

Exploring creativity and critical thinking in traditional and innovative problem-based learning groups

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Aims and objectives. To explore students' attitude towards problem-based learning, creativity and critical thinking, and the relevance to nursing education and clinical practice.

Background. Critical thinking and creativity are crucial in nursing education. The teaching approach of problem-based learning can help to reduce the difficulties of nurturing problem-solving skills. However, there is little in the literature on how to improve the effectiveness of a problem-based learning lesson by designing appropriate and innovative activities such as composing songs, writing poems and using role plays.

Design. Exploratory qualitative study.

Methods. A sample of 100 students participated in seven semi-structured focus groups, of which two were innovative groups and five were standard groups, adopting three activities in problem-based learning, namely composing songs, writing poems and performing role plays. The data were analysed using thematic analysis.

Results. There are three themes extracted from the conversations: 'students' perceptions of problem-based learning', 'students' perceptions of creative thinking' and 'students' perceptions of critical thinking'. Participants generally agreed that critical thinking is more important than creativity in problem-based learning and clinical practice. Participants in the innovative groups perceived a significantly closer relationship between critical thinking and nursing care, and between creativity and nursing care than the standard groups.

Conclusions. Both standard and innovative groups agreed that problem-based learning could significantly increase their critical thinking and problem-solving skills. Further, by composing songs, writing poems and using role plays, the innovative groups had significantly increased their awareness of the relationship among critical thinking, creativity and nursing care.

Relevance to clinical practice. Nursing educators should include more types of creative activities than it often does in conventional problem-based learning classes. The results could help nurse educators design an appropriate curriculum for preparing professional and ethical nurses for future clinical practice.

Key words: creativity, critical thinking, focus group interview, problem-based learning, qualitative study

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Introduction

Problem-based learning (PBL) has a long history rooted in healthcare teaching (Azer 2001, Streitwieser & Light 2010). However, little has been done to discuss possible innovations in teaching and learning, and what exactly happens in a PBL class to nurture students' creative and

critical thinking. Being the qualitative wing of a larger study, this article aimed to examine the experiences of three learning and teaching activities, namely composing songs, role playing and poem writing in nursing PBL classes at a university in Hong Kong, in terms of creativity and critical thinking, and to illustrate student participation and involvement in the learning journey.

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To develop students' learning motivation and enable them to decide their learning objectives and play the role of 'peer teachers', McMaster University in Canada first developed the teaching strategy of PBL in 1969. The innovative strategy became popular in North America, Europe and Australia in the 1970s (Azer 2001, Streitwieser & Light 2010). The interest of adopting PBL also increased in Asia to promote self-learning, independent learning, responsibility and motivation to learn, creativity, critical thinking, problem-solving capacity and self-reflection (Chan 2009, Klunklin *et al.* 2010). For instance, the one-way lecture in Thailand similarly underwent reform and converted to a student-driven style (Klunklin *et al.* 2010). In 2008, the Kaohsiung Medical University International Conference and Workshop on PBL suggested placing stress on the holistic nursing care experience and unanticipated healthcare context in the PBL class (Chan 2009). Several research studies investigated the effect of PBL on the empowerment of nursing students, confirming that PBL has a positive impact on professional and generic skills, retention of knowledge, enthusiastic behaviour and development of vision and participation (Schmieding 1993, Dochy *et al.* 2003, Green *et al.* 2003).

Several research studies have revealed the difficulties of using PBL. Some traditional subjects in medical school may be difficult to translate for PBL (Maudsley 1999). Haith-Cooper (2000) further explained that the role of facilitator is crucial in determining the success of implementing PBL effectively. If the facilitator can neither provide appropriate guidance at certain points nor improve the teamwork in class and enable students to figure out the learning objectives, the PBL class may fail to support students' learning. Lastly, some studies suggest that students in PBL may acquire less knowledge than those in didactic lectures (Dochy *et al.* 2003). To increase the effectiveness of nursing education, the assessment adopted in PBL should place more emphasis on higher-order thinking, such as ability to relate and organise various concepts (Gijbels *et al.* 2005); in addition, motivation for learning should be founded on active learning experience in PBL, rather than cumulative GPA (Ning & Downing 2012). In the light of the above difficulties and unknown experience of song composition, poetry writing and role-play creation in the PBL context, the study aimed to examine the learning experiences of these activities in nursing PBL classes in terms of creativity and critical thinking. The innovative groups implemented these activities, while the standard groups adopted conventional PBL teaching approaches. Composing songs, writing poems and role plays constitute a new experience for nursing students. Students can master nursing professional knowledge, transform the knowledge to contextual situations and

enhance their team spirit by composing songs together (Chan 2006). When students are writing poems, they make full use of their creativity, sensitivity and critical thinking to summarise what they have learnt in different lectures and re-construct patients' conditions (Raingruber 2009). Role playing is another learning and teaching activity that arouses students' empathy, develops their analytical reasoning and communication skills with patients, and promotes a patient-oriented approach to nursing education (Chan 2012).

Background

Studies have shown that creativity and critical thinking are the two main outcomes expected in PBL teaching (Chan 2012). Creativity is necessary to explore various solutions, adapt to the complicated clinical setting and promote quality nursing care (Boxer & Goldfarb 2011). In nursing education, implementing creative and problem-based activities can promote students' cognitive attributes and reflection and engagement in learning by reforming assessment strategies and inspiring internal motivation for lifelong learning (Hullinger 1973, Hu *et al.* 2008). For instance, to allow students to experience the suffering of older patients at home and prepare for the healthcare professions, some nursing schools establish creative methods such as simulation to reconstruct the context of clinical care and nurture critical thinking and problem-solving skills (Neal-Boylan 2006, Lee *et al.* 2010). Therefore, creativity is a necessary competence in nurturing nursing students.

In addition to creativity, critical thinking is another crucial competence. Critical thinking has been the foundation of nursing and medical education for decades, as interprofessional medical knowledge advances over time, while the theory and application have to be correlated in realistic clinical settings. Nurses should be willing and able to co-construct their knowledge and theoretical framework in the challenging and stressful workplace, and therefore, many medical and nursing curricula, such as in Newcastle, Hawaii, New South Wales, Turkey and Australia (Neame 1981, Vanetian 2001, Ellermann *et al.* 2006, Darbyshire & Fleming 2008, Romeo 2010), have adopted an innovative teaching style to nurture logic models and reasoning, such as mind maps and conceptual linkage; some enhance students' autonomy and independent thinking by eliminating possible obstacles in the hierarchical traditional structure (Ellermann *et al.* 2006, Karagözoğlu 2009). It is especially important in nursing schools in the Chinese cultural context, which emphasises hierarchical structure, the power of the incumbent and the consideration of harmony, rather than critical and independent thinking. Liu (2008)

pointed out that Taiwanese nurse leaders should encourage their subordinates to participate and perform decision-making creatively in the intercultural interaction. Lee *et al.* (2010) suggested that nursing education in Hong Kong adopt simulation, to develop students' critical thinking, problem-solving and generic skills for the clinical setting and patient health care. Instead of simulation in the laboratory, few studies have been discussed in relation to PBL activities in the Chinese context.

To enhance creative and critical thinking in nursing education, innovative activity is an efficient tool in nursing PBL classes and medical workshops. During various teaching activities, which are mainly simulation or role plays, students learn how to cooperate with a multi-professional medical team in the clinical context, and to care and communicate with patients, particularly when delivering bad news or critical care (Chan *et al.* 2003, Torke *et al.* 2004, Wiskin *et al.* 2004, Scheffer 2008, Spafford 2008, Rotgans & Schmidt 2011). This qualitative study is a part of a major educational study, aiming to evaluate the influence of three teaching innovations, namely song composition, poem writing and role playing on students' critical thinking and creativity.

Song composition is one of the productive activities that can nurture students' critical thinking ability and allow them to explore different possibilities in learning (Brookfield 1987, Boud *et al.* 1998). Students are encouraged to work together and make use of creative thinking, in order to represent what they learnt in class (Boud 1998, Carlisle *et al.* 2004). Instead of outcome-based learning, song composition emphasises on the learning process and exploration of a more supportive environment (Harden *et al.* 1999, Chan 2006).

Poem writing is another activity that requires special affordances, higher-level thinking and co-construction of knowledge. Because of knowledge explosion, integration of arts and science becomes a trend of educational development. Raingruber (2009) and Chan (2010) state that the novel ideas from other disciplines, for instance poetry writing, can shed some lights on the concerns of creativity in nursing pedagogy. Poetry is efficient in capturing the abstract ideas and human beliefs, and reflecting on the hidden feeling (Chan 2003a,b).

The last activity studied in this research is role playing, which is an effective approach in medical education (Lau *et al.* 2001, Chan *et al.* 2003, Green *et al.* 2003, Kim *et al.* 2003, Torke *et al.* 2004), as it provides students with an opportunity to express their views, actively participate in a sociocultural context and demonstrate their critical thinking skills (Simonneaux 2001, Korenstein *et al.* 2003, Alford & Currie 2004, Roter *et al.* 2004, Wiskin *et al.* 2004). Given the features of composing songs, writing poems and using

role playing in PBL class, this research aims to explore students' perceptions towards these three activities and the influence on students' creativity and critical thinking.

Methods

Design

An exploratory mixed-method research design was used in the entire study, and this article focused mainly on the qualitative part. Students' views on PBL, creativity and critical thinking were elicited by focus group interviews with students using a semi-structured interview guide. Focus group interviews were the chosen method of data collection, as they were considered to facilitate interaction, peer learning and spontaneous dialogue, eliciting students' views on nursing PBL and making sense of their experiences (Morse & Field 1995, Polit & Hungler 2001, Hansen 2006). Qualitative interviews are found to be an inductive process and particularly valuable in encouraging participants to share and reflect on their perceptions and to be aware of their hidden thoughts (Morgan & Krueger 1993, Polit & Hungler 2001, Hansen 2006). In particular, qualitative research enables researchers to gain entry into students' world and a detailed description of their complicated social context (Morse & Field 1995, Dempsey & Dempsey 2000, Hansen 2006), and to draw a validation of responses from the diverse information (Morgan & Krueger 1993, Lane 2001, Litosseliti 2003). Therefore, this study adopted the qualitative research method of focus group interviews.

Participants

This study employed purposive sampling. A total of 100 participants were invited in seven focus group interviews at a University nursing school in Hong Kong. The sample involved 31 male and 69 female students in two innovative groups and five standard groups. On average, there were 19 students in each innovative group and 13 in each standard group.

Ethical considerations

The approval was granted by the ethics research committee of the university before commencement of the focus groups. The study was explained, and written consent was received from students prior to data collection. Confidentiality was followed strictly, and students' participation was not identified in the research results (Hansen 2006). Participants also understood that they could withdraw from the interview without any penalty (Dempsey & Dempsey 2000, Hansen 2006).

Data collection

Data were collected from seven focus groups with 100 students. Approximately 12–13 students were allocated to one of the groups for a two-hour interview in a comfortable and quiet environment (Litosseliti 2003). The conversation was recorded by audio tape and field notes (Hansen 2006). The interview guide was subdivided into four sections and was designed to facilitate the exploration of PBL, critical thinking, creativity and activities. The guide was semi-structured and consisted of a series of open-ended questions related to the aim of the study. Each student was allocated an identification code. The interview guideline is presented in Table 1.

Data analysis

This study implemented thematic analysis on the qualitative data (Smith *et al.* 2009). The research assistant listened to the audio record and followed a series of rigorous procedures, by which the interview data were initially translated from Chinese to English, then transcribed, summarised, coded in small segments and developed into meaningful sorts (Morse & Field 1995). Lastly, the analysis involved a constructive process of thematising these sorts. The researcher verified and confirmed the main elements of nursing education in creative and critical thinking.

Rigour

The researcher and her research assistant implemented the following strategies to ensure the trustworthiness and vali-

Table 1 Focus group interview guidelines

<i>Problem-based learning (PBL)</i>
What is PBL?
What are the differences between PBL class and other lecture?
<i>Critical thinking</i>
What is critical thinking?
What is the relationship between critical thinking and nursing care?
<i>Creativity</i>
What is creativity?
What is the relationship between creativity and nursing care?
<i>Activities</i>
Available for Ordinary PBL Class
Please describe the activities offered by the lecturer.
What are the roles and functions of these activities on critical thinking ability?
What are the roles and functions of these activities on creativity?
Available for Innovative PBL Class
What is the influence of poem composing on learning?
What is the influence of song composing on learning?
What is the influence of play performance on learning?

dation of the study results. Assurances about the credibility, dependability, transferability and confirmability of data were given (Lincoln & Guba 1986). A pilot test was conducted before the qualitative study to test the practical aspects and the feasibility and clarity, and to refine the protocol of the interview process (Litosseliti 2003, Hansen 2006, Allen *et al.* 2009). Furthermore, the thematic analysis was subject to audit trail, continuous review and peer checking among the research team members, to get mutual consensus (Polit & Hungler 2001, Hansen 2006).

Results

The three teaching activities of composing songs, writing poems and role playing were adopted in innovative groups of PBL tutorials. Each activity was implemented in every two weeks, after students discussed the hypotheses, assumptions and learning objectives of the particular scenario. They were usually required to finish and present the product in class, except for role plays, which may allow students to prepare the scripts and stage properties in a week. Two examples of students' poems related to the complications of Severe Acute Respiratory Syndrome (SARS) and rheumatoid arthritis are illustrated below:

Poem 1: Fall to pieces

SARS ruins my life in all the way.
 Husband supports me to carry on my way.
 Arthritis causes me pain and drags me down.
 Trapping myself in a small small town.
 Tearing our relationship far apart.
 Erasing the beautiful scenes by a dart.
 Reviewing what's the meaning of my life.
 I wonder where's the light of my drive.
 Nothing worths me to living for.
 God please guide me through the moor.

Poem 2: Louisa and SARS

Louisa, Louisa, woman who contracted SARS
 Poor her, cannot dance, get hip pain and lose her charm
 Everyone left her far.....
 Medicines are great suffered
 Love partner, Leonard?
 Their relationship separated far
 Louisa, Louisa, woman recovered from SARS
 Losing hope, losing fun, losing everything at once
 No more tears, no more cry. I believe you can fly

Both poems showed students' understanding of the patient, Louisa, and her suffering in a holistic perspective. They balanced the focus on the physical and psychosocial needs and expressed their support to this patient. The first group wrote an acrostic poem using each letter of the word, s-h-a-t-t-e-r-e-d to present the corresponding meaning.

At the end of the semester, both standard and innovative PBL groups implemented focus group interviews on nursing education, creativity and critical thinking. There are three themes extracted from the data: 'students' perceptions of 'PBL', 'students' perceptions of critical thinking' and 'students' perceptions of creativity'. In addition, according to the experiences of the innovative groups, participants gradually expressed their views of the three activities. The following sections will extract several narratives to illustrate the themes, with the code SG denoting standard group, IG denoting innovative group and S denoting student. The perspectives of standard groups are followed by those of innovative groups.

Students' perceptions of PBL

Standard groups

This theme refers to the participated nursing students' views on the PBL class. Participants in the standard group generally explained that the teaching approach of PBL is more interactive than that of didactic lectures. They enjoyed this teaching strategy, and the knowledge they acquired in the PBL class was more easily remembered. Some students felt stressed when participating in discussion sessions, as they had to strive for the opportunity to speak up. Nevertheless, they felt autonomous in deciding their own hypotheses, assumptions and learning objectives with regard to the given scenario:

Compared with traditional lectures, PBL encourages students' involvement. We are allowed to discuss with our fellow students and instructor, and then we receive spontaneous responses. (Standard group 1, student 5)

In PBL, we can investigate a disease and nursing care thoroughly and review critically what we have learnt in previous lectures. Although our discussion is closely related to the given scenario, we can freely decide on the research area we are interested in. (Standard group 6, student 6)

According to the above narratives, students in the standard groups mentioned that nursing PBL encourages students' participation, autonomy and critical thinking.

Innovative groups

Participating in song composition, poem writing and role playing, the students in the innovative group shared a differ-

ent picture of PBL. When they were writing a play script or singing a song to express patients' feelings, they understood the suffering of patients more and empathised with the less fortunate. Some of the participants clearly explained that empathy is one of the most important attributes in nursing caring. However, some participants also pointed out that the lack of availability of certain information may limit their creativity demonstrated in the activities:

I was challenged rigorously by my fellow students in the last ordinary PBL series. We needed to prepare a lot of information, and competed for opportunities to express our views. I was too tense to participate, but I did not want to be an armchair strategist. Now, however, I feel much happier, as I can write a poem or perform a play about patients' and their families' inner feelings. It is very interesting. (Innovative group 1, student 1)

This PBL class focuses more on emotional aspects. We empathise with the cases. Our groupmates even cried for the patients. In the past, I could only imitate others' feelings. But in the clinical environment, if nurses can empathise with their patients, patients will be gratified by the medical care and service. (Innovative group 1, student 7)

Compared with participants in the standard groups, those in the innovative groups enjoyed the PBL class, felt more relaxed and learned the importance of empathy from composing songs, writing poems and using role plays.

Students' perceptions of creative thinking

Standard groups

In our discussions, nearly all of the participants in standard groups believed that creativity was not necessary in nursing care. They talked about their opinion that, as nursing is a profession that plays a significant role in human life, they cannot plan their nursing care without any foundation of research reasoning. This implies that they perceived creativity as an unrestrained and vigorous way to generate ideas, without logical and analytical verification. However, a few participants insisted that creative thinking is important in certain contexts. The participants in the standard groups were asked to indicate the level of relevance between creativity and nursing care, 0 being the lowest and 10 being the highest. The level of relevance in the standard groups ranged from 1–7, and the average level of relevance was 3:

I don't think creativity is necessary in nursing care. Every treatment must be based solely on clinical reasoning. I cannot try any care plan and bet on my patient. It is all about life and security. For instance, I cannot use herbs to stop bleeding. Every clinical care

plan should be founded on rigorous research. (Standard group, student 8)

We demonstrated creative thinking through PowerPoint presentations. One of my groupmates created many different ways to end the presentation. The words 'The End' were formatted in amazing and special formats, but this kind of creative thinking is not very useful. (Standard group 2, student 18)

The above participants mentioned that creative thinking is not necessary in nursing practice and education. Even though they might come up with interesting ideas, they did not find them important.

Innovative groups

Participants in innovative groups generally indicated that composing songs, writing poems and performing role plays could develop their creative thinking. Nevertheless, they had diverse perspectives and expectations of the term 'creativity'. Some students pointed out that any ideas that come up instantaneously and illogically are creative, while others criticised that they can demonstrate creativity by observing society in detail and figuring out a new approach to integrating original ideas. The participants of the innovative groups were asked to indicate the level of relevance between creativity and nursing care, 0 being the lowest and 10 the highest. The level of relevance in the innovative groups ranged from 3–7, and the average level of relevance was 4:

Both our creativity and critical thinking ability are enhanced via preparing a play. We analyse the case and ensure that our performance will not deviate from the main track. We must also be brave to perform the play, for instance, I sacrificed my hairstyle to portray a female character. (Innovative group 1, student 4)

IG2S19: A creative care approach may threaten patients. We cannot give an injection by throwing darts or other creative ways.

Some students in the innovative groups agreed that the three activities of song composition, poetry writing and role-play creation can enhance creative thinking, while others argued that it is difficult to apply creativity in clinical setting.

Students' perceptions of critical thinking

Standard groups

Some participants in the standard groups referred to the importance of critical thinking in nursing care and offered a detailed explanation of the relationship between critical thinking and nursing care. They maintained that critical

thinking is positively correlated with nursing care in the first few years, because when nurses accumulate experience, they have more confidence to make their own decisions rather than just blindly following instructions. And then when nurses keep accumulating their experience to a certain level, critical thinking becomes negatively correlated with nursing care, as their previous knowledge already supports the decision and thus may prevent them from further enquiries. A majority of participants agreed that critical thinking is a crucial competence encouraged in the nursing PBL class. The participants in the standard groups were asked to indicate the level of relevance between critical thinking and nursing care, 0 being the lowest and 10 the highest. The level of relevance in the standard groups ranged from 7–9, and the average level of relevance was 8:

Our instructor strongly encourages critical thinking. For instance, he places a lot of stress on the construction of hypotheses. He always emphasises that the hypothesis should not be solely rephrased by the factual information, as it becomes tautology. In contrast, the hypothesis must be conceivably wrong and arguable. Secondly, every term adopted in the hypothesis should be strictly based on the scenario. (Standard group 3, student 2)

Nurses require critical thinking at every moment, no matter how important the decision they have to make. This is because doctors' treatments and prescriptions may not be absolutely appropriate. Nurses should not follow the instructions blindly, but always remind themselves to make a judgment before taking action. (Standard group 4, student 9)

The above students in the standard group emphasised the importance and contribution of critical thinking to nursing education and practices.

Innovative groups

It was also clear from the data that the participants in the innovative groups perceived the importance of critical thinking in clinical care. When one of the students stated that 'nursing care is critical thinking', all the students clapped heartily. When they composed songs, wrote poems and performed role plays, a majority of them realised that being professional and ethical nurses, they should analyse patients' contexts and suffering, put themselves in patients' shoes and critically choose the most appropriate care plan. To promote critical thinking, some students emphasised that the autonomy and empowerment of nurses should be enhanced in the clinical setting. The participants in the innovative groups were asked to indicate the level of relevance between critical thinking and nursing care, 0 being the lowest and 10 being the highest. The level of relevance

in the innovative groups ranged from 8–9, and the average level of relevance was 8:

I have performed more formal dramas before, but the play required in this PBL class was on a larger scale. I had to consider the appropriate setting, script, lighting, and properties, to recreate the manipulation of nursing care. I had to choose different wordings in lines for different characters, in order to accurately reflect their emotions. (Innovative group 1, student 12)

To be frank, I admit that the relationship between composing songs and critical thinking is not so obvious. Although it is enjoyable, it may not easily involve higher order thinking. (Innovative group 1, student 8)

In the interviews with the innovative groups, some students expressed that their critical thinking and analytical reasoning were enhanced, while others would like to practice higher-order thinking in the activities.

Discussion

Students' perceptions of PBL

This study aimed to explore students' experiences of participating in innovative activities, namely composing songs, writing poems and using role plays in a nursing PBL class. By replacing traditional didactic teaching approaches, PBL has become increasingly popular in nursing and medical education, in turn encouraging student-driven learning, critical thinking, creativity and independent problem-solving skills, and preparing professional nurses and medical staff in unpredictable healthcare settings (Chan 2009, Klunklin *et al.* 2010). Both the standard and innovative groups agreed that PBL is more interactive and autonomous. The students demonstrated a linkage between PBL and critical thinking by actively searching for information, expressing their views in discussions and presentations, and being able to retain what they learnt in their long-term memory. This is congruent with a previous study revealing that PBL provides a robust positive impact on students' skills and memory of the acquired knowledge (Dochy *et al.* 2003). Students from the innovative group expressed a different perspective on PBL. They learned the importance of empathising with the pain of patients when they were participating in song composition, poem writing and role playing. They made full use of their creativity and explored different possibilities in PBL. Pike and O'Donnell (2010) and Green *et al.* (2003) stated that simulation and integration of clinical content can develop students' self-efficacy and clinical skills. The facilitators of PBL should effectively

guide their students to maintain collaboration and find out their learning goals and objectives (Haith-Cooper 2000). While some students in the standard groups felt stressed when striving for opportunities to express their views in keen discussions, participants in the innovative groups were relaxed, enjoying the teaching activities.

Students' perceptions of creative thinking

The excerpts of this study demonstrate that a majority of participants, especially in the standard groups, considered creativity unimportant. The participants argued that they should decide their caring plan with rigorous clinical reasoning and sound evidence instead of creative ideas. Even though some of them expected creativity to be useful in certain contexts, the creative idea may not be higher-order thinking. These students perceived creativity as being equivalent to vigorous, instantaneous and illogical thinking. The findings show that nursing education should place more stress on creativity, so that students pay more attention to it. Nurses must always adopt creative solutions to achieve enculturation in certain contexts: for example, when they counsel patients and deliver bad news to them, they need to set new tones to engage on different emotional levels (Torke *et al.* 2004, Spafford 2008, Boxer & Goldfarb 2011). In addition, innovative teaching approaches can enhance the linkage between creativity and PBL via interaction, learning interests and internal motivation in cognitive and affective attributes (Hullinger 1973, Hu *et al.* 2008, Chan 2012). When the innovative groups were encouraged to demonstrate creativity by composing songs, writing poems and preparing role plays, some of the participants in the focus group interview pointed out that creativity and critical thinking do not contradict each other and that they could make full use of their creative talent by analysing the environment and generating a new approach from previous ideas.

Students' perceptions on critical thinking

Due to the continuous re-evaluation of medical knowledge and the shortage of clinical staff, nursing practice places more emphasis on critical thinking and problem solving in a timely manner (Neame 1981, Robertson 2006, Lee *et al.* 2010, Romeo 2010). This study lends support to the argument that participants of both the standard groups and the innovative groups in PBL classes realised the values and contributions of critical thinking in nursing care. Compared with the standard groups, the innovative groups were more optimistic about using critical thinking in the clinical setting

and less bound by the hierarchical emphasis and power of the incumbent in the Chinese traditional culture. Some students in the standard groups pointed out that the accumulation of experience may reduce nurses' motivation for using critical thinking, while all of the students in the innovative groups agreed that 'nursing care is critical thinking'. More and more universities promote critical thinking, autonomy and logical reasoning in undergraduate nursing students (Ellermann *et al.* 2006, Karagözoğlu 2009). Participants in the standard and innovative groups reported that PBL can effectively facilitate critical thinking, while some students in the innovative groups expected more involvement of higher-order thinking in composing songs, writing poems and using role plays.

Limitations of the study

In this study, only one-time interviews were conducted; thus, the longitudinal effect of composing songs, writing poems and role playing could not be evaluated. Because the sizes of some focus groups were too large to stimulate the involvement of some participants, a smaller sample size in each group would help to understand more accurately the effect of activities on enhancing creativity and critical thinking in nursing PBL. However, as the interviews lasted for two hours, they still had sufficient opportunities to express their viewpoints. Further studies are recommended to conduct external reviews on students' written assignments and the extent to which they demonstrate critical thinking and creativity.

Conclusion

The traditional method of PBL may be effective in the development of students' problem-solving and critical thinking skills, but to our knowledge, few studies have addressed the importance of creativity in nursing education and caring. This study has shown the impacts of adopting teaching innovations, namely song composition, poetry writing and role-play creation, on creative and critical

thinking of students. In this study, the findings emphasised that these activities could positively influence students' awareness of creativity and critical thinking in nursing care. This further indicated that the enhancement of students' critical and creative thinking had positive implications for the clinical staff and teachers in terms of the application of innovative teaching strategies.

Relevance to clinical practice

Clinical practices emphasise accuracy and the following steps. Due to medical teaching advancements, patients' expectations and the rapid spread of infectious diseases, nurses have to apply creativity and critical thinking to respond in a timely fashion, analyse patients' conditions and tailor-make appropriate caring plans. Nursing education should include a greater variety of activities than it often does in the conventional PBL class. Such inclusion will enhance nursing students' creative and critical thinking. The results could shed some light for nursing educators regarding the design of an appropriate curriculum for preparing students for clinical practice. It could be argued that the role and involvement of students should be extended.

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Contributions

Study design: ZCYC; data collection and analysis: ZCYC and manuscript preparation: ZCYC.

Conflict of interest

The author has no conflict of interest to declare in relation to this study.

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