethical practice.

In this study, PBL was found to increase five of the core competencies in CIRN, two of them were not directly developed: professional development, teaching coaching. It's unrealistic to expect any prior institutional vocational education to exactly match the real life needs of work, especially in a constantly changing, high stress environment of nursing. PBL classes are shown to push

students to develop themselves and to make them acquire new study skills and habits. These, combined with the development of their ethical practices and increased social skills should give them the necessary tools and abilities to cultivate even those undeveloped competencies during their working life.

Prior studies have found it beneficial if seniors' students are used in tutoring roles during PBL classes. Namely, it will not only teach the tutors important skills from the core competency category of teaching-coaching, but also help junior students to get accustomed to the PBL-method and to receive needed support when encountering new or difficult problems.

The initial idea to choose three students and three interns is that they may have different thoughts concerning PBL as interns have more practical experience. The data showed that the interns, as expected, were able to integrate the lessons learned during PBL-classes into their internship in a hospital. While the students cared more about PBL's influence on their academic performance.

Measured and careful usage of PBL is proven to be a very effective teaching method to prepare nursing students for their working life. It's notable that beyond teaching practical work related skills, PBL does also increase students' motivation, enthusiasm for study, social skills and innovation ability. These are values that will benefit students in all areas of life.

6.2   Reliability, generalizability and limitation

Any qualitative researchers should be aware of reliability and validity when carrying out the study design, result analysis and the overall quality assessment (Patton, 2002). Although the concepts of reliability and validity are most often employed to ensure the integrity and authenticity of the findings in quantitative paradigms, the term reliability and validity could also be used in other research types (Shenton, 2004; Golafshani, 2003). I will employ qualitative trustworthiness criteria of credibility, transferability, dependability and confirmability to assess and evaluate this study (Shenton, 2004; Lincoln & Guba, 1988).

Credibility means to ensure if the participants' original views is interpreted properly in the findings (Lincoln & Guba, 1985; Shenton, 2004).   In this

study, having regular research seminar meetings with my cohorts and supervisor and receiving valuable feedback from them ensured the smooth process of the research (Shenton, 2004). The design of the interview questions was based on the research questions and they were reviewed and revised after feedback from my supervisor. Furthermore, the opponent working system and presentations with comments from group members and my supervisor made sure that my effort was true and fair. The strategy of low-inference descriptors in this study, using mechanical recording to increase the accuracy of transcripts for me and the verbatim quotes are provided to help readers to experience the actual feelings and opinions of the participants (Brink, 1993; Johnson & Christensen, 2008).

Additionally, relevant literature was reviewed to construct the research questions at the beginning of the research. The connection between the findings and the existing knowledge is presented in discussion section. This is a key criterion to assess and evaluate the quality of qualitative research (Shenton, 2004). Though Bouma and Atkinson (1995) states that random sampling ensures the selected participants are a representative sample of a larger group and reduces or evens "unknown influences" (Preece, 1994). However, this study did not choose random sampling because to answer the research questions, the participants should have prior PBL experience and to be willing to actively cooperate and share their views (Shenton, 2004). This study is not about measuring the effectiveness of PBL method, rather it's about a detailed examination of its effect on particular students in a case. The participants in this study needed to be willing to voluntarily offer their genuine and honest answers without worrying and fearing the loss of their privacy as I promised them confidentiality (ibid.).

Transferability is about the feasibility to generalize or apply the findings of the research to other contexts (Shenton, 2004). Although every case is unique, it is also possible to reapply the results to a broader scale if the researchers think that the context in this study is similar to their situations (Lincoln and Guba, 1985; Stake, 1994). The participants in this study are nursing students having PBL courses in a vocational college. This case is unique but can also be applicable for the same level vocational colleges where PBL courses are implemented

for nursing students. PBL practitioners and vocational college faculties can take the results into consideration to see how PBL affects nursing core competencies and the improvement suggestions to PBL implementation.

Dependability is concerned with whether we could obtain similar results if the study was repeated with applying the same research process, including same participants, same methods and same context (Shenton, 2004). Thus, in order to stress the dependability of this study, the research design, its implementation and data collection were described in detail (ibid.). To ensure that the participants were given full freedom to express their views, I did not influence them in any way.

In regard to confirmability, it is the degree of objectiveness in this study. Patton (2002) indicates it is difficult to have the real objectiveness because the whole research process is designed and implemented by human beings. It is very important to ensure the findings are the real voice from the participants rather than the researcher's preference or understanding (ibid.). Since the researcher has no background in nursing field, it further ensures the confirmability of this study. Additionally, the detailed research process allows the readers to criticize the data and findings and to determine how much they agree with (ibid.). The "data-oriented approach" in "audit trail", presenting how the data was initially coded and categorized into the finding which were shown in diagrams (ibid) (See Appendix 4-6). The limitation section in this study can also provide confirmability.

Generalizability is not stressed in qualitative research findings, which focus study to a specific phenomenon in a particular group or a context (Leung, 2015). Considering the fact that other vocational colleges may not implement PBL in the same way as in this case, the findings of this study might not be applicable in all vocational college settings. The findings in this study might not generalize to the overall situation in all vocational colleges in China. However, if some vocational colleges would like to conduct PBL class for nursing students or are already in the implementation process, the results in this study can advise them of the current situation, possible problems, the relationship between PBL and core competencies and the possible improvement to PBL.

The limitations of this study are presented in the following aspects. Firstly, the study was carried out in a public vocational college in a medium-sized city and the participants number is very limited, so the findings might not be fully applicable in other vocational colleges from other cities. Secondly, the case of this study is the views of PBL from students in one vocational college, so the implementation of PBL in other colleges might differ. Thirdly, all the participants have good academic performance and are naturally more capable to contribute to the group work than students with weak knowledge/skills. Therefore, different results might be obtained from a group with relatively poor academic skills.

Fourthly, the data collection, data analyzing process were conducted in Chinese for convenience, the data diagram was first categorized in Chinese and later translated into English. As a non-native English speaker, my Chinese way of thinking has some influence on interpreting the data. Fifthly, I have no nursing background before and the answers from the participants include some medical terms and expressions. Although I have had asked about the terms I did not fully understand during the interview, as much as possible. Still there exist limitations when describing the medical knowledge. Sixthly, there are usually more than 40 students in one class so the teachers cannot take everyone's merits into consideration to better organize PBL class and they cannot properly motivate the students who are in need. Therefore, the results might differ with much smaller class sizes.

6.3 Ethical solutions

Researchers need to take ethical issues into consideration in all kinds of research, to provide and maintain privacy for informants (Orbm, Eisenhauer & Wynaden, 2001). Three appropriate ethical principles has been addressed in this study to protect participants from harm and uncomfort. They respectively are autonomy, beneficence, and justice. (ibid.).

In terms of autonomy, the participants were reached with the assistance of the faculty dean. They all voluntarily joined in the research and were informed

about the study beforehand. Therefore, they had autonomous right to decide if they would like to join in and they had the right to withdraw anytime during the study. Every participant's' rights were recognized and highly respected. I maintained a positive and equal relationship with the participants to respect their autonomy.

Beneficence refers to take care of the benefits for participants and preventing harm (Orbm et al., 2001). Considerable attention should be paid when using participants' identities. As this was not a large-scale study, it would be easy to recognize the participants. For this reason, the participants were separately given a pseudonym (Angela, Daisy). As a result, participants' quotations in the results and discussion parts would not reveal their names, ages, their teacher's name etc. The interviews were voice recorded by the sound recorder in my IPad and transcribed, analyzed and stored in my personal laptop. I tried to inconvenience the participants as little as possible by placing the interviews flexibly around their time schedule.

The principle of justice is about the equal share and fairness (Orbm et al., 2001). All participants knew very well beforehand about the value of their contributions to this study and they answered the questions honestly. All the interviews were carried out in Chinese for the convenience and fairness to every participant. I selected the participants purposefully, in the aspect of equal distribution of gender, sex and age.

6.4   Recommendations for further research

Chinese nurses do not have the qualifications and rights to make prescriptions. Their main job is to assist doctors to conduct the medical treatments. Because of special national conditions, they have to undertake high workload and do 24-hour work shifts. Moreover, the nurses have no time and energy to care about patients' emotions and mental conditions (Lin & Liu, 2012). This is one of the reasons why the relationship between doctors and patients remain tense (Lin & Liu, 2012; Zhu, 2014). There are many nurses working in the hospital but their professional skills need to be improved. Nursing core competencies examines

seven components and professional development is one part. Therefore, improving nursing core competencies is one of the basic solutions and this should start with the nurse training program and schools. The basic conclusion of this study is that the application of PBL did cultivate nursing students' core competencies from various perspectives: critical thinking, clinical care, leadership, interpersonal relationship, ethical concerns.

Based on the Chinese context, this study investigated how project-based learning affected nursing students' core competencies, participants' views on PBL's implementation and its future improvement, in a chosen vocational college. The data (Ministry of Education of the People's Republic of China) shows that there were 1341 vocational colleges in China in the year of 2015, and the amount of vocational colleges is rising every year. The previous studies have focused on separate aspects of core competencies (Lei, 2007; Cui, 2015; Yan et al., 2015; Xu, 2016; Qi, 2011; Huang, 2001; Zhu, 2014; Xia, 2012; Lin & Liu, 2012), however I feel there is need for a comprehensive study. As the thesis was an intrinsic case study, and only one vocational college was investigated, I wish that in the future data would be collected from other vocational colleges in different provinces in China. Technically, it would be a big project, consuming massive manpower and physical resources.

This study examined the thoughts from the students who have high academic scores and the data showed that one of them cannot adapt to PBL very well. It is possible that PBL demands too much from students themselves. Therefore, there is a need to study how the students with low academic performance are affected by the use of PBL. Keeping in mind that PBL was found to enhance the motivation for studying, it is plausible that this method might be very beneficial to those students as well.

It would be interesting and meaningful to carry out a large scale quantitative study to exam the findings in this study from multiple perspectives. This study helps readers to better understand students' voice about project-based learning on a deeper level. Additionally, bigger sample sizes in future studies could contribute to and support the depth and generalization of the findings in this study to the whole Chinese vocational education. I wish this study will con-

tribute to the deep understanding of PBL's implementation and provide support to improve PBL's effectiveness in enhancing nursing students' core competencies.

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APPENDICES

Appendix 1 Competency Inventory for Registered Nurse (CIRN). Liu, et al. (2007, p.808-809)

Dimension	Items
1. Critical thinking and research aptitude (CR)	Defend decisions using scientific knowledge principles
	Identify priority risk in clinical situations
	Make decisions that reflect both knowledge of facts and good judgment
	Figure out more than one way to solve confronting clinical problems
	Integrate pertinent data from multiple sources
	Employ empirical and personal knowledge to examine the rationale put forth by self and others
	Incorporate relevant research findings into nursing practice
	Assist in the clinical research data collection
	Analyze data accurately and comprehensively
	Use different ways to search for information
2. Clinical care (CC)	Develop a nursing care plan for a specific patients based on a primary and secondary data base
	Utilize technological advances to improve nursing and health care
	Detect and document significant changes in a patient's condition
	Assess all health dimensions of client, i.e. physical, psycho-social, spiritual aspects
	Provide culturally sensitive care
	Deliver accurate, comprehensive and effective nursing

	in accordance with the care plan
	Give emotional support to families
	Identify and include immediate patient needs in the nursing care plan
	Involve the patient and family in the planning and implementation of care
	Evaluate results of nursing care interventions
3. Leadership (LD)	Delegate responsibility for care based on assessment of abilities of individuals
	Get group approval in important matters before acting
	Act to develop an atmosphere for teamwork and cooperation
	Recognize other's contributions and achievements
	Act as a change agent for the integration of new concepts into clinical practice
	Promote cooperation, trust, and open exchange of ideas
	Coordinate the relations between nurses and all related personnel
	Accept and use constructive criticism
	Resolve conflict in a positive way
	Identify and understand others' personal strengths and weaknesses
4. Interpersonal relationships (IPR)	Cooperate with other care providers solving to meet patient needs
	Adjust actions in relation to other's actions
	Express disagreements in a constructive manners
	Communicate facts, ideas and feelings to other health team member verbally
	Build trust by keeping word, commitments, and promises
	Acknowledge the differences in beliefs and cultural

		practices of individuals/groups
		Show willingness to share workload when needed
		Express facts and thoughts in writing in a clear and organized way
5. **Legal/ethical practice (LE)**		Carry out nursing practice according to legal requirements and organizational policy
		Report all perceived malpractice incidents to responsible persons
		Function in accordance with legislative and common law affecting nursing practice
		Take responsibility for one's own performance
		Serve as an advocate for the rights of clients or groups
		Respect the patient's/client's right to privacy
		Ensure confidentiality and security of written and verbal information acquired in a professional capacity
		Respect the patient's/client's right of choice and self-determination in nursing and health care
6. **Professional development (PD)**		Understand role of professional organizations and actively participate
		Display self-direction in personal development
		Use learning opportunities for ongoing personal and professional growth
		Recognize own learning needs

	Demonstrate self-awareness of personal limitations and strengths
	Understand relevant and current information concerning health care system
7. **Teaching-coaching (TC)**	Identify the learning needs of others including patients, families, and junior nurses
	Coach junior nurses to meet both the task needs and their developmental needs
	Take up the preceptor role to support new nurses in adapting a new working environment
	Initiate the appropriate orientation programs for new nurses
	Use opportunities for patient teaching when they arise
	Provide consultations for nurses and/or other care personnel
	Develop an explicit teaching strategy to teach patients and families

Appendix 2 Interview Questions (English version)

Your answers will be stored confidentially and will be used only for the research. Your answer will be very important to understand project-based learning method from the point view of students towards professional competence.

Basic Information
- What is your age?
- What is your gender?
- What is your major?
- <u>How long have you been an intern? (intern)</u>
- <u>What grade are you in? (student)</u>
- Do you have previous nursing knowledge before you enter the vocational college?

1. How do you understand project-based learning?
    What is your project-based learning experience?
    How would you describe your experience?
2. In what subjects PBL method is applied?
    Is it proper to use PBL in this subject? If it is, why do you think PBL is proper for this subject?
    Are there any other subjects you think which is suitable to apply PBL method? why?
3. Based on your own experience of PBL, how is the process going on? Please give an example
    Are there any special teaching materials in PBL?
    How is a PBL course planned?
4. In PBL course, what kind of roles did you take?
    Why would you like to be in this position? (e.g. project leader, project organizer, project executor etc.)
    What have you done in this position?

5. How would you describe your experience in these roles you have had?
    Comparing to traditional teaching method (e.g. lectures), what is your
    understanding of PBL method?
    What is the biggest differences or similarities?
    How would you describe the differences and similarities?

6. As a nursing student, what kind of professional competence do you
    think you should have in future career?

7. <u>Based on your own intern experience (Based on your experience of PBL)</u>,
    what do you think about how PBL help your professional competence?
    how does the knowledge learned through subjects applied PBL help
    your professional competence?
    What professional competences do you think that are enhanced through
    project-based learning? Can you clarify?

8. Comparing traditional teaching method and PBL, is there any differences
    in supporting your competence?

9. How do you see the relation between PBL and future employment (or in-
    tern)?

10. What do you think about improving PBL?

11. How PBL courses should be improved?

Appendix 3 Interview Questions (Chinese version)

你的回答将以匿名的方式进行，仅作为研究使用。你的回答对于研究项目教学法对于护理学生职业能力影响至关重要。 感谢你的参与！

基本信息

你的性别是？

你的年龄是？

你的专业名称是？

你是几年级学生？

你实习多久了？ （实习）

你读几年级？ （学生）

在进入职业学院之前有过护理专业的知识吗？

1. 你如何理解项目化教学法？
   你的项目化教学经历是什么？
   你如何描述你的项目化教学经历？

2. 采取项目化教学的课程一般是什么科目？
   你认为这门科目采取项目化教学合理吗？若合理，为什么你觉得这门课应该采取项目化教学？
   有其他科目你觉得非常适合实施项目化教学吗？为什么？

3. 就你所经历过的项目化教学，你理解的它的流程是什么样的？请简要举例说明你上过的项目化教学课程流程。
   这门科目有专用的教材吗？
   一门项目教学法课程是如何设计的？

4. 项目化课程中，你一般担任什么样的角色？
   你为什么喜欢或愿意担任这样的角色？（比如项目领导者，项目谋划者，项目执行者等）
   你在这个角色中做过什么？

5. 请谈谈与传统教学（授课式）相比较，你自己对于项目化教学模式的理解是？
   最大的不同点或相同点是什么？
   你是如何看待这些不同点和相同点的？

6. 作为护理系学生，你认为你应该具备怎么样的综合职业能力以满足日后工作需要？

7. 基于你个人实习经验（你的项目教学经历），你认为项目化教学对你的综合职业能力有哪些影响？
   你认为一些通过项目化教学学习的科目，对于你知识的吸收有帮助吗，为什么这样

认为？
你认为你的哪些职业综合能力得到了提高？ 能否举例？

8. 比较传统教学法和项目教学法，两者之间对于提升个人职业综合能力的区别在于？

9. 你认为项目化教学法对于你以后工作（或实习）有关系吗？有什么关系？

10. 你认为应该如何改善项目化教学的实施？

11. 采用项目教学的课程应该如何改进？

Appendix 4 Research question 1: coding framework

Initial coding framework	Category	Final category
Understanding content knowledge more easily Wider knowledge Diversified learning process Student centered	Modern teaching method	Positive aspects of PBL
Group work Doctor-patient communication	Team cooperation	
Raise students interest and Confidence Improvements in independent study	Motivation	
Frequent communication	Teacher-Student interaction	
More familiar with traditional lecture approach	Inadaptability to PBL	Negative aspects of PBL
(group members are not talkative) taciturnity (hold on one's own views stubbornly) obstinacy conflicts in discussion	Weak co-working ability	
Unclear labor division Inefficient meetings Rely on some people to finish the project	Lack of leadership	
absence from group work Slapdash behavior Avoiding responsibilities	Poor attitude	

Appendix 5 Research question 2: coding framework

Initial coding framework	Category
Enhancing evaluative and reflective ability Improving the ability of information search Increasing creative ability	Critical thinking
Knowing clinical equipment well Increasing operation proficiencies The ability to settle practical problem	Clinical care
Team awareness Doctor-patient communication ability	Leadership
Language expression ability Social competence	Interpersonal relationship
Attention to the needs of patients Emotional needs	Ethical practice

Appendix 6 Research question 3: coding framework

Proper supervision Insufficient guidance Limited clinical experience Lack of motivation measures	Teachers
Weak infrastructure and resource Combining PBL with traditional lectures Project sharing	Teaching environment