Review

The effectiveness of outcome based education on the competencies of nursing students: A systematic review

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\textbf{ABSTRACT}

\textbf{Background:} Outcome Based Education (OBE) is a student-centered approach of curriculum design and teaching that emphasize on what learners should know, understand, demonstrate and how to adapt to life beyond formal education. However, no systematic review has been seen to explore the effectiveness of OBE in improving the competencies of nursing students.

\textbf{Objective:} To appraise and synthesize the best available evidence that examines the effectiveness of OBE approaches towards the competencies of nursing students.

\textbf{Design:} A systematic review of interventional experimental studies.

\textbf{Data Sources:} Eight online databases namely CINAHL, EBSCO, Science Direct, ProQuest, Web of Science, PubMed, EMBASE and SCOPUS were searched.

\textbf{Review Methods:} Relevant studies were identified using combined approaches of electronic database search without geographical or language filters but were limited to articles published from 2006 to 2016, hand-searching journals and visually scanning references from retrieved studies. Two reviewers independently conducted the quality appraisal of selected studies and data were extracted.

\textbf{Results:} Six interventional studies met the inclusion criteria. Two of the studies were rated as high methodological quality and four were rated as moderate. Studies were published between 2009 and 2016 and were mostly from Asian and Middle Eastern countries. Results showed that OBE approaches improves competency in knowledge acquisition in terms of higher final course grades and cognitive skills, improve clinical skills and nursing core competencies and higher behavioural skills score while performing clinical skills. Learners' satisfaction was also encouraging as reported in one of the studies. Only one study reported on the negative effect.

\textbf{Conclusions:} Although OBE approaches does show encouraging effects towards improving competencies of nursing students, more robust experimental study design with larger sample sizes, evaluating other outcome measures such as other areas of competencies, students' satisfaction, and patient outcomes are needed.

1. Introduction

Educating nurses for the 21st century practice is increasingly demanding due to the complexities of global healthcare and in meeting the learning styles of the Generation Y nursing students (Eckleberry-Hunt and Tucciaronne, 2011; Thorne (2006)). Literatures revealed that the didactic method of traditional approach fails to appeal to the learning styles of Generation Y student nurses (Johanson, 2012; McCurry and Martins, 2010). Preparation of future nurses remains a great concern as nurse graduates must adequately be equipped with competencies to meet the demands of the workplace and profession (Klein, 2006). These concerns have led to a more learner centred nursing curriculum which focuses on the outcomes of learning rather than maintaining with the content-saturated teacher-centred curriculum (Spector and Odom, 2012; Valiga, 2012).

Thus, Outcome-based Education (OBE), a performance based and learner-centred approach in education offers a powerful and appealing way of reforming and managing nursing education (Singh and Ramya, 2011). OBE emphasize on what learners should know, understand, demonstrate and how to adapt to future life roles (Killen, 2000).

The nursing profession which requires high level of competencies cannot have the exception of ignoring the quality of the product. For
this reason, the effectiveness of OBE in improving the competencies of nursing students should be explored in depth before embracing OBE.

2. Background

Newly employed nursing graduates seemed academically equipped as they enter the clinical setting but lacks the ability to apply their knowledge to practice especially in transferable skills such as problem solving, leadership, communication and critical thinking skills (Mtsahli, 2005). The study by Arumugam et al. (2014) showed that unemployment among graduate nurses in Malaysia was of major concern. The key findings were 65% of their respondents felt they did not have adequate skills and could not promote themselves during interview, 55% felt they did not have the necessary skills and confidence to apply for jobs outside the country and 65% strongly felt that primarily they lack English language proficiency and communication skills. Planners of nursing education is challenged to transform nursing curriculum into one which can narrow the theory-practice gap in order to prepare nurses capable of outstanding practice in the 21st century (Benner, 2012). Thus, OBE may be the effective approach to uplift the nurses’ competencies.

Organizing education based on results and outcomes rather than curriculum coverage forms the basic concept of authentic outcome-based education (Spady, 1988). OBE involves “starting with a clear picture of what is important for students to be able to do, then organizing curriculum, instruction, and assessment to make sure this learning ultimately happens” (Spady, 1994, p. 1).

The concept of OBE is considered synonymous with concepts such as competency-based education (CBE) and performance-based education (Mokcke et al., 2013; Mtsahli, 2005). Frank et al. (2010, p. 641) defines competency-based education as an “outcomes-based approach to the design, implementation, assessment, and evaluation of […] education programs”. Essentially competency based education focuses on learner performance and achieving learning outcomes (Pijl-Zieber et al., 2014) similar to the core principles of OBE. This review refers to OBE approaches as both OBE and CBE approaches, and nursing competencies as “measurable behaviors, knowledge, actions and skills essential to the nursing practice” as defined by the National League for Nursing Accrediting Commission (NLNAC) cited by Fitzpatrick (2009).

The primary focus of OBE is achievement of intended outcomes. Spady, 1994,p. 49) describes outcomes as “…what students actually can do with what they know and understand”, basically involving “…actual results of learning that students visibly demonstrate” (p. 76) described by verbs rather than just knowing or involving purely mental processes.

Despite criticism, OBE is still appealing and has been widely advocated and implemented in medicine (Davis, 2003; Harden, 2007; Mukhopadhyay and Smith, 2010); pharmacy education (Ho et al., 2009); engineering (Addullah et al., 2009; Akir et al., 2012) and in nursing (Kim, 2012; Singh and Ramya, 2011). As mentioned by Harden et al. (1999), “Although OBE has obvious appeal, research documenting its effects is fairly rare”. Nevertheless, some of the effects of OBE documented are improvement of generic and professional capabilities of pharmacy students (Ho et al., 2009); improved in medical knowledge and practical skills (Castel et al., 2011) and increased nursing students learning satisfaction (Goudreau et al., 2009).

Although OBE has been advocated and implemented in nursing education, this initiative lacks strong empirical research on the effectiveness of OBE approaches on competencies of nursing students.

The purpose of this systematic review was to appraise and synthesize the best available empirical evidence to investigate the effectiveness of OBE approaches on the competencies of nursing student. The findings from this review aims to add more empirical evidences of OBE approaches in supporting the justification for the adoption of OBE to improve the quality of nurse graduates.

3. Review Methodology

3.1. Search Strategy

The search strategy employed is based on the guidance of the Centre for Reviews and Dissemination (CRD, 2009). Relevant studies were identified using combined approaches of electronic database search, hand-searching journals and visually scanning references from retrieved studies. The literature search was performed in July 2016. The initial search using search terms “outcome based education” and “nursing curriculum” were entered into Google Scholar to identify pre-existing reviews addressing the question of interest (CRD, 2009). One qualitative systematic review (Dioso, 2012) on OBE in the Malaysian context was retrieved but failed to address the review question. Subsequently, a thorough search was made of eight electronic databases namely CINAHL, EBSCO host, SCIENCE DIRECT, PROQUEST, WEB OF SCIENCE, PUBMED, EMBASE, and SCOPUS without geographical or language filters but were limited to articles published from 2006 to 2016. The search was conducted using combinations of keywords, MESH terms and by breaking down the review question into concepts. The following is an example of a search syntax used: (“nursing students” or “student nurses” or “nursing graduates” or “pre-licensure student nurses” or “pre-licensure nursing students” or “Diploma student nurses” or “baccalaureate nursing students”) and (‘outcome based education’ or “outcomes-based education” or “outcome based approach” or “outcomes-based approach” or “outcome based curriculum” or “competency-based education” or “competency-based approach” or “competency-based curriculum” or “competency -based teaching learning method”). The detailed search syntax for all databases search is available on request.

Subsequently, landmark papers and potential studies were also identified by scanning reference list of articles.

This review aims to answer the following question: Can the implementation of OBE approaches as compared to the conventional nursing curriculum improve the competencies of nursing students? The review question is framed following the PICO elements/clauses: P (Population) – nursing students, I (Intervention) – OBE approaches, C (Comparison) – conventional nursing curriculum, O (Outcome) – improve nursing competencies.

3.2. Study Inclusion and Exclusion

Studies that met all the following criteria were retrieved and assessed for its methodological quality.

1. The paper concerned nursing education/courses and nursing students.
2. And investigated OBE and CBE approaches/interventions.
3. And provided empirical or observational data from an experiment or observation of the effects of OBE approach.
4. And reported the effects of OBE approaches on the competency of nursing students.

Exclusion criteria:

1. Studies which do not evaluate the effectiveness of outcome-based approaches in the delivery of modules or subjects in nursing education;
2. studies of samples from post-graduate nursing students and other healthcare professional students, as at this higher level, the skills set and outcomes measure would be different;
3. studies with incomplete reports.

3.3. Study Screening and Selection

There were 646 potential relevant publications identified through electronic database searching and none from other sources. The search hits were imported into EndNoteX7 and 180 duplicate records were
removed. The remaining 466 records were screened initially by title and 280 records were excluded. In the second stage, 186 articles were screened for abstract and 121 abstract were rejected at this stage, which leaves 65 articles forwarded to the third stage for rigorous full text review according to the eligibility criteria. In this third stage, 55 articles were excluded as it could not meet all the inclusion criteria. Due to the limited number of relevant studies, a total of 10 eligible studies were maintained. After another rigorous full text review, another three studies were excluded (Applin et al., 2011; Choi et al., 2014; Gholami et al., 2016) as these studies examined the effects of Problem-based learning (PBL) which is one of the many OBE teaching strategies but it does not examine the concept of OBE as a whole. Another study by Hsieh and Hsu (2013) was also excluded as the type of intervention was not reported although the study had focused on the outcome-based concept of assessment. The researchers contacted the corresponding author to obtain the missing information of the study via email but there was no respond. The study mainly identified the factors which had the greatest impact on students’ nursing competency but does not suggest that OBE approach improves nursing students’ competencies.

As a result, a final total of six articles were subjected for critical quality appraisal. Fig. 1 illustrates the review process based on the PRISMA Flow Diagram.

### 3.4. Quality Appraisal

The six included articles were all quantitative studies, thus the standardized tool for assessing the quality of quantitative studies by the Alberta Heritage Foundation for Medical Research (AHFMR) was used (Kmet et al., 2004). AHFMR composed of 14 items assessing the methodological features such as objective of the study, study design, sample/participants, risk of bias assessment, sample size, statistical methods, control of confounding factors and reported results and conclusions. The maximum possible score was 28 points. The summary score for each paper was calculated by summing the total score obtained across relevant items and dividing by the total possible score. The minimum threshold for inclusion of studies is determined by considering the distribution of the quality scores and the consideration of limited number of relevant articles. Thus, two reviewers (KT and CMC) who had independently assessed the methodological quality of the articles had decided that the median quality score of 50% and above would be the selected cut-point for article inclusion. Cohen’s kappa for inter-rater agreement between the 2 reviewers was 0.667 which is categorised as good agreement. The third reviewer was not needed as consensus was met. Due to the limited number of relevant studies, the quality scores of 0–50% were considered as low quality (high risk of bias) and studies would be excluded, 50–75% were considered as moderate quality (moderate risk of bias) and 75–100% were considered as high quality (low risk of bias) were established.

Table 1 summarizes the overall quality score for the 6 studies and the inter-rater agreement for inclusion of studies is attached.

### 3.5. Data Extraction and Synthesis

A self-developed Data Extraction Form adapted from the Cochrane...
The strength of agreement is considered to be... and... measures in the domains of knowledge, skills, and attitude/behaviour. Participants, OBE interventions, comparison interventions, key outcome... study design, study location, characteristics of sample participants and were mostly recruited via purposive and convenience methods... discrepancies were resolved through discussion and reconciled by mutual consensus. Data extracted included details about author, year of publication, design and outcome measures, a meta-analysis was not possible. Relevant studies were identified using combined approaches of electronic database search without geographical or language... The methodological quality of the included studies was only moderate as the sample sizes were too small to yield an appropriate effect size.

4. Results

4.1. Overview of the Included Studies

The six included studies were published between 2009 and 2016 as described in Table 2. Three of the studies were conducted in Iran (Nadery et al., 2012; Soheili et al., 2015; Valizadeh et al., 2009) and had to be translated to English from Farsi by a translator who is proficient in both English and Farsi, two were conducted in Taiwan (Fan et al., 2015; Hsu et al., 2016), and one in China (Wu et al., 2014). Five of the studies employed a quasi-experimental design and one study employed the two groups pre-test and post-test experimental design. Participants in two of the six studies were second year nursing students enrolled in medical-surgical nursing course at college in Taiwan (Fan et al., 2015; Hsu et al., 2016). Another study by Wu et al. (2014) involved fifth year nursing undergraduates from two different classes. The other three studies involved nursing students taking Intensive Care Unit (ICU) Course (Nadery et al., 2012), senior nursing students undergoing clinical training at the haemodialysis ward (Valizadeh et al., 2009) and senior nursing students enrolled in the coronary care unit course (Soheili et al., 2015) respectively. Demographics (e.g., age, gender, marital status, prior school performance) were reported for all six studies. Overall sample sizes were small, ranging from 26 to 312 participants and were mostly recruited via purposive and convenience sampling methods.

4.2. Methodological Quality

Given the limited number of relevant studies, all the six studies were included in the review. The methodological quality of four of the studies with quality scores ranging from 50%–54% were considered moderate and two of the studies with quality scores of 75%–79% were considered high quality. In the experimental study by Hsu et al. (2016), random allocation of participants was reported but there was lack of blinding of participants and assessors which is also rarely possible with educational research interventions. In the five quasi-experimental studies, three studies reported random allocation of their participants but the sample sizes for these studies are too small and two studies lack random allocation but participants and assessors were blinded. Only two included studies reported the control of confounding factors during their analysis of data. Overall the methodological quality of the included studies was only moderate as the sample sizes were too small to yield an appropriate effect size.

4.3. Findings of the Review

The findings of the review (Table 3) is presented according to the major components of the OBE/CBE conceptual framework which emphasizes on the OBE interventions including specification of learning outcomes, instructional strategies and assessment of outcome measures.

4.4. OBE Interventions

Two studies compared outcome-based education approaches with traditional objective based training (Hsu et al., 2016; Valizadeh et al., 2009). Four studies compared competency-based education approach with conventional teaching/training method (Fan et al., 2015; Nadery et al., 2012; Soheili et al., 2015; Wu et al., 2014). The study by Hsu et al. (2016) employed the outcome-based framework focusing primarily on outcome-based course design using concept mapping in the teaching strategies as compared to the objective-based curriculum design focusing mainly on lecture and group discussion. Similarly, the CBE curriculum employed by Fan et al. (2015) in their study also incorporated concept mapping as one of their instructional strategies as compared to traditional formal lectures. Valizadeh et al. (2009) used the OBE method of training in which the expected outcomes of the training in the hemodialysis ward were first determined via the Delphi Technique. Similarly, the CBE model was employed in which the educational outcomes of education at ICU (Nadery et al., 2012) and the communication competencies of nursing students (Soheili et al., 2015) were determined by the Delphi Technique prior to the interventions for the respective studies. Both these studies reported that the training outcomes and the expected competencies as identified are made known to...
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**Table 2**: Characteristics of eligible studies included for analysis.

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<th>Participants</th>
<th>Intervention</th>
<th>Content</th>
<th>Comparison</th>
<th>Methodological quality</th>
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<tbody>
<tr>
<td>Valizadeh et al., 2009</td>
<td>Quasi-experimental study with pre-post survey design</td>
<td>26 nursing students in their 7th Semester undergoing clinical training at the hemodialysis ward. Experimental group (2 groups) n = 12 students. Control group (2 groups) n = 14 students.</td>
<td>Outcome-Based Education method of training</td>
<td>The OBE method of training was employed in the clinical education in the hemodialysis ward. The Delphi Technique was employed to determine the expected outcome of the training in the hemodialysis ward. A list of important competencies required was determined. Students' cognitive skills were measured by pre and post-test and their behavioural skills were observed via checklist.</td>
<td>Traditional training</td>
<td>Moderate</td>
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<tr>
<td>Soheili et al., 2015</td>
<td>Quasi-experimental study</td>
<td>34 senior nursing students in their 8th Semester enrolled in the coronary care unit course. Intervention group (2 groups) n = 18 students. Control group (2 groups) n = 16 students.</td>
<td>Competency Based Education (CBE)</td>
<td>The communication competencies were first determined by Modified Consensus Technique. The intervention group was taught via the competency based education model which was conducted in 4 steps: 1. Defining the tasks and activities that students were expected to achieve. (Delphi) 2. Standardizing competences to clarify the students' roles and responsibilities. 3. Conducting the educational program and subordinating it. 4. Evaluation (based on self-reporting questionnaire) The subjects were given guidelines designed for the clinical period according to the CBE Model and which included the list of main communication skills, goals, resources, action plans and the period's content. The teacher was asked to teach according to the principles of CBE Model.</td>
<td>Traditional teaching method</td>
<td>Moderate</td>
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Valizadeh, 2009; Soheili et al., 2015

**Table 2 (continued)**

- **OBE approach**: n = 13 students
  - Control group (2 groups) n = 15 students
- **Content**: Clinical skills notebook for recording in the duration of 3 weeks. In the competency-based method all teaching steps are designed and pre-programmed. Only 1 developmental test required and the students still had to attend the classes until the end of the period. The teachers are required to identify the learning problems of each student and would try to solve them and giving them feedback. The teacher applied both the individual teaching methods like doing procedures individually, independently or under supervision and individual studying and group teaching methods like helping others with their procedure, observing the teacher or experienced nurses and clinical conferences.
- **Comparison**: Teacher. There is no precise educational program or evaluation, but every teacher teaches the students based on his own experiences and available clinical facilities.
- **Methodological quality**: Traditional teaching method Moderate
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<th>Secondary outcomes</th>
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<td>Hsu et al., 2016</td>
<td>Correct concept relationships (18.03 vs. 16.43), hierarchies (121.43 vs. 107.29), cross-links (57.46 vs. 36.86), and examples (4.43 vs. 3.71) of a scenario-based concept map had a higher mean score in Class A than Class B, but no significant difference.</td>
<td>Significant increases of mean nursing competency scores in both groups from the pre-test to the post-test. There were no statistically significant differences in mean nursing competency score between the experimental group and the control group. The mean nursing competency score of the experimental group (mean = 231.74, SD = 27.34) was lower than the control group (mean = 234.32, SD = 29.61) at the post-test. Learning satisfaction: The mean learning satisfaction scores of the experimental group (mean = 41.79, SD = 7.92) were higher than the control group (mean = 41.60, SD = 9.64). The experimental group's answers to open-ended questions showed more positive impression with concept map training (n = 62) than the control group (n = 52). Cognitive load: The mean cognitive load scores of the experimental group (mean = 9.75, SD = 2.10) were lower than the control group (mean = 9.86, SD = 2.01) at the post-test.</td>
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<td>Fan et al., 2015</td>
<td>The experimental group (Group L) had higher final grades in their medical-surgical nursing course than the control group (Group C), t (307) = 3.04, p = 0.003.</td>
<td>Experimental group had higher final grades in their clinical practicum than the control group (t(307) = 3.38, p = 0.001). There was no difference in the 5-station mini-OSCE scores for both groups. There was significant improvement in the total score for self-evaluated core competencies ability in the experimental group than in the control group (B = 0.28, p &lt; 0.05), after adjusting for the metacognitive ability.</td>
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<td>Wu et al., 2014</td>
<td>The mean score of nursing comprehensive theoretical knowledge examination did not show any significant difference between the experimental and control group.</td>
<td>The objective structured clinical examination was used to evaluate students' clinical thinking, communicating and adaptability. The evaluation results shown that the mean score of the health information collection (p = 0.009), physical assessment (p = 0.001), scenario simulation (p = 0.039) and communication skills (p = 0.046) in the experimental group were significantly higher than those of the control group.</td>
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<td>Nadery et al., 2012</td>
<td>The independent t-test on pretest scores on cognitive skills showed there was not a statistically significant difference between the two groups (p &gt; 0.05). But post-test scores on cognitive skills in the experiment group were significantly higher than those of the control group (p &lt; 0.05).</td>
<td>The results showed the mean and standard deviation scores in clinical skills obtained from the experiment group students (competency-based education) and control (traditional training) were 162 ± 10.72 and 117 ± 25.01, which were significantly greater in the experimental group (p &lt; 0.05).</td>
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<td>Valizadeh et al., 2009</td>
<td>The mean cognitive scores of the experimental group in post-test is significantly higher than the control group in all cases and in total. There was statistically significant difference between the 2 groups (z = 3.63, p = 0.000).</td>
<td>Students' clinical competency in the experimental group was significantly higher than the control group. The mean behavioural skills scores of the experimental group in post-test (113.75 ± 8.62) is significantly higher than the control group (102.42 ± 9.68) in all cases and in total.</td>
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<td>Soheili et al., 2015</td>
<td>In the comparison of the communication skills scores of the two groups, the results showed that the intervention group's average was higher after being trained with the competency-based education and the difference was significant statistically (p = 0.007). However, the difference wasn't significant in other dimensions.</td>
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the participants prior to starting their respective training programs. However, the details of the OBE instructional strategies were not reported clearly in these three mentioned studies. Wu et al. (2014) used the nursing core competency standard education model incorporating teaching strategies such as problem-based learning (PBL), scenario simulation, role playing, case analysis and cooperative learning as compared to the conventional teaching method comprising mainly lecture in the training of nursing undergraduates. It should be noted that in view of the heterogeneity of OBE interventions, it may cause bias in the results of the outcomes measured.

4.5. Primary Outcome Measures

4.5.1. Effect of OBE Approaches on Knowledge

Nursing students’ knowledge acquisition was measured in four of the studies (Fan et al., 2015; Nadery et al., 2012; Valizadeh et al., 2009; Wu et al., 2014). Among these studies, the study by Fan et al. (2015) showed that the experimental group (OBE approach) had higher final grades in their medical-surgical nursing course than the control group (t (307) = 3.04, p = 0.003). In the study by Wu et al. (2014), there was no significant difference between the experimental (CBE) group and the control group with regards to the mean scores of theoretical knowledge examination (76.08 ± 4.69 vs. 77.97 ± 6.31, p = 0.160). The pre and post quasi-experimental studies by Nadery et al. (2012) and Valizadeh et al. (2009) showed a significant increase in the post test scores of cognitive skills with the experimental groups compared to the control groups with the both p values of < 0.05. The cognitive skills in both of these studies were evaluated using self-administered questionnaire and the details of the questionnaires were not reported. The study by Hsu et al. (2016) reported the use of the Knowledge Test of Neurological Nursing in its formative evaluation but the test scores was not reported, thus it was inconclusive whether there was knowledge gained following the OBE curriculum design.

4.5.2. Effect of OBE Approaches on Skills Performance

All the six included studies have looked into the evaluation of skills performance following OBE and CBE interventions showed improvement in skills in the experimental group except for the study by Hsu et al. (2016) which revealed an insignificant statistical difference in mean nursing competency scores between the experimental and control group (231.74 ± 27.34 vs 234.32 ± 29.61). The study by Fan et al. (2015) demonstrated that the experimental group had higher final grades in their clinical practicum than the control group (t(307) = 3.38, p = 0.001) after the implementation of the CBE curriculum. In the same study, significant improvement was shown in the total score for the self-evaluated core competencies ability in the experimental group after adjusting for metacognitive ability (5.14 vs. 4.92, p < 0.001). However, there was no difference in the 5-mini–OSCE scores for both groups. In the study by Wu et al. (2014), the mean scores of health information collection (p = 0.009), physical assessment (p = 0.001), scenario simulation (p = 0.039) and communication skills (p = 0.046) in the experimental group were significantly higher than those of the control group, with the p value set 0.05. The study by Nadery et al. (2012) also showed that the clinical skills scores of the experimental group were significantly higher than the control group (162 ± 10.72 vs. 117 ± 25.01, p < 0.05). Soheili et al. (2015) revealed that communication skills scores were also higher in the intervention group after being trained with CBE (p = 0.007).

Three of the studies have used self-rated questionnaire to evaluate the skills performance and two studies, evaluation was done through observation using checklist.

4.5.3. Effect of OBE Approaches on Attitude/Behaviour

In the study by Valizadeh et al. (2009), the behavioural skills of nursing students during carrying out clinical procedures in the experimental group are significantly better in terms of mean clinical competency scores as compared to the control group (113.75 ± 8.62 vs.102.42 ± 9.68). The evaluation was done through observation following a checklist.

4.6. Secondary Outcome Measures

4.6.1. Participants’ Satisfaction

Only one study (Hsu et al., 2016) evaluated participants’ satisfaction with outcome-based approach. The study reported that the mean learning satisfaction scores of the experimental group (41.79 ± 7.92) were higher than the control group (41.60 ± 9.64). Nevertheless, the experimental group students found that the use of concept mapping is productive but it has not affected their learning satisfaction. The study also demonstrated that the objective-based approach to neurological care education did not have any effect on students’ learning satisfaction.

4.6.2. Higher Order Thinking Skills

Two of the included studies have considered evaluating the effect of OBE approaches on the cognitive load of students and the metacognitive abilities. Cognitive load refers to the mental stress and cognitive burden as described by Hsu et al. (2016). The study demonstrated that the mean cognitive load rating for the experimental group (9.75 ± 2.10) was lower than the control group (9.86 ± 2.01) following the use of concept mapping as an outcome-based approach intervention. However, the difference in the mean ratings between the two groups was not statistically significant after adjusting covariates. Nevertheless, the study concluded that the outcome-based approach using concept mapping could lower the cognitive load of students and cause higher learning satisfaction.

Fan et al. (2015) looked into the metacognitive abilities which involves the evaluation of mental processes such as critical inquiry, reasoning, judgment, and creativity in solving problems. The study results revealed that there was a significant increase in the metacognitive inventory post-test scores from the pre-test scores of the experimental group (p < 0.001) as compared to the control group. The findings from these 2 studies demonstrate that outcome-based interventions can have positive effects on the higher thinking order of nursing students.

5. Discussion

This systematic review, to some extent have demonstrated that OBE/CBE approaches in nursing education may contribute to the improvement in nursing competencies in the areas of knowledge acquisition, skills performance, behaviour, and in contributing to higher learning satisfaction and achieving higher order thinking processes. In the competency area of knowledge, three of the studies (Fan et al., 2015; Nadery et al., 2012; Valizadeh et al., 2009) demonstrated higher knowledge acquisition and cognitive skills following OBE approaches. Four studies have revealed improvement in skills performance with evidence of achieving higher final grades in clinical practicum and self-evaluated core competencies ability (Fan et al., 2015); higher performance in health information collection, physical assessment, scenario simulation, and communication skills (Wu et al., 2014); higher scores in clinical skills in intensive care nursing (Nadery et al., 2012) and an improvement in communication skills of senior nursing students (Soheili et al., 2015). The behavioural skills which were reported in the study by Valizadeh et al. (2009) did not specify clearly which aspect of behaviour was assessed. Only one study (Hsu et al., 2016) reported higher learner satisfaction scores following outcome-based course design using concept mapping in neurological nursing but the difference was not statistically significant as the time of intervention was only 12 h which may be too short a duration to cause a significant effect on learners’ satisfaction.

Evaluating students’ satisfaction can be very subjective but it is important in any course or training evaluation as students are regarded as the primary stakeholder, whose satisfaction is one of the important
quality indicators of teaching (Roh et al., 2014). On this basis, it is certainly recommended that future research on OBE should evaluate learners’ satisfaction.

The positive effects in most of the included studies may be contributed by the following factors identified in the review. Firstly, it was reported in two studies (Soheili et al., 2015; Valizadeh et al., 2009) that the expected outcomes and core competencies of specific disciplines were defined by Delphi studies and standardized at the start of the training followed by the appropriate teaching methods to achieve the expected outcomes and competencies. Teaching steps were also designed and pre-programmed so that it can be followed clearly by the students (Nadery et al., 2012). This is an important aspect in the implementation of OBE method of curriculum and training as it demonstrates clarity of focus and designing down principles of OBE (Killen, 2000; Mukhopadhyay and Smith, 2010; Spady, 1994).

Secondly, the incorporation of more appealing student centred instructional strategies such as concept mapping, reflective writing and clinical application of knowledge (Fan et al., 2015); problem based learning, scenario simulation and role playing (Wu et al., 2014); more hands-on teaching methods in groups (Nadery et al., 2012). These strategies require active participation of learners and in the process it engages learners. These claims are supported by Frantz and Mthembu (2014) whose systematic review highlighted that nursing students prefer learning styles which incorporate live examples and lots of interaction and using real-life experiences as teaching methodologies.

Thirdly, it was noted that all the selected participants were senior undergraduate nursing students and post registration nursing students undergoing specialized training. It could suggest that due to the level of maturity and greater learning experiences, these learners could adapt to the outcome-based approach of learning better. In addition, the theory underpinning OBE framework as mentioned by Morcke et al. (2013) is the Constructive Alignment Theory of learning (Biggs and Tang, 2011) where interconnected knowledge forms the basis of effective teaching. The OBE approaches which incorporate this theory can be beneficial to senior students as they possess previous experiences which help them to build upon and construct new knowledge. Thus, future studies comparing the effects of OBE between junior and senior nursing students are recommended.

The method of assessment and evaluation that was used to measure the competencies is an important aspect in this review. Three of the included studies (Fan et al., 2015; Hsu et al., 2016; Soheili et al., 2015) used self-rated competency questionnaire to evaluate the level of nursing competencies among learners. In OBE assessment, learners are encouraged as active participants in judging their own work (Mtshali, 2005). Nevertheless, according to Ross (2006), “self-assessment introduces construct irrelevant variance (e.g., inflation of grades, motivated by self-interest, underestimate achievement…) that threatens the validity of grading”. The study concluded that the validity and reliability of self-assessment by students can be enhanced through proper training given to students about self-assessment and students’ self-assessment is compared against teacher judgments (considered as the gold standard). This should be considered for future research. Furthermore, a competency approach to assessment which is based on student’s performance in the clinical setting could have more validity as it takes into account the capacity of the student to integrate knowledge, values, attitudes and skills in practice (Fordham, 2005). In addition, a study by Casey and Clark (2014) pointed out the involvement of patient in the assessment of nursing students will add to the validity of students performance in practice.

All of the included studies did not mention of follow up of assessment as, according to Spady (1994) one of the core principles of OBE is everyone can learn but at a different pace and that students should be given the expanded opportunities to learn in terms of time. With this in mind, longitudinal studies to examine the effects of OBE should be considered.

In any given educational research, confounding factors such as students’ demographic characteristic, previous experiences and academic performance, the learning environment and the quality of the teacher/faculty can greatly affect the performance of the students (Hsieh and Hsu, 2013). Thus, controlling these confounding factors during data analysis is important to see the true effect of the intervention. However, from the review findings, only two studies (Fan et al., 2015; Hsu et al., 2016) have considered controlling of confounders where it was revealed by Hsu et al. (2016) that there was no statistical significant in mean nursing competencies scores as compared to a positive effect in the study by Fan et al. (2015). This inconsistency should further justify the need to consider controlling of confounders in future studies on OBE.

The review findings also demonstrated the improvement of meta-cognition abilities and reduction of cognitive load among nursing students following outcome-based approaches. The effect of OBE on higher order thinking skills and mental processes of information in learners is greatly encouraged in any form of learning particularly in complex learning such as in nursing education (Chabeli, 2006). This area of cognitive skills evaluation needs further exploration to strengthen the empirical evidence to suggest that OBE can improve higher mental capabilities of nurses.

Lastly, five out of the six included studies were mainly from Asian countries and only one from Western country. Considering the concept of OBE is founded in United States and have been adopted by many countries such as US, Australia, New Zealand, Canada, Hong Kong, Africa, this search result was disconcerting. The probable speculations could be the review was limited to 10 years of publication and the study design used may not meet the inclusion criteria of this review. Thus, the researchers hope to consider further exploration in this area of interest in order to update this review with new evidences from the countries that were mentioned.

5.1. Limitations

Generally, the review evidences is not sufficiently robust to ascertain the effectiveness of OBE approaches compared to conventional approaches due to only six primary studies were identified, the small sample sizes in the included studies and lack of high methodological quality of these studies. The heterogeneity of the studies and small sample sizes also limits the ability to generalize the findings. It is also possible that not all relevant studies were retrieved and included in this review despite following a thorough search strategy. In addition, the evidences which mainly come from Asian countries may not be generalizable to other countries.

6. Conclusion

In summary, the findings from this review do suggest that OBE approaches in nursing education can have a positive effect on nursing students’ competencies in terms of knowledge acquisition, skills performance and attitude, in addition to improving higher thinking abilities, reducing cognitive load and achieving higher learner satisfaction. Only one study revealed that there was no difference in achievement of competency between OBE approach and the conventional methodology of training of nursing students. Based on the limitations as mentioned, this review serves as the foundation for future research to further examine the efficacy of OBE in producing better graduate outcomes. More robust experimental study design with larger sample sizes, evaluating other outcome measures such as student satisfaction, improving patient outcomes etc. is needed to strengthen the evidence in justifying that OBE is as an appropriate educational strategy to prepare more competent nurse graduates.

Disclosure

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Author Contribution

The authors, Katerine Tan and Dr. Chong Mei Chan have substantially contributed to the conception and design, data extraction, analysis and appraising the quality of the papers as well as drafting and critically revising the content of the review paper.

Dr. Pathmawathy has critically reviewed the final intellectual content of the paper.

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