Evidence based practice and critical thinking in nursing education and practice: A scoping review of literature

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Evidence-Based Practice (EBP) in health is important for patient safety and quality care while Critical Thinking (CT) is a vital prerequisite to evidence based nursing. Despite their importance, in some settings neither EBP nor CT is taught assessed or implemented. This scoping review examined literature related to teaching, learning, assessment and implementation of EBP and application of CT by nursing students and graduates. Arksey and O’Malley framework was used to conduct the scoping review. PubMed, CINAHL, EMBASE and Joanna Briggs Institute for EBP data bases were searched for studies conducted between 2000 and 2020. Inclusion criteria were adapted from the -Population, Intervention, Professionals and Patients, Outcomes, Health Care settings (PIPOH) framework. Search terms included; evidence based practice, nursing education, nursing practice, critical thinking, methods, barriers, facilitators to teaching, learning, assessing and implementing EBP and CT. A total of 2,303 articles were retrieved, eventually 37 met the inclusion criteria. Use of non-traditional instructional methods for teaching EBP and CT were documented including Problem Based Learning, concept mapping, simulation, think aloud, critical incidence technique, debates and role-plays, reflective journaling, article analysis, nursing journal clubs and multidisciplinary clinical rounds. Validated tools for assessing EBP and CT Skills included; California Critical Thinking Skills Test, Upton and Upton 2006 EBP questionnaire and Yoon’s 2004 Critical Thinking Disposition Inventory. Teaching, assessing EBP and applying CT skills is challenging. Therefore innovative teaching methods are required to promote learning while successful implementation require strategies to minimize detractors and sustain enablers of the process.

Key words: Evidence-Based Practice nursing, critical thinking, teaching, learning, assessment and implementation.

INTRODUCTION

Evidence-Based Practice (EBP) in health is important for patient safety and quality care (Melnyk et al, 2012; Melnyk et al., 2014; Horntvedt et al., 2018). According to literature, there are better outcomes for patients who...
receive evidence-based care compared to those who do not (Manjula et al., 2018). It is therefore important that EBP competencies be incorporated into all levels of training programs to establish EBP as foundation of practice (Melnyk et al., 2018). For Bachelors Nursing Students, using the available best evidence is important in patients’ care, while knowledge of the linkage between research evidence and practice is pre-requisite to implementing EBP (Institute of Medicine, 2010; Aglen, 2016; Fiset et al., 2017). Since the establishment of Evidence Based Medicine at McMaster University in the 1980s, several authors have defined and redefined EBP with most agreeing that it is “the conscientious, explicit and judicious use of current best evidence in conjunction with clinical expertise and patient values to facilitate clinical decision making” (Sackett et al., 1996, 2000; Titler et al., 2001, 2006; Hughes, 2008; Melnyk and Fineout-Overholt, 2011; Melnyk et al., 2014). On the other hand, Critical Thinking (CT) is a “mental process of active and skilful perception, analysis, synthesis and evaluation of information collected through observation, experience and communication that leads to a decision for action” (Papathanasiou et al., 2014).

Both EBP and CT are a component of one key domain of the International Council of Nurses (ICN) Core Competences for Registered Nurses (ICN, 2009). In addition, CT has been lauded as a vital prerequisite and a key element essential to evidence based nursing practice (Profetto-McGrath, 2005; Canada, 2016). Profetto-McGrath (2005) further states that development of CT prepares nurses with the necessary skills to promote EBP. CT is therefore an essential mental process for ensuring, efficient and skilful nursing interventions (Papathanasiou, 2014). According to Leufier and Cleary-Holdforth (2009), the importance of EBP has been recognized as far as the mid-19th century; conversely, its implementation has undoubtedly received “Lip service” in most settings. Regarding CT, it is frequently referenced in literature, as regards its importance in daily clinical nursing and midwifery practice (Tajidi et al., 2014), however, in many settings, neither the concept of CT nor the process of developing the skills is formally taught either during training or in practice. Literature alerts us that teaching EBP can be challenging and that creative teaching methods are required in order to promote student learning (Liou et al., 2013; McCurry and Martins, 2010; Sin and Bliquez, 2017). Based on the 5As of the EBP process, Melnyk and Fineout-Overhold, (2005) and Sin and Bliquez (2017) proposed four steps that could be used to teaching EBP to undergraduate nursing students. These were asking a question, acquiring evidence, appraising evidence and applying evidence. The approach utilized small group teaching method and clinical scenarios as a way to enhance student knowledge and competency of EBP. Other authors (Larsen et al., 2019; Davidson and Candy, 2016; Whalen and Zentz, 2015; Reichert et al., 2013; Dawley et al., 2011; Brown and McCrorie, 2015) have suggested interactive methods suitable for teaching both EBP and CT skills. These include research courses and workshops, concept mapping, journal clubs, clinical simulations, collaboration with clinical practice, use of dedicated education units and use of IT Technology. Strategies and methods to develop and maintain CT include reflective journals and critiques (Craft, 2005), role modelling and questioning (Dickerson, 2005), Journal clubs (Seymour et al., 2003) and Problem Based Learning (PBL) with real life scenarios (Williams, 2004). Others reported in literature are concept mapping, clinical rounds, debates and simulation (Staib, 2003; Profetto-McGrath, 2005; Karabacak and Atay, 2011; Orique and McCarthy, 2015). Despite the established and documented methods for teaching, learning and assessing EBP and CT, at the University of Zambia School of Nursing Sciences (UNZA-SON) where the scope review was conducted, the two concepts: EBP and CT are not taught in the undergraduate curricula, while in the MSc programmes EBP is taught using traditional lecture methods, while CT skills are not taught at all. Therefore the main objective of the scope review was to identify methods for teaching, learning, assessment and factors influencing implementation of EBP and application CT Skills among Nursing Students and Graduates. The review was part of a major post-doctoral study whose aim was to build capacity for EBP and CT among nursing students and graduates of the University of Zambia. The other aspects and processes of the doctoral project are beyond the scope of this paper and are therefore reported elsewhere.

**Rationale for the review**

EBP transforms nursing from routine tasks and care decisions based on traditions to practices which have been subjected to critical appraisal and validated by research evidence (Gagan and Hewitt-Taylor, 2004; Sams et al., 2004). In addition, EBP allows for individualized, effective, streamlined and dynamic nursing care (Youngblut and Brooten, 2001). On the other hand, without EBP, care provision is prone to and is provided based on out-of-date procedures and guidelines. Nurses may be relying on concepts learned in nursing school several years prior as well as old clinical habits, or nursing traditions to guide care provision (Keller, 2018). Given the value attached to EBP and CT in addition to
the gap in the teaching and application of the two at UNZA-SON, it was imperative that a scoping review of literature be conducted to obtain scientific evidence on the existing level of capacity of students and graduates of the School of Nursing. This was intended to set a benchmark or yardstick for developing mechanism for incorporating teaching, assessment and subsequently implementation of EBP and application CT skills in Nursing and Midwifery education and practice in the Zambian context.

**MATERIALS AND METHODS**

Arksey and O’Malley framework was used to conduct a scoping review of literature (Arksey and O’Malley, 2005). Considering the broad nature of the question that was being addressed; what are the methods for teaching, learning, assessment and factors influencing implementation of EBP and application CT Skills among nursing students and graduates? A scoping review as opposed to a systematic review was more applicable. As asserted by Arksey and O’Malley (2005), systematic reviews are more suitable for well-defined questions and research designs while scoping reviews are appropriate for answering broader questions and allow for inclusion of studies of wide-ranging designs. In applying the Arksey and O’Malley Framework, the review was conducted through a five-step approach: (1) identification of the research question; (2) identification of relevant studies; (3) selection of the studies; (4) charting of data; (5) collating, summarizing and reporting results. The sixth step of consultation was not undertaken as the reported scoping review was part of a large Post-Doctoral study, whose other results will be reported elsewhere.

A number of electronic data based were searched for the review. These included CINAHL, PubMed, EMBASE and Joanna Briggs Institute EBP Data Base. Determination of the inclusion criteria was adapted from the Population, Intervention, Professionals and Patients, Outcomes, Health Care settings (PIPOH) framework according to Fervers et al. (2006). The population considered in the scoping review was undergraduate nursing students and graduate nurses. Interventions were any teaching, learning and assessment methods, and barriers or facilitators to implementation of EBP or application of CT. Professionals were graduate nurses, outcomes were implementation of EBP and application of CT skills while the health care setting was any clinical area where nurses implement EBP and apply CT skills.

Search terms included evidence based practice, nursing education, nursing practice, critical thinking skills in nursing education and practice, methods, barriers, facilitators to teaching, learning, assessing and implementing EBP and CT. Others included nursing education and EBP and CT, EBP and CT in nursing practice. Data bases were searched for studies conducted between 2000 and 2020.

Only studies written in English were included. A librarian was involved in designing and implementation of the search strategy, while the researcher with one research assistant screened the articles and documented the review findings.

**RESULTS**

From the databases searched 2,303 articles were retrieved. Out of the 2,303, 97 were excluded as duplicates. For the remaining 2,206, 1,267 were excluded for not meeting the inclusion criteria. Records screened for full abstracts were 939, out of which 886 were excluded. Eventually 66 full articles were assessed and 29 were excluded for the following reasons; 9 not addressing nursing students or practicing nurses, 1 full English text not available, 12 none research article, and 7 not focusing on EBP or CT. Figure 1 gives a summary of the scoping review process.

**DISCUSSION**

The scoping review was designed to answer the question: what are the methods for teaching, learning, assessment and factors influencing implementation of EBP and application CT skills among nursing students and graduates? The review question was answered through the data from four databases: CINAHL, PubMed, EMBASE and Joanna Briggs Institute EBP Data Base, and desk search of some key articles identified through Google Scholar. Globally, there is a plethora of literature related to EBP and CT among nursing students and practicing nurses.

From global literature, several teaching and learning methodologies for EBP and CT have been documented in literature. These include Problem Based Learning (PBL), concept mapping, simulation, think aloud, critical incidence technique, videos, debates and role-plays, reflective journaling and article analysis, reflection and documentation, reading and writing assignments, group work and presentations (Simpson and Courtney, 2008, Karabacak and Atay, 2012; Goodstone et al., 2013; Ticha and Fakuda, 2015; Zori, 2016; Charania et al., 2017). Others are use of clinical events (cases or case studies), nursing rounds, and interdisciplinary rounds, dedicated education units, experiential learning and clinical experience, writing answerable clinical questions and conducting literature searches (Chen and Lin, 2003; Vnenchak et al., 2019; Weathers, 2019).

From the Zambian context where the current review was conducted, there is still scarcity of such literature as the search yielded only three articles. Two articles did not specifically focus on EBP but on use of research information by nurses in clinical practice and on challenges faced by nurses in searching for and accessing research information at a University Teaching Hospital in Zambia (Monde et al., 2017a, b). Although not specifically on EBP or CT, the two were considered and included in the scoping review as they provided contextual information related to the Zambia setting. The 3rd article which was directly related to the review and focused on the process, lessons and implication of implementing Evidence Based Practice Nursing at the University Teaching Hospitals-Adults Hospital in Lusaka, Zambia (Katowa-Mukwato et al., 2020). This review may therefore provide an impetus to nursing educators in Zambia to consider incorporation of EBP and CT in the nursing curriculum and provide for innovative teaching methods that have need for this document to promote
learning.

The main curricula content to ensure students and graduates are competent in EBP and CT, include history of EBP and CT, role of EBP in clinical care, EBP models, formulating answerable clinical questions, searching relevant literature, appraising literature, evaluating qualitative and quantitative research, identifying best practices, implementing best practices, evaluating and restarting the circle (Simpson and Courtney, 2008, Ramos-Morcillo et al., 2015; Kim et al., 2019) (Table 1). This is in addition to the generic research methodology competencies. While content for promoting CT skills include questioning skills, problem solving skills, intellectual eagerness/curiosity, health scepticism which should be taught via simulation, debate, role play small group activity, interdisciplinary round participation, case studies and presentations during staff rounds, nursing journal clubs (Profetto-Mc Grath, 2005; Karabacak and Atay, 2011). In order to promote CT skills, scholars such as Goodstone (2013) and Orique and McCarthy (2015)
Table 1. Scoping review findings.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Date</th>
<th>Title of study</th>
<th>Country</th>
<th>Sample</th>
<th>Theoretical framework</th>
<th>Design &amp; data collection</th>
<th>Intervention</th>
<th>Key findings and conclusion</th>
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<tbody>
<tr>
<td>Orique and McCarthy</td>
<td>2015</td>
<td>Critical Thinking and the Use of Nontraditional Instructional Methodologies</td>
<td>United States of America</td>
<td>49</td>
<td>None Described</td>
<td>1. A quasi-experimental study with a pre-test–post-test design</td>
<td>Students were taught the nursing process and care plan using lecture and group discussion, and later using Problem Based Learning (PBL) and Concept Mapping (CM) individually and integrated.</td>
<td>Mean and Standard Deviation for critical thinking at phase 4 (integration of CM and PBL) was significantly higher (M at 3.714, SD at 0.456) from a maximum possible score of 4, compared with phase 3 (CM only, M at 2.939, SD at 0.242) compared with phase 2 (PBL only, M at 2.306, SD at 0.466) and phase 1 (Baseline M at 1.449, SD at 0.503). Utilization of non-traditional instructional (Concept Mapping and PBL) in undergraduate nursing curricula can improve CT</td>
</tr>
<tr>
<td>Karabacak and Atya</td>
<td>2012</td>
<td>Care plans using concept maps and their effects on the critical thinking dispositions of nursing students</td>
<td>Turkey</td>
<td>80</td>
<td>None described</td>
<td>1. Pre-test and post-test control design</td>
<td>Training in Preparation of Concept Maps and Care-Plans</td>
<td>No statistical difference was observed in the total and sub-scale pre-test scores for CT Disposition between the experimental and control group (220+ 17.7 in the experimental, and 221+ 19) for the control group. Significant differences were observed in the total and sub-scale post-test scores between the experimental group and control group students, 225+ 19.2 in the control group and 247+ 16.4 in the experimental group. Concept mapping strategy improves critical thinking skills of nursing students.</td>
</tr>
<tr>
<td>Vrenchak et al.</td>
<td>2019</td>
<td>Dedicated Education Unit Improving Critical Thinking and Anxiety</td>
<td>United States</td>
<td>17</td>
<td>None described</td>
<td>1. Longitudinal quasi-experimental, within-subjects, repeated-measures longitudinal design</td>
<td>Use of Dedicated Education Unit (DEU) Model as a collaborative teaching strategy.</td>
<td>Critical Thinking Score improved from 831.8 ± 44.2 at Baseline to 912.9+ 42.2, P&lt;0.001 at Graduation. The DEU provided an environment for students and clinical nurse professional growth. It improved CT, confidence in clinical decision-making, self-efficacy, and reduced anxiety.</td>
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<tr>
<td>Charania et al.</td>
<td>2017</td>
<td>Designing Assignments to Establish a Foundation for Evidence-Based Practice in an Undergraduate Clinical Nursing Course: Teaching Strategies for Implementing EBP Evidence Review</td>
<td>United States</td>
<td>64</td>
<td>None Described</td>
<td>1. EBP Project.</td>
<td>Faculty designed assignment that required use of Evidence Based literature</td>
<td>The percentage of students using at least one journal article increased from 75% (48) to 100% (64) from the first to the 5th reflection during the project time. Use of written assignments during clinical placement promoted students’ search of the literature as antecedent towards the first step of the EBP process.</td>
</tr>
<tr>
<td>Blum</td>
<td>2018</td>
<td>Does Podcast Use Enhance Critical Thinking in Nursing Education?</td>
<td>United States of America</td>
<td>38</td>
<td>None Described</td>
<td>1. Comparative interventional pre-test–post-test design Pilot Study</td>
<td>Use of Education podcast intervention technology to Enhance Critical Thinking</td>
<td>No statistical significant difference was observed between Health Sciences Reasoning Test pre-test and post-test scores, number of times the podcast was used.</td>
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<td>Study</td>
<td>Year</td>
<td>Title</td>
<td>Country</td>
<td>N</td>
<td>Description</td>
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| Simpson and Courtney | 2008 | Implementation and evaluation of critical thinking strategies, to enhance CT Skills in Middle Eastern Nurses | Australia     | 20 | None described                                                             | 1. CT Enhancement Education Programme  
2. Direct Participant Observation and Focus Group discussions | Developing and implementation of questioning, debate, role play and small group strategies, modified classroom setting arrangement from Military to "U" arrangement to enhance interaction and critical thinking |
| Goodstone et al.   | 2013 | Effect of Simulation on Development of CT in Associate Degree Nursing Student | United States | 42 | None described                                                             | 1. Two group quasi-experimental pre and post-test design  
2. Health Studies Reasoning Test (HSRT) | Use of High Fidelity Patient Simulated (HFPS) Scenarios for the experimental group and case study activities for the control group |
| Chen and Lin       | 2003 | Effects of a Nursing Literature Reading Course on Promoting Critical Thinking in Two-Year Nursing Program Students | Taiwan        | 170| American Philosophical Association (APA)                                    | 1. Quasi-experimental design (Student taking the course versus students not taking the course)  
2. A tool for measuring article critique skills test before and after the course. | A 32-hour course in which students experienced the processes of literature searching, reading and writing. Three assignments were designed for the course: (1) compiling a literature reference list according to the key search words (2) present literature critique report of a current nursing journal articles (3) write a literature article summary. |
| Serfass and Wonder  | 2018 | You're Teaching EBP to BSN Students: But Are They Learning?           | United States | 334| None Described                                                             | 1. Multisite, cross-sectional, descriptive study.  
2. Seven-item demographic questionnaire and the BP Knowledge Assessment in Nursing (EKA)  | Mean EKAN scores were 9.32 (SD = 2.22) for 2nd year students (Junior), 11.28 (SD = 2.38) 3rd years and 11.17 (SD = 1.77) for 4th years (Senior). There were no statistically significant differences in mean EKAN sum scores between junior and senior students at either campus (p > 0.65). Results showed stagnation of EBP knowledge development after junior year. |
| Kim et al.         | 2019 | Effects of EBP education program using multifaceted interventions: a quasi-experimental study with undergraduate nursing students | Korea         | 44 | None Described                                                             | 1. Quasi experimental design with pre-test, intervention, and post-test measurements  
2. Evidence Based Practice Evaluation Competence Questionnaire (EBP-1 COQ) was used to measure EBP knowledge and attitude. Cognitive | A 20 hour program, administered to fourth year students over 4 weeks period. The program comprised of a five-step EBP process; asking clinical questions, searching for evidence, critical appraisal of evidence, and future use of EBP |

Table 1. Cont’d

- Positive change was observed in students' behaviour, interaction and participation. The implemented CT programme transformed students from being passive or rote learners to having questioning minds.
- Both groups demonstrated an increase in CT skills; however, no statistically significant difference was observed between the High Fidelity Simulated Patients and case study groups.
- Results reviewed that both high and low fidelity simulations are associated with increases in CT score.
- At the end of the course, scores on the critique test in both groups were significantly higher than before the course (p < 0.001). However, the experimental group recorded, significantly higher scores than the control group (p < 0.001).
- Content analysis of students' self-evaluation of their learning experience, revealed Changes in thinking pattern and learning attitude, a feeling of growth and achievement).
- Results revealed positive effect of reading and writing assignments on CT ability.
- Mean EKAN scores were 9.32 (SD = 2.22) for 2nd year students (Junior), 11.28 (SD = 2.38) 3rd years and 11.17 (SD = 1.77) for 4th years (Senior). There were no statistically significant differences in mean EKAN sum scores between junior and senior students at either campus (p > 0.65). Results showed stagnation of EBP knowledge development after junior year.
- The program significantly improved all outcomes for EBP. Experimental group had significantly higher scores than the control group from baseline to immediately and 6 weeks after. EBP knowledge (F=19.99, p<0.001), attitude (F=24.05, P<0.001), Competencies (F=51.47, p<0.001), future use of EBP (F=7.30, p= 0.001) and CT skills (F = 17.07, p < 0.001).
<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Study Title</th>
<th>Country</th>
<th>n</th>
<th>Design</th>
<th>Data</th>
<th>Findings</th>
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</thead>
</table>
| Simpson et al. | 2017 | Enhancing CT Via a Clinical Scholar Approach                                                  | United States | 92  | None Described                                                                                  | 1. A two-group, repeated-measures control trial  
2. California Critical Thinking Dispositions Inventory (CCTDI) | Students were allocated to either of the two treatment groups, clinical scholar (CS) or CS + System Engineering (SE). The CS groups received no additional guidance or support for the EBP. The CS + SE groups attended a 3-hour seminar about SE and the group had access to an industrial engineering graduate student for mentorship. Significant increases were found in both groups in the total CCTDI score (p = 0.02) and in the CCTDI truth (p = 0.002) and confidence (p = 0.001) subscales. Students’ search for information was significantly different between the control and experimental group (p = 0.03). Intentional integration of an evidence-based, systems perspective supports development of nurses CT Skills. |
| Smith-Strøm et al. | 2006 | Evaluation of Evidence-Based Methods Used to Teach Nursing Students to Critically Appraise Evidence | Norway        | 68  | None described                                                                                  | 1. No specific design indicated  
2. A 5-point Likert scale questionnaire.  
A 4-week course to educate students on three of the five EBP steps. Two scientific articles with different designs were given to students to learn how to critically appraise evidence. | Majority of students (71%) agreed, that lecture, group work, interactive plenary discussions were effective in teaching critical appraisal of scientific articles. 57% of students totally agreed that the manual was effective in guiding critical appraisal. The EBP teaching methods used in the course seemed to be a good combination for increasing students’ understanding of EBP. |
| Hung et al. | 2019 | Evidence-Based Practice Curriculum Development for Undergraduate Nursing Students: The Preliminary Results of an Action Research Study in Taiwan | Taiwan        | 3   | external EBP educators  
| None described | 1. Action research (AR)  
2. Focus group interviews, external course reviews, and EBP Attitude Questionnaire | Development, implementation and evaluation of an undergraduate EBP curriculum | Participating Teachers recommended that EBP education be conducted along with instructions in relevant background knowledge of EBP. Post-test scores were high after receiving the EBP education, an indication of more positive attitude toward EBP after the course before (p < 0.004). |
Aquasi-experimental, controlled, pre and post-test study Knowledge, Attitudes and Behaviors Questionnaire for Evidence Based Practice | EBP focused interactive teaching (E-FIT) strategy. The experimental group received the E-FIT strategy intervention which involved a 2-hour introductory lesson on the basic EBP principles and processes and description of the clinically integrated EBP group project. The project involved identification of a nursing practice problem, and future use of EBP was measured using a modified Future Use of EBP subscale. CT skills were measured using the Critical Thinking Disposition Scale for Nursing Students. The EBP education program effectively improved the knowledge, skills, attitudes, competencies, and future use of EBP among students. | Th experimental group recorded higher post-test EBP knowledge (mean difference = 0.25; P = 0.001) and EBP Use (mean difference = 0.26; P = 0.015). No statistically significant differences in Attitudes and use of EBP was noted (mean difference = 0.12; P = 0.398 and mean difference = 0.13; P = 0.255 respectively) The interactive teaching strategy was effective in improving EBP knowledge and use of EBP among nursing students but not attitudes toward or future use of EBP. |
<table>
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<tr>
<th>Study</th>
<th>Year</th>
<th>Title</th>
<th>Country</th>
<th>Sample Size</th>
<th>Methodology</th>
<th>Findings</th>
<th>Notes</th>
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<tbody>
<tr>
<td>de Cordova et al.</td>
<td>2008</td>
<td>Implementing EBP with student nurses and clinicians: Uniting the strengths</td>
<td>United States of America</td>
<td>40</td>
<td>Straus, glassziou richardson &amp; haynes 2005 EBP conceptual framework</td>
<td>1. EBP Collaborative Framework Project involving clinical nurses and students. 2. Not described</td>
<td>Both clinicians and students attended a course on assessing and evaluating Clinical Evidence. Changes were noted between students’ grades before and after the intervention. Changes were also noted in the clinician’s knowledge of EBP and their behaviour as mentors.</td>
</tr>
<tr>
<td>Oh et al.</td>
<td>2010</td>
<td>Integrating EBP into RN-to-BSN Clinical Nursing Education</td>
<td>Korea</td>
<td>74</td>
<td>None Described</td>
<td>1. A one-group pre and post-test design. 2. Structured questionnaires with scales of; efficacy toward EBP and barriers of research utilization</td>
<td>EBP clinical practicum Lectures, individual mentoring on EBP, small group, and wrap-up conferences. Prior to the clinical practicum, the overall individual scores for EBP efficacy among students ranged from 2.09 to 2.54, on a 5 point Likert scale with an overall mean score of 2.30. After the practicum, scores increased to a mean of 3.05, with ranges from 2.82 to 3.31. The overall mean score for the barrier to research utilization was 2.02 (SD = 0.39) before the practicum. After completion of the clinical practicum, the mean barrier score decreased to 1.67 (SD = 0.37). Findings highlighted the effectiveness of EBP education among RN-to-BSN students.</td>
</tr>
<tr>
<td>Dale et al.</td>
<td>2019</td>
<td>Nursing Journal Clubs (NJC) for teaching EBP and Critical Appraisal Skills</td>
<td>United States of America</td>
<td>One final year nursing class</td>
<td>None Described</td>
<td>1. EBP Project using Nursing Journal Clubs 2. Qualitative Course Evaluation form</td>
<td>Structured weekly Nursing journal clubs for discussing research articles for students to gain critical appraisal skills. NJC benefited students in thinking outside the box when reading research articles. NJCs were effectively used as a teaching strategy for students learning critical appraisal of research.</td>
</tr>
<tr>
<td>Kesten et al.</td>
<td>2019</td>
<td>Perceived EBP Competency Acquisition in Graduate Nursing Students: Impact of Intentional Course Design</td>
<td>United States of America</td>
<td>544</td>
<td>Star Model of Knowledge Transformation by Stevens, (2004)</td>
<td>1. A retrospective pre–post cohort design. 2. National consensus-based EBP competencies (Stevens, 2009) were used to develop an assessment tool to measure students’ perceptions of their ability to perform each competency before and after the 13-week course.</td>
<td>A 13 weeks EBP course that involved the five steps of EBP cycle, which ended with proposing an organizational or individual practice change and strategies for implementation. Findings indicated improved scores for all of the study years which were statistically significant (p ≤ .014). The total pre-course mean score was 74.09 ± 18.35 compared with a total post course mean score of 104.04 ± 14.18. Findings support the use of intentional course design based on a recognized EBP model.</td>
</tr>
<tr>
<td>Weathers</td>
<td>2019</td>
<td>A Creative Teaching Method for Research and Evidence-Based Practice</td>
<td>Ireland</td>
<td>61</td>
<td>None Described</td>
<td>1. In-Class EBP Project 2. Project specific scoring sheet assessed seven domains on a scale of 0 to 4.</td>
<td>Research and EBP Nursing Course where students were taught the importance of research and EBP. Lowest group score was 16 and 26 as highest out of 28. One group reported the strategy as an opportunity to be creative, demonstrate understanding outside the usual didactic lecture, and to work as a team. Teaching EBP to nursing students can be challenging. Innovation is required to ensure that students recognize the importance of EBP and are equipped with the knowledge, skills, and attitudes required to implement it.</td>
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<td>Zori</td>
<td>2016</td>
<td>Teaching Critical Thinking Using Reflective</td>
<td>United States of</td>
<td>71</td>
<td>None Described</td>
<td>1. Descriptive Qualitative Study using content analysis</td>
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<tr>
<th>Title</th>
<th>Country</th>
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<th>Participants</th>
<th>Methodology</th>
<th>Intervention</th>
<th>Findings</th>
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<tr>
<td>Journaling in a Nursing Fellowship Program</td>
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<td>A 1-hour class which defined CT and presented the seven CT dispositions;</td>
<td>Purposeful use of CT dispositions can guide individual learning and help reduce negative patient outcomes.</td>
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<td>inquisitiveness, analyticity, truth seeking, systematicity, CT maturity,</td>
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<td>open-mindedness and CT self-confidence</td>
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<tr>
<td>Wane and Lotz 2013</td>
<td>United States of America</td>
<td>12</td>
<td>None described</td>
<td>1. CT Faculty Partnership approach Pilot Project</td>
<td>Folder of information was provided with sample scenarios and didactic information and evidence-based practice tutorial. Students were expected to develop and run their own scenario</td>
<td>Students verbally articulated the complexity of accounting for pertinent laboratory values and diagnostic testing. Students appreciated the amount of detail required to critically analyze a medical situation. The teaching method provided a strategy to facilitate CT and clinical judgment skills.</td>
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<tr>
<td>Simulated Clinical Environment as a Platform for Refining Critical Thinking in Nursing Students</td>
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<td>2. Debriefing session</td>
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<tr>
<td>Mena-Tudela 2018</td>
<td>Spain</td>
<td>120</td>
<td>None Described</td>
<td>1. Quasi-experimental before-and-after study</td>
<td>The intervention consists of two hours of EBP theory and two hours of computer lab sessions. The first session focused on defining terms related to EBP and students to employ critical thinking in the use of research tools. The second was a practical exercise on information literacy.</td>
<td>The mean scores of the Evidence-Based Practice Competence Questionnaire were 79.83 as baseline measurement, 84.53 for the intermediate measurement, and 84 for the final measurement, with a statistically significant difference among the three measurements ((p&lt;0.001)). There were statistically significant differences in Attitudes ((p = 0.034)) and Knowledge ((p &lt;0.001)) but not in Skills ((p = 0.137)). The intervention enhances EBP competence among second-year nursing students.</td>
</tr>
<tr>
<td>Effectiveness of an Evidence-Based Practice educational intervention with second-year nursing students</td>
<td></td>
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<td></td>
<td>2. EBP Competence Questionnaire</td>
<td></td>
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<tr>
<td>Ticha and Fakude 2015</td>
<td>South Africa</td>
<td>21</td>
<td>None described</td>
<td>1. Qualitative exploratory Design</td>
<td>None</td>
<td>Themes which emerged included Challenges related to collecting evidence for Portfolio of Evidence including Racism and Discrimination. Portfolio of Evidence was a good teaching and learning strategy. The skills, experience and knowledge acquired boosted participants’ self-esteem, confidence and critical thinking.</td>
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<tr>
<td>Reflections on clinical practice whilst developing a portfolio of evidence: Perceptions of undergraduate nursing students in the Western Cape, South Africa</td>
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<td>2. Focus Group Discussion</td>
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<tr>
<td>Part 2: Implementation of EPB and Application of CT Skills by Nursing Students</td>
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<tr>
<td>Wilde-Larsson et al. 2018</td>
<td>Norway, Sweden, Indonesia</td>
<td>498</td>
<td>None</td>
<td>1. A descriptive, comparative, cross-sectional and longitudinal cohort study</td>
<td>None</td>
<td>Indonesian participants scored significantly lower than the Norwegian ((4 of 10 comparisons)) and the Swedish samples ((7 of 10)) on the CTQ and RUQ. Scandinavian sample reported fewer barriers than the Indonesian sample. Teachers must support nursing students to strengthen their CT ability.</td>
</tr>
<tr>
<td>Critical thinking, research utilization and barriers among nursing students in Scandinavia and Indonesia</td>
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<td></td>
<td>2. CT Questionnaire (CTQ), Research Utilization Questionnaire (RUQ), the Barrier Scale</td>
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<tr>
<td>Lam and Schubert 2019</td>
<td>United States of America</td>
<td>118 in the survey</td>
<td>None described</td>
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</table>
Table 1. Cont’d

<table>
<thead>
<tr>
<th>Study</th>
<th>Participants/Setting</th>
<th>Methodology</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students: An Exploratory Study and 12 in the interview</td>
<td>1. Sequential, mixed-methods design</td>
<td>None</td>
<td>Participants had difficulties distinguishing between EBP and research. Participants were able to identify experiences that fostered attainment of EBP competencies but less able to describe higher-order activities such as integrating evidence in planning for EBP changes. Findings suggested that nurse educators did not only need to model EBP competence but also guide students in the application it’s application.</td>
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<tr>
<td></td>
<td>2. A quantitative survey questionnaire</td>
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<td></td>
<td>3. Individual, semi-structured interviews exploring the factors impacting understanding of EBP and information-seeking behaviors in each clinical course and setting.</td>
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<tr>
<td>Part 3: Assessing EBP and CT Skills of Nursing Students</td>
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<tr>
<td>Ahn and Yeom start 2014</td>
<td>Moral sensitivity and critical thinking disposition of nursing students in Korea</td>
<td>1. Cross Sectional Correlational Study</td>
<td>Mean score was 2.83 out of 7 minimum 1.96 and maximum 3.89 on the K-MSQ and 3.70 out of 5 on the CTDQ minimum 3.25 and 4.33 maximum. Results indicated the need for incorporation of strategies that enhance moral sensitivity for nursing students in Korea.</td>
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<tr>
<td></td>
<td>South Korea</td>
<td>2. Moral Sensitivity Questionnaire (Korean-Version-K-MSQ) and CT Disposition Questionnaire (CTDQ)</td>
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<tr>
<td>Wonder and Spurlock 2019</td>
<td>A National Study Across Levels of Nursing Education: Can Nurses and Nursing Students Accurately Estimate Their Knowledge of Evidence-Based Practice?</td>
<td>Cross-sectional correlational design</td>
<td>Participants scored highest on EBPQ attitude (M = 5.46, SD = 1.12) followed by EBP Knowledge/Skills (M = 5.03, SD = 0.95) while practice/use score were lowest (M = 4.27, SD = 1.74). EBPQ scores were positively associated with the highest earned nursing degree. Having dedicated EBP training was also associated with scores across domains.</td>
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<td></td>
<td>United States of America</td>
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<tr>
<td>Shirazi and Heidari 2019</td>
<td>Relationship Between CT Skills and Learning Styles and Academic Achievement of Nursing Students</td>
<td>1. Cross sectional Study</td>
<td>Mean score for CT skills was 6.75 + 2.16, out of a maximum possible score of 34. The highest score was on evaluation and lowest on analysis subscale. The most common learning style was “Diverging”. The highest mean academic achievement was earned by those students who adopted the “accommodating” learning style. There was no relationship between CT and academic achievement but a significant relationship was found between learning style and academic achievement (p &lt; .001). Findings revealed unacceptably low CT skills.</td>
</tr>
<tr>
<td></td>
<td>Iran</td>
<td>2. A three-component questionnaire; demographic characteristics, Kolb’s Learning Style Standard and the California Critical Thinking Skills Questionnaire.</td>
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<tr>
<td>Part 4: Relationship between EBP &amp; CT Skills</td>
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<tr>
<td>Kim et al. 2018</td>
<td>Korean Nursing Students’ Acquisition of Evidence</td>
<td>1. Not Described</td>
<td>Mean EBPQ total score was 4.69 + 0.64 from a total 7 Point Likert Scale. Knowledge of EBP had the highest</td>
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<td></td>
<td>South Korea</td>
<td>2. Evidence Based Practice</td>
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Table 1. Cont’d

| Questionnaire (EBPQ) and Critical Thinking Predisposition (CTD) tool | Mean score (4.71 ± 0.77), followed by practice of EBP (4.71 ± 0.77) and attitudes towards EBP (4.58 ± 1.20). Mean CTD total score was 3.56 ± 0.32 from a total 5 point Likert Scale. Among the seven EBP subcategories, objectivity scored highest at (3.97 ± 0.46), followed by, intellectual fairness (3.97 ± 0.45), while systematicity was the lowest at (3.25 ± 0.58). EBP total score was significantly correlated with CTD total score. EBPQ attitude had a significant correlation with CTD total score. Furthermore, EBPQ knowledge significantly correlated with the total CTD score. Results pointed out to the need to have a curricula that is EBP oriented in order to improve EBP, knowledge, attitude CTD. |

Part 5: Use of EBP and Application of CT Skills by Practicing Nurses

<table>
<thead>
<tr>
<th>Study</th>
<th>Title</th>
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<tbody>
<tr>
<td>Jordan et al. 2015</td>
<td>Barriers to implementing evidence-based practice in a private intensive care unit in the Eastern Cape</td>
</tr>
<tr>
<td>Monde et al. 2017</td>
<td>Nurses and Use of Research Information in Clinical Practice: a Case Study of the University Teaching Hospital in Zambia</td>
</tr>
<tr>
<td>Monde et al. 2017</td>
<td>Challenges Of Accessing And Seeking Research Information: Its Impact On Nurses At The University Teaching Hospital In Zambia</td>
</tr>
</tbody>
</table>

| Barriers to implementing evidence-based practice in a private intensive care unit in the Eastern Cape | South Africa 75 Non-described 1. A positivistic, quantitative, exploratory research design 2. A Study specific questionnaire that measure demographic characteristics, and individual and organizational barriers on a 5-point Likert Scale ranging from (1) strongly disagree to (5) strongly agree. | Identified barriers at individual level included lack of familiarly with EBP (only 54% could correctly define EBP. Another barrier was inability to synthesise the literature eg 60% of respondents indicated that information related to intensive care was too overwhelming. Organisational barriers including lack of authority to facilitate EBP implementation as agree by 58% of respondents. In order to enhance care delivery in ICUs, nurse managers need to acknowledge and manage individual and organisational barriers towards implementation of EBP. |
| Nurses and Use of Research Information in Clinical Practice: a Case Study of the University Teaching Hospital in Zambia | Zambia 77 None Described 1. Case study 2. Investigator designed Questionnaire | 95% of the nurses stated that they utilize research information in clinical practice. Regarding frequency of use of research information, only 12.28% used research information very often. Results revealed that nurses were prompted to seek information because of emergency of new diseases or technologies. |
| Challenges Of Accessing And Seeking Research Information: Its Impact On Nurses At The University Teaching Hospital In Zambia | Zambia 77 None Described 1. Case study 2. Study specific Questionnaire | Common challenges faced by nurses were: lack of access to information resources as mention by (70%), poor Information Communication and Communication (ICT) infrastructure (60%), lack of support from hospital administration (62%), inadequate time to read (60%), not being aware of available information resources (54%) and poor information sharing culture (56%) were amongst the top challenges faced by the nurses when accessing and seeking information to use in clinical practice. |
Table 1. Cont’d

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Design</th>
<th>Country</th>
<th>N</th>
<th>Scale</th>
<th>Data Collection</th>
<th>Data Analysis</th>
<th>Findings</th>
</tr>
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<tbody>
<tr>
<td>Malik et al.</td>
<td>2014</td>
<td>1. Descriptive Survey  2. Study specific EBP Questionnaire</td>
<td>Australia</td>
<td>135</td>
<td>None described</td>
<td>Measured self-perceived knowledge, skills and attitude.</td>
<td>None</td>
<td>Mean score for self-perceived knowledge of EBP was 2.98. Almost half (47%) perceived themselves as having ‘good’ knowledge, 25% as ‘fair’ and 24% ‘very good’. Overall, 40.7% rated themselves as ‘beginner’, 36% as ‘quite skilled’ and 23% as ‘competent’ towards critical appraisal skills. Attitudes towards EBP had the highest mean of 4.34 (SD = 0.536). Factors that hindered change were: resistance to change, busy schedule, lack of time to refine research reports and lack of resources. Nurse Educators, Clinical Coaches and Nurse Specialists, had positive attitudes, but lacked knowledge and skills, therefore they relied heavily on personal experience, organizational policies and protocols as sources of knowledge.</td>
</tr>
<tr>
<td>Wangensteen et al.</td>
<td>2010</td>
<td>1. Cross-sectional descriptive study  2. A study-specific questionnaire for background data and a 6-point Likert scale CCTDI with total scores range between 70 and 420</td>
<td>Sweden</td>
<td>2675</td>
<td>None described</td>
<td></td>
<td>None</td>
<td>Mean value for CCTDI score was 300.3 indicating a positive inclination towards CT. Nearly 80% of the respondents reported a positive disposition towards CT. The highest mean score was on the inquisitiveness subscale and the lowest on the truth-seeking subscale. Results pointed out to the need for Nurse leaders and teachers to nurture critical thinking among newly graduated nurses and students.</td>
</tr>
<tr>
<td>Varnell et al.</td>
<td>2007</td>
<td>1. A quasi-experimental design with Pre-Post-test survey.  2. EBP barriers (EBPB) and EBP implementation (EBPI) scales</td>
<td>United States of America</td>
<td>57</td>
<td>Transtheoretical model of organisational change.</td>
<td>8-week program to develop EBP champions. Programme was organized into a 2-hour class per week for participants.</td>
<td>Participant s with advanced degrees, who were currently in school had worked in advanced roles were more likely to report implementing EBP while prior exposure to EBP, educational level, enrollment in school, and advanced roles were no longer significantly correlated with scores on the EBPB or EBPI at the end of the intervention. Paired t tests indicated a significant difference in means for both the EBPB (p &lt; 0.01) and EBPI (p &lt; 0.01). Results pointed out to the role of administrative support and collaboration between academia and service in the success of EBP interventions.</td>
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<tr>
<td>Ramos-Morcillo et al.</td>
<td>2015</td>
<td>1. Two group quasi-experiment with an intervention and comparison group.  2. A 19-item 7-point Likert scale self-administered EBPQ questionnaire (Upton and Upton, 2006).</td>
<td>Spain</td>
<td>109</td>
<td>The Theory of Planned Behavior by Ajzen, 1991.</td>
<td>Intervention group attended the EBP course, while the comparison group attended a different course. The evaluation was administered at (time 01) and mid-point (time 02) and end-point (time 03).</td>
<td>Knowledge and skills of participants significantly differed, between the groups and over time in intervention group. Post hoc analysis of differences with the Bonferroni test revealed a greater effect on the intervention group versus the comparison group both at 02 (p = 0.002) and 03 (p = 0.005) A basic educational intervention on EBP can produce improvements in the knowledge and skills of clinical nurses.</td>
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support the utilization of non-traditional instructional including Concept Mapping, PBL and simulation methodologies in undergraduate nursing curricula. As stated earlier, other authors (Larsen et al., 2019; Davidson and Candy, 2016; Whalen and Zentz, 2015; Reicherter et al., 2013; Dawley et al., 2011; Brown and McCrorie, 2015) have suggested interactive methods suitable for teaching both EBP and CT skills. These include research courses and workshops, concept mapping, journal clubs, clinical simulations, collaboration with clinical practice, use of dedicated education units and use of IT Technology.

With regards to assessing EBP and CT skills, there are a number of validated tools; commonly the Upton and Upton 2006 EBP Questionnaire (Upton and Upton, 2006), the California Critical Thinking Skills Test (CCTST) of 1994. It is from these two tools that several scholars have modified notably the Yoon’s 2004 Critical Thinking Disposition Inventory YCTDI (Yoon, 2004). Whereas the CCTST is a general tool testing CT skills of Post-Secondary education candidates, YCTDI was originally developed specifically for Korean Nursing, but it is now validated and recommended for testing CT skills of nursing students.

Regarding implementation of EBP and application of CT skills by nurses, the reviewed literature, indicated varying levels of EBP and CT application from different clinical setting. Additionally, a number of challenges faced in implementing EBP were revealed. The challenges range from cost implication of funding EBP, organizational culture that do not support EBP, workplace resistance “That is the way we have always done it”, lack of knowledge and skills in EBP and CT by nurses, misunderstanding that EBP takes too much time, to inadequate mentors for EBP (Willis, 2012). Another major barrier is the over-emphasis on conduct of research by education institutions against none or limited emphasis on translation and utilization of research findings (Melnyk and Fineout-Overholt, 2015; Melnyk et al., 2012a, b, 2016).

Katowa-Mukwato et al. (2020) observed that there are both enablers and detractors to implementing EBP. Enables include support of senior nurses who act as champions and availability of mentors, while detractors included fixation to status quo.
status quo is a barrier to EBP implementation (Wallis, 2012). Wallis (2012) affirmed that getting past workplace resistance and the phrase, “That is the way we have always done it” pausing as a major constraint to EBP implementation.

Limitation of the review

Considering the Zambia context within which the scoping review was conducted, EBP and CT as key elements in health care have not received their due value either in Nursing Education or Practice as such the desk review did not come across any policy documents or expert opinion regarding the two concepts. This meant that as opposed to the general recommendation the policy documents and expert opinion may be part of a scoping review; it was not the case for this review. Consequently, only research papers were included.

Conclusion

Teaching and assessing EBP and applying CT skills have been reported to be challenging and therefore innovative teaching methods are required to promote learning while successful implementation require strategies to minimize detractors and sustain enablers of the process. Although there is a plethora of literature at global level on different methods for teaching, learning, assessment and implementation of EBP and CT in Nursing Education and Practice, from the Zambian context literature is very scarce. The two concepts are not taught in the undergraduate curricula, while in the MSc programmes EBP is taught using traditional lecture methods, while CT skills are not taught at all. This review may therefore provide an impetus to nursing educators in Zambia to consider incorporation of EBP and CT in the nursing curriculum and provide for innovative teaching methods that have need of this document to promote learning.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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