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THE EFFECTS OF PROBLEM-BASED LEARNING ON NURSE COMPETENCE: A SYSTEMATIC REVIEW

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfillment of the requirements for the degree of

Master of Science in Nursing

Johannesburg, 2012

DECLARATION

I, Penelope Janet Cartwright declare that this research report is my own work. It is being submitted for the degree of Master of Science in Nursing in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

Signature

_____

Penelope Janet Cartwright

Signed at Johannesburg

On 30 March 2012

DEDICATION

In memory of my father

Dudley Selwyn Cartwright

1942 – 2009

ABSTRACT

PURPOSE OF THE STUDY:

The purpose of this study was to conduct a systematic review to determine the effects of problem-based learning on nurse competence.

METHODS:

A systematic review was used as the study design. This method included defining the research question, searching the relevant databases to access the relevant literature, analysis of the literature using critical appraisal and checklists, combining the results by doing a meta-synthesis for qualitative data, a narrative summary for quantitative data and reporting of the results.

RESULTS:

72591 articles were initially accessed through the databases and, through specific search criteria, they were narrowed down to eleven (11) articles. These eleven (11) articles went through critical appraisal by the researcher as a primary reviewer and a co-reviewer to ensure high quality and rigor of the systematic review. Of these eleven (11) articles, four (4) qualitative articles and one (1) quantitative article were further analysed and the data synthesised.

CONCLUSION:

The conclusion of the systematic review was that problem-based learning has positive effects on nurse competence.

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TABLE OF CONTENTS

DECLARATION		**iii**
DEDICATION		**iv**
ABSTRACT		**v**
ACKNOWLEDGEMENTS		**vi**
TABLE OF CONTENTS		**vii**
APPENDICES		**xii**
LIST OF TABLES		**xiii**
LIST OF FIGURES		**xiv**
CHAPTER ONE	**ORIENTATION TO THE STUDY**	
1.1	**INTRODUCTION AND BACKGROUND**	**1**
1.2	**PROBLEM STATEMENT**	**7**
1.3	**PURPOSE STATEMENT**	**7**
1.4	**STUDY OBJECTIVES**	**8**
1.5	**DEFINITIONS**	**8**
1.5.1	**Problem-based learning**	**8**
1.5.2	**Competence**	**9**
1.5.3	**Nurse**	**9**
1.6	**RESEARCH DESIGN AND METHODS**	**10**
1.7	**ETHICAL CONSIDERATIONS**	**11**
1.8	**CONCLUSION**	**13**

CHAPTER TWO	**RESEARCH METHODS**	
2.1	**INTRODUCTION**	**16**
2.2	**SYSTEMATIC REVIEW**	**18**
2.2.1	**Criteria for considering reviews in a systematic review**	**19**
2.2.1.1	***Types of papers in systematic reviews***	***20***
2.2.1.2	***Types of participants***	***20***
2.2.2	**Types of outcome measures**	**21**
2.2.3	**Search strategy in a systematic review**	**22**
2.2.4	**Reviewing a systematic review**	**23**
2.2.4.1	***Criteria for assessment***	***23***
2.2.4.2	***Synthesis of data collected***	***24***
2.3	**METHODOLOGY OF SYSTEMATIC REVIEW**	**26**
2.3.1	**The review question**	**27**
2.3.2	**Search strategy**	**28**
2.3.2.1	***Inclusion and exclusion criteria***	***29***
2.3.2.2	***Identification of articles***	***31***
2.3.3	**Article selection**	**35**
2.3.3.1	***Papers reviewed***	***36***
2.3.3.2	***Participants***	***37***
2.3.3.3	***Outcomes measured***	***38***
2.3.4	**Data extraction**	**38**
2.3.5	**Quality assessment**	**40**
2.3.6	**Data analysis**	**41**

2.3.7	**Assessment of methodological quality**	**42**
2.3.7.1	***Independent reviewers***	***42***
2.3.7.2	***Level of evidence***	***43***
2.3.8	**Presentation of results**	**45**
2.4	**CONCLUSION**	**45**
CHAPTER THREE	**DESCRIPTION OF STUDIES USED IN THE SYSTEMATIC REVIEW**	
3.1	**INTRODUCTION**	**46**
3.2	**TYPES OF PAPERS FOR SYSTEMATIC REVIEW**	**46**
3.3	**DESCRIPTION OF STUDIES USED IN THE SYSTEMATIC REVIEW**	**46**
3.3.1	**Studies selected for the systematic review**	**51**
3.3.2	**Studies excluded from the systematic review**	**53**
3.4	**METHODS OF STUDIES USED IN THE SYSTEMATIC REVIEW**	**59**
3.4.1	**Design of the studies**	**59**
3.4.2	**Sampling methods in the studies**	**60**
3.4.3	**Data collection in the studies**	**62**
3.4.4	**Data analysis in the studies**	**63**
3.5	**CONCLUSION**	**64**

CHAPTER FOUR RESULTS OF THE SYSTEMATIC REVIEW

4.1 INTRODUCTION 65

4.2 QUALITATIVE EVIDENCE 66

4.2.1 Employers generally positive about PBL graduates' competence 66

4.2.1.1 Feelings of contrast 68

4.2.2 Problem-based learning has a positive 70

4.2.2.1 Changing thinking 70

4.2.2.2 Nurse practice affirmation 72

4.2.2.3 Soaring high 74

4.3 QUANTITATIVE EVIDENCE 76

4.3.1 Comparison of post graduate nurses at graduation to after six months in clinical practice 76

4.3.1.1 Competence at the end of programme of study 77

4.3.1.2 Competence six months after graduation 77

4.4 CONCLUSION 78

CHAPTER FIVE	**DISCUSSION, LIMITATIONS AND CONCLUSION**	
5.1	**INTRODUCTION**	**79**
5.2	**QUALITATIVE SUMMARIES**	**79**
5.2.1	**Employers generally positive about PBL graduates' competence**	**79**
5.2.2	**PBL has positive effects on nurse competence**	**82**
5.3	**QUANTITATIVE SUMMARIES**	**87**
5.4	**LIMITATIONS**	**89**
5.5	**IMPLICATIONS**	**92**
5.6	**CONCLUSION OF THE SYSTEMATIC REVIEW**	**93**
REFERENCES		**97**

APPENDICES

APPENDIX A	**Approval of Title from Post Graduate Committee**	**108**
APPENDIX B	**Ethics Clearance Certificate**	**109**
APPENDIX C	**JBI – Qualitative Assessment and Review Instruments (QARI)**	**110**
APPENDIX D	**JBI – Meta-Analysis and Statistical Review Instruments (MAStARI)**	**113**
APPENDIX E	**Electronic Correspondence**	**115**

LIST OF TABLES

TABLE 2.1	INITIAL DATABASES AND NUMBER OF ARTICLES	33
TABLE 2.2	SECONDARY DATABASES AND NUMBER OF ARTICLES	34
TABLE 2.3	JBI – LEVELS OF EVIDENCE	44
TABLE 3.1	TOTAL NUMBER OF ARTICLES INITIALLY RETRIEVED FROM DATABASES	47
TABLE 3.2	TOTAL NUMBER OF ARTICLES RETRIEVED USING SPECIFIC SEARCH CRITERIA	47
TABLE 3.3	ARTICLES FROM DATABASES	49
TABLE 3.4	QUALITATIVE REVIEW ARTICLES INCLUDED IN THE STUDY	54
TABLE 3.5	QUANTITATIVE REVIEW ARTICLES INCLUDED IN THE STUDY	56
TABLE 3.6	REVIEW ARTICLES EXCLUDED FROM THE STUDY – QUALITATIVE	57
TABLE 3.7	REVIEW ARTICLES EXCLUDED FROM THE STUDY – QUANTITATIVE	58

LIST OF FIGURES

FIGURE 3.1	**PROCESS OF SEARCH STRATEGY**	**50**
FIGURE 4.1	**SYNTHESES FOR THE SYSTEMATIC REVIEW**	**67**

CHAPTER ONE

ORIENTATION TO THE STUDY

1.1 INTRODUCTION AND BACKGROUND

Problem-based learning (PBL) has been around since the late 1960's. It first started in the medical fraternity at McMaster University, Canada, and has since become a means of delivering education to other health professionals, has spread globally, and has gone beyond the healthcare disciplines (Parton & Bailey, 2008; Gwee, 2009; Niemer, Pfendt & Gers, 2010).

Education, from a global perspective, and specifically in nursing, has moved away from the traditional teacher-directed approach to a friendly, student-centered approach, using problem-based learning as a new style of teaching and learning. This educational approach introduced a new style of learning four decades ago (Gwee, 2009). PBL was used to overcome the shortcomings of traditional curricula and to improve clinical practice by delivering learning in small groups and using social construction of knowledge to enhance the rapidly changing learning process (Chikotas, 2008; Gwee, 2009). In PBL, the student learns from his / her own experiences to solve real-life problems or clinical situations (Chikotas, 2008, Niemer, et al., 2010). This allows students to take ownership of their learning, as they can relate to future problems that

they encounter due to their knowledge from previous experiences (Chikotas, 2008).

The purpose of PBL is to allow students to work with experiences gained from any nursing situation, enabling them to become life-long and self-directed learners with the ability to acquire knowledge and skills, and to apply these according to their level of learning at the time (Williams, 2004). Students should be able to identify areas of learning which guide the process of their individualised learning at their own pace. Knowledge and skills are acquired through different means in a PBL learning environment. These include: research, reflection and critical reflection when presented with a certain situation. These are then used to evaluate the student's own self-directed learning (Williams, 2004). The knowledge that is acquired by the students is then integrated into their existing knowledge and experience. Throughout the whole process of PBL, facilitators are required to facilitate and guide the students' development, by redirecting them when needed, and challenging the conclusions that they arrive at. Facilitation includes evaluating their understanding and application of principles and experiences learnt (Williams, 2004).

The process of PBL involves dividing the students into small groups, and giving each group real-life problems, one scenario at a time, in a systematic manner in the learning environment (Chikotas, 2008; Parton & Bailey, 2008; Gwee, 2009 and Niemer et al., 2010). Each of these small groups has a

facilitator who coaches and mentors the students with the problems and scenarios they are given, guiding and challenging them where needed, but allowing them to explore all possible outcomes (Williams, 2004). During participation in a PBL environment, there are phases or steps, which must be followed for PBL to be successful (Williams, 2001; Williams, 2004):

- *Phase One:*

In the first phase, the students are placed in groups of approximately six to nine individuals. They are given authentic clinical or community situations to discuss in their groups. These situations may be presented as videos, audio-tapes or put down on paper (paper problems). A facilitator is present to guide the students through any difficulties. At the start, students consider the situation, discuss it aloud, identify what information they do and do not have, and what needs to do be done to gain the unknown facts to understand and manage the situation. During this phase, the students are able to formulate preliminary explanations about the problem or scenario, develop goals and devise an action plan to meet those goals. The students develop self-monitoring skills which are associated with metacognition. These skills will ultimately result in an individual who is a critically reflective and self-directed learner (Williams, 2001; Williams, 2004).

- *Phase two:*

During phase two, the students use the goals generated in phase one in self-directed study. They decide on how they will gain the knowledge and what resources they will need to solve the situation. Evidence-based research is one particular resource that the students are encouraged to use (Williams, 2001; Williams, 2004).

- *Phase three:*

In phase three, the students apply the information that they have gathered during self-study and discuss it with the rest of the group. The group as a whole then accepts, modifies or rejects the information presented by its members. The facilitator asks appropriate questions to direct the group towards the correct solution (Williams, 2001; Williams, 2004).

- *Phase four:*

This is the final phase of PBL. Students summarise what they have found to be relevant to the particular situation and discuss how their knowledge and skills could be used in clinical practice in the future. The students reflect on the situation and how they solved the problem. This involves critical reflection from the individual and from the group, as well as from the facilitator (Williams,

2001; Williams, 2004). The group must reflect on the whole process for internalisation of knowledge and for the skills to be learnt. To identify further learning opportunities, they need to ensure that they gain the knowledge and skills to be competent (Williams, 2001; Parton & Bailey, 2008; Gwee, 2009). Through PBL, the groups acquire not only theoretical knowledge, but skills to enable them to continue their learning to ensure continued competency (Williams, 2001).

Competence has many meanings, especially in nursing. Since the introduction of problem-based learning (PBL), the competence of nurses has been questioned. Past reviews have focused on defining what the core competencies of nurses should be during and after studying. These core competencies can be described as the ability to apply the skills and knowledge of a particular profession. These competencies include the knowledge, abilities, skills, attitudes, values, reasoning and judgement that are required of professionals to perform as effectively and as competently as is required of them (Lysaght & Atschuld, 2000; Lee-Hsieh, Kao, Kuo & Tseng, 2003; Hsu & Hsieh, 2009).

There have been many reviews regarding medical students and problem-based programs during their learning years, but very limited research regarding this has been done in the nursing field (Uys, Gwele, McInerney, van Rhyn & Tanga, 2004). Research on the effects of PBL on nurse competency is also very limited. Andrews and Jones (1996) state that PBL is important in

developing nurses' skills, and is used not only in their years of study, but throughout their professional careers.

Nurses in the profession accept that their knowledge levels and skills are lacking at the practical level. This limited knowledge in turn affects their practice and skills (Parfitt, 2002). Bradshaw and Merriman (2008) agree that in the last twenty years nurses in the United Kingdom were found to be deficient in clinical skills. This limited knowledge of nurses, and its effect on clinical practice, demonstrates the gap between knowledge and clinical practice, and how it affects the skills and competencies of the professional nurse.

Nursing students who have been through a problem-based learning programme / curriculum produce professionals who are competent in the clinical setting from the start of their nursing career, and may even exhibit higher levels of competency compared to their non-PBL peers (Andrews & Jones, 1996; Uys et al, 2004). This demonstrates that the gap between knowledge and clinical practice could be decreased by using problem-based learning. All nurses must be competent in the delivery of care to all patients, using safe and acceptable protocols and methods (Klein & Fowles, 2009). Are all nurses who are trained using a PBL approach able to do this? Does problem-based learning actually bridge the gap between knowledge and skills?

Using a systematic literature review and searching for evidence, the effects of problem-based learning on nurse competency was determined.

1.2 PROBLEM STATEMENT

Current literature shows that limited studies have been conducted regarding problem-based learning and its effects on nursing (Uys et al., 2004), and that there is a gap between knowledge and practice, and practice and competence (Klein & Fowles, 2009; Farrand et al., 2006). Chikotas (2008) supports this statement by adding that students are unable to apply the theory to clinical situations. PBL has been in use for over forty years in the medical field, but has only been used in the nursing field for the last fifteen to twenty years, hence why so little is known about its effects on competence, and the ability of nursing professionals to link theory (knowledge) to clinical situations (practice).

The review question is thus: Is there supporting evidence that problem-based learning has any effect on nurse competence?

1.3 PURPOSE STATEMENT

The purpose of this study was to conduct a systematic literature review to determine the effects of problem-based learning on nurse competence.

1.4 STUDY OBJECTIVES

The objectives of the systematic review were to:

- Critically evaluate all the relevant articles found in the electronic databases.
- Describe the effects of problem-based learning on nurse competence.
- Describe the competencies most commonly identified in the literature associated with problem-based learning.

1.5 DEFINITIONS

1.5.1 Problem-based learning (PBL)

Problem-based learning is a method used where students actively search for knowledge to solve real-life clinical problems and scenarios. The students critically analyse the problems, and discussions are done in groups. A facilitator is present to guide the students in the group situation (Niemer et al., 2010).

PBL is thought to develop an individual who can solve problems, think critically, be a self-directed learner and have the ability to self-reflect.

1.5.2 Competence

Damron-Rodriguez (2008) describes competence as “being able to demonstrate that the knowledge, values and skills learned can be integrated into practice.”

Competence is thus the ability to gain knowledge and skills at an appropriate level where a professional can take responsibility and accountability for individual performance.

Competence is operationally defined as the psychomotor and cognitive knowledge and skills that the professional has acquired as a result of completing a PBL nursing programme.

1.5.3 Nurse

A professional individual who has studied in a PBL nursing programme, and has acquired the necessary skills to be a competent practitioner.

1.6 RESEARCH DESIGN AND METHODS

A research design is a blueprint for the study being undertaken that enables the researcher to take control of any factors that may influence the findings of the study. Research methods are the processes that the researcher follows when conducting the specific steps of the research design (Burns & Grove, 2009).

A systematic review has been chosen to evaluate the research that has been conducted in the field of PBL and the effects it has on nurse competence by collating the gathered information and publishing it. A systematic review is a method that has replaced traditional narrative reviews and expert commentaries. It is a way of summarising research evidence and is based on peer-reviewed protocols, and as such, can be replicated if needed. Systematic reviews try to produce the same level of rigor in reviewing the research evidence as was used when producing that same research (Hemmingway & Brereton, 2009).

1.7 ETHICAL CONSIDERATIONS

For the research study to proceed, certain ethical requirements were taken into consideration in order to ensure that the research remained authentic, valid and reliable.

- The research proposal was submitted to the Faculty's Research and Postgraduate Studies Committee for approval to conduct the study. The protocol was assessed and approval was obtained, subject to minor corrections made to the satisfaction of the supervisor (Appendix A).

- Application for ethical clearance to conduct research was made to the Human Research Ethics Committee of the University of the Witwatersrand and a clearance certificate was obtained (Appendix B). Clearance from the Ethics committee was still required even though no human subjects or facilities were part of the research study.

- All articles used in this systematic review were checked against checklists (Appendix C and D) for validity, reliability and authenticity. These checklists are from the Joanna Briggs Institute (JBI) Summari programme. All terms and conditions as stipulated by JBI were adhered to while using these checklists.

- An experienced co-reviewer was used to maintain rigor and ensure high quality. No conflict arose between the researcher and the co-reviewer. This allowed for the research to be of a high quality and to maintain rigor throughout the review process.

- All data results, methods and procedures from the systematic review were recorded in a comprehensive report, and guidelines were used to show the phases of the systematic review process (Evans, 2004).

- All evidence was critically examined and errors were avoided. This was done with the critical appraisal of all articles with valid checklists from the JBI as well as a co-assessor to ensure a high quality research study.

- All articles used were handled with respect and integrity and all copyright issues were observed.

- Two authors, Bev Williams and Noreen Chikotas, were contacted via email for advice on this particular field of study. Bev Williams replied with consent to use information from a recent study that her group had done, and offered some advice on the topic of PBL (Appendix E).

1.8 CONCLUSION

An overview of the research study has been provided in this chapter. The problem, purpose statement and objectives of the study have been well described. All variables and terms have been theoretically and operationally defined accordingly to clarify their meanings and purpose in this research. All ethical considerations were described and possible conflicts of interests were declared.

The information included in this research report will follow the systematic review process, which has the following phases (Evans, 2004):

- Review focus:

  The review question and rationale for conducting the review is discussed. This is done in Chapter One – Orientation to the Study.

- Search strategy:

  In this phase all electronic databases are searched for relevant studies, and search terms are developed. Relevant articles are selected using the inclusion criteria as set. A hand search is also conducted, and experts on the topic can be contacted for further advice. The outcome of the search

process is discussed here. This is presented in Chapter Two – Research Methods.

- Study selection:

  This involves the inclusion and exclusion criteria as set by the researcher and discusses how the criteria were decided on. The outcome of the selection process is also discussed. This is also presented in Chapter Two – Research Methods.

- Critical appraisal:

  This involves the criteria to determine the quality of the study and the processes used to appraise the studies. The outcome is also discussed. This can be found in Chapter Three – Description of the Studies Included and the Studies Excluded.

- Data Abstraction:

  This phase discusses the processes for abstracting the data in a systematic review. This is presented in Chapter Three – Description of the Studies Included and the Studies Excluded.

- Analysis:

  This discusses the methods used to analyse the data – either meta-synthesis or meta-analysis, and are reported in Chapter Three – Description of the Studies Included and the Studies Excluded.

- Results:

  Characteristics of the studies are discussed as well as a summary of all the results for each of the studies that were included. This is discussed in Chapter Four – Results of the Systematic Review.

- Discussion:

  A summary of all the findings is presented and discussed, as well as the limitations of the review, and the implications for research and practice. This is presented in Chapter five – Discussion, Limitations and Conclusion.

The research methods that were undertaken are discussed in detail in the next chapter.

CHAPTER TWO

RESEARCH METHODS

2.1 INTRODUCTION

Problem-based learning (PBL) has many benefits for students, not only while they are studying, but when they have qualified and are working in clinical areas. PBL requires one to be actively involved when acquiring knowledge, either by examining, inquiring, reflecting or understanding the problem or scenario (Mennin, Gordan, Majoor & Osman, 2003). When working in groups, the knowledge, ideas and concepts shared between the students allows co-operation between the group rather than individual competition (Mennin, et al., 2003). Long-term retention of new knowledge is improved when the students reflect on experiences and the need to find new knowledge, and this is possible through the process of PBL. Through this process of PBL, the student is encouraged to become a self-directed learner (Mennin, et al., 2003). Life-long learning is also encouraged through PBL, as it provides the ability to solve problems by retrieving the relevant knowledge (Mennin, et al., 2003). In the clinical area, this self-directed, life-long learner can make decisions by gathering the correct knowledge and sharing it with others.

The purpose of this study was to summarise the research evidence by conducting a systematic review to get the best possible results. Literature from the last ten years (1999 – 2009) was identified in an effort to obtain the most recent and updated research done in the field of PBL and the effects it has on nurse competence. This chapter describes the theory of a systematic review and the methods that were used to conduct the systematic review.

A full description of a systematic review will be discussed, including:

- The criteria for considering reviews in a systematic review
- Types of outcome measures
- Search strategies in a systematic review
- Review of a systematic review

The methodology of a systematic review will be then discussed including:

- The review question
- Search strategy
- Article selection
- Data extraction
- Quality analysis
- Data analysis
- Assessment of methodological quality

2.2 SYSTEMATIC REVIEW

A systematic review is a research method that has replaced traditional narrative reviews and expert commentaries. It is a way of summarising research evidence and is based on peer-reviewed protocols, and as such, can be replicated if needed. Systematic reviews try to produce the same level of rigor when assessing and reviewing research evidence as that of the original research (Hemmingway & Brereton, 2009). When conducting systematic reviews, explicit methods are used to search for the literature, which leads to critical appraisal and synthesis of the findings. Relevant publications are selected and the validity of each is assessed by means of objective criteria, reducing reviewer bias and increasing the quality of the systematic review. Systematic reviews involve transparent methods, which are clearly stated in order to be reproducible by others (Collins & Fauser, 2005).

When conducting systematic reviews, there are certain steps a researcher must adhere to in order to ensure that quality is maintained. Firstly, the researcher must identify all relevant published and unpublished evidence pertaining to their subject of interest, which usually has a very specific question, and involves a comprehensive search. From there, studies or research reports are selected to be included as part of the inclusion criteria set by the researcher. Each and every study or report is then assessed for its quality and validity, and the findings are synthesised in an unbiased way. The last step is to interpret the findings and present them in a summary, including

any flaws that may have occurred during the systematic review (Collins & Fauser, 2005; Hemmingway & Brereton, 2009).

When conducting systematic reviews, both quantitative, qualitative, or a mixture of both, may be examined - the latter is called a mixed-method systematic review. In the past, systematic reviews concentrated on clinical effectiveness, but are now being used by researchers to examine issues of appropriateness, feasibility and meaningfulness (Hemmingway & Brereton, 2009).

In comparison, narrative reviews are generally more comprehensive and usually cover a wider range of issues within one topic. These reviews do not follow any rules or methods about the search for literature or evidence, and they do not discuss how decisions are made about the relevance of the studies with regard to the validity of the included studies (Collins & Fauser, 2005).

2.2.1 Criteria for considering reviews in a systematic review

Criteria for a systematic review are important as they define what articles the researcher will include for critical appraisal in a systematic review. These criteria include the types of papers being reviewed, and the type of participants that will be included.

2.2.1.1 Types of papers in systematic reviews

Systematic reviews examine evidence from papers that have quantitative research designs, such as randomised control studies, descriptive statistics and experimental studies, and qualitative research designs, such as phenomenological studies and grounded theory studies. A systematic review, which includes both quantitative and qualitative evidence is referred to as a mixed-methods systematic review (Hemmingway & Brereton, 2009).

In this systematic review the researcher used a mixed-methods approach, as using both quantitative and qualitative evidence gives more quality and rigor to the review.

2.2.1.2 Types of participants

The types of participants in a systematic review are the study population that the researcher will be using. A population in a study includes all the individuals, objects or substances and their characteristics, which meet the inclusion criteria (Burns & Grove, 2009:42). The population is defined according to the researcher's sample criteria and the similarities of all these subjects in the different settings. This population must be accessible and adequately represented in the research study (Burns & Grove, 2009:42), for example, a group of nursing students studying for a Bachelor's degree at a university following a problem-based nursing program.

From the population, a sample is chosen for the particular study being undertaken. This sample is selected either through probability (random) or non-probability (non-random) sampling methods (Burns & Grove, 2009:42). For example, the nursing students studying for a Bachelor's degree could be selected by systematic random sampling, by allocating numbers to their names and selecting every fifth number.

2.2.2 Types of outcome measures

When conducting a systematic review, the researcher must decide on the types of outcome measures. The outcome measures in a systematic review are those components that the researcher is reviewing in the evidence to make the systematic review meaningful and complete. The outcome measures do not make the studies eligible for review, but form part of the review question that are of interest to the researcher (Higgins & Green, 2009).

The outcome measures decided on and explored in this systematic review were to determine if problem-based learning had any positive effects on nurse competence with regards to cognitive and psychomotor competence.

Damron-Rodriguez (2008) describes competence as "being able to demonstrate that the knowledge, values, and skills learned can be integrated into practice." Problem-based learning results in both cognitive and psychomotor competencies, as it is based on actual problems and involves

self-directed learning. Problem-based learning stimulates learners and professionals to take knowledge already acquired, integrate new information, and put it into practice (Damron-Rodriguez, 2008). Cowan, Norman and Coopamah (2007) described competence in their review as a variety of behaviours including attitudes, motives, personal interests, perceptions, receptiveness, maturity and personal identity. The different types of outcome measures explored in this systematic review were cognitive and psychomotor competence.

2.2.3 Search strategy in a systematic review

A search strategy describes the means of finding the evidence for a systematic review by identifying the databases that need to be searched for the evidence and by defining the search terms to be used. The aim of the search strategy in a systematic review is to find both published and unpublished studies, including grey literature, from the dates specified by the researcher. Experts in the field of study and authors may be contacted for ongoing and unpublished studies (Pai M, McCulloch, Gorman, Pai N, Enanoria, Kennedy, Tharyan & Colford, 2004). Initial searches of specific databases are done with the original search terms in order to identify other related terms. Once the initial search is completed, a second search will commence using all the identified search terms, and all the databases will be included. All reference lists pertaining to the relevant articles will be searched for any additional information conducted (Pai M, McCulloch, Gorman, Pai N, Enanoria, Kennedy, Tharyan & Colford,

2004). The detailed search strategy for this systematic review will be discussed later in this chapter under the methodology (subheading 2.3.2).

2.2.4 Reviewing a systematic review

When reviewing a systematic review, certain criteria need to be adhered to in order to maintain rigor and ensure a high quality study. The review method includes using a co-reviewer to ensure this high quality, as well as using checklists to guarantee that the evidence being collected is accurate and relevant to the systematic review. The methods used in this systematic review, including the criteria for assessment and synthesis of data collection, will be discussed (Pai, et al., 2004).

2.2.4.1 Criteria for assessment

Two reviewers should appraise all articles retrieved, both published and unpublished. Where the two reviewers do not reach agreement on a particular paper, a third person will be asked to appraise the paper and give recommendations (Pai, et al., 2004). The articles will be appraised using critical appraisal instruments sourced from the Joanna Briggs Institute (http://www.joannabriggs.edu.au/).

In this research study, both reviewers agreed on all articles appraised, making a third reviewer unnecessary.

2.2.4.2 Synthesis of data collected

All data collected must be analysed and the results interpreted. All findings from the articles are analysed in an unbiased way and must be interpreted and presented in a balanced, impartial summary (Hemingway and Brereton 2009).

The literature should be analysed for eligibility and quality of sources, to ensure unbiased research (Pai, et al., 2004). To achieve this, checklists must be used to check all articles, whether quantitative or qualitative, and a co-reviewer will assist with appraising the retrieved articles for inclusion in the review. In this systematic review all literature was appraised and checked using checklists from the Joanna Briggs Institute. Once the primary reviewer appraised the literature, the co-reviewer appraised the same literature and a consensus was reached regarding which literature was to be included in the systematic review.

When combining the results, a meta-analysis should be done to assess if the quantitative evidence is homogenous and effective, and a meta-synthesis should be used to assess qualitative data to ensure all evidence is accurate. Where possible, forest plots and tables should be used to show the characteristics of problem-based learning and the effects on nurse competence in order to place the findings in context. A statistical program designed to analyse meta-analysis, should be used to analyse the quantitative data. The instrument that was used was the JBI Meta Analysis and Statistics

Assessment Review Instrument (JBI MAStARI). Where necessary a statistician could be consulted in terms of appraisal of findings in quantitative papers. A program designed to analyse meta-synthesis could be used to analyse the qualitative data. The instrument that was used was the JBI Qualitative Assessment and Review Instrument (JBI QARI).
(http://www.joannabriggs.edu.au/).

The researcher used checklists from the JBI SUMMARI programme to analyse both the quantitative and qualitative data. Tables were used to explain the findings. The researcher was unable to use forest plots as there was only one review article appraised for quantitative analysis and there was thus nothing to compare.

2.3 METHODOLOGY OF SYSTEMATIC REVIEW

The methodology used for the systematic review was based on guidelines from 'What is a Systematic Review' (Hemingway & Brereton, 2009) and the 'Cochrane handbook for Systematic Reviews of Interventions' (Higgins & Green, 2009). These guidelines include:

- The review question was defined and criteria developed, and published and unpublished articles for ten years were identified.

- These articles were identified and retrieved through a systematic search strategy, and were selected by inclusion criteria.

- Each article was critically appraised and analysed for quality by one reviewer and one co-reviewer.

- The findings of each article were synthesised through meta-synthesis and meta-analysis.

Each of these steps is discussed below.

2.3.1 The review question

In a research study, the starting point is an interest in a topic, but many research questions materialise from the daily practice in the life of a health professional. One needs to be interested in something in order to research it, and make it interesting and worthwhile (De Vos, Strydom, Fouche & Delport, 2008).

Burns and Grove (2009) concur with De Vos et al. (2008) that research problems arise from practice. In practice, multiple problems exist, and each of these could be researched in various ways, depending on the experience of the researcher. The steps that researchers usually follow are firstly to observe the real world situation, and then identify possible topics that can be researched. Then questions are constructed around the topics, and lastly, the research problem is clarified and refined (Burns & Grove, 2009:76).

The review question in this review was based on the researcher's search for topics and questions by asking various people in the area of nursing education. Through this, an interest developed in problem-based learning and how it affects nurse competence. A literature search was done initially to investigate if any previous systematic reviews had been done on the effects of PBL and the effects on nurse competence, thus finding a need to do a systematic review to answer the review question.

The review question was: “Is there supporting evidence that problem-based learning has any effect on nurse competence?”

2.3.2 Search strategy

The search strategy in a systematic review is the method of retrieving all articles, published and unpublished, in the applicable databases to extract the necessary data needed for the review.

When conducting a systematic review, an exhaustive search for all primary articles needs to be conducted (Pai, et al., 2004). This includes searching electronic databases specific to the review topic, published and unpublished, reviewing articles by hand search, and contacting certain authors and experts to trace any ongoing studies (Annexure E) (Pai, et al., 2004).

Ng and Peh (2010) confirm in their study that an exhaustive search must be conducted in order to gather the necessary literature to bridge the gap between knowledge and practice. Ng and Peh (2010) discuss six crucial steps to follow when conducting a search of the literature for a systematic review.

These six steps are:

- Inclusion and exclusion criteria
- Identification of articles
- Article selection
- Data extraction
- Quality assessment
- Data analysis

For the purpose of this systematic review, all of these steps will be discussed.

2.3.2.1 Inclusion and exclusion criteria

This describes which articles can be included in the systematic review. The researcher uses sub-headings, outcome measures and study characteristics to describe the inclusion criteria. The exclusion criteria are also described fully in order to exclude those articles from the research (Ng & Peh, 2010).

Inclusion criteria describe which articles can be included, and exclusion criteria describe which will be excluded according to certain criteria that the researcher has chosen in order to select the correct evidence needed for the systematic review.

The inclusion criteria for this review are:

- Articles that were published and those not published in the last ten years (1999 – 2009).
- All articles that had a problem-based learning programme that nurses had gone through during their years of study.
- Both diploma and degree nurses.
- Articles that stated that the qualified nurse had been employed for a year post graduation from a problem-based programme.
- Articles that showed the cognitive and psychomotor competencies of the qualified nurse.
- Articles that were in the English language for the purpose of interpretation and analysis.

The exclusion criteria for this review are:

- No articles that referred to outcomes based education.
- No articles where the population was involved with another programme e.g. problem-based learning while doing CPR training.

2.3.2.2 Identification of articles

Identification of articles involves the electronic databases that need to be searched to obtain the evidence needed, i.e. PUBMED, MEDLINE, Google Scholar etc. This is where the search terms and keywords are important, as this aids the search for the evidence. The search includes published and unpublished articles from electronic databases, as well as any articles from hand searching that may have been found (Ng & Peh, 2010).

The researcher conducted an initial search where two data bases were explored: MEDLINE and CINAHL. This was done to find the initial search terms in order to search the other databases. The initial search was conducted over a three month period. While doing the initial search, only the titles of the articles were considered, and where the titles were unclear, the abstracts were considered.

The approach for the strategy for the systematic review:

- Identification of all articles on the topic in the last ten years (1999 – 2009)
- Initial search was done using MEDLINE and CINAHL including
  the search terms: “problem-based learning”, “nurse competence”, “nurse competencies”, and “nursing competencies”.

- Once the initial search had been conducted, the identified search terms and keywords for the second search were used to search all the databases:

    - PUBMED including MeSH
    - MEDLINE
    - CINAHL
    - JBI (Joanna Briggs Institute Library)
    - SABINET (for published and unpublished studies)
    - EBSCO Host
    - Cochrane Library
    - Google Scholar

The search terms included: problem-based learning, problem-based learning nursing, nurse competence, nurse competencies, nursing competencies, competenc*. These search terms yielded many articles and needed to be refined in order to locate the data that was needed (Table 2.1).

TABLE 2.1: INITIAL DATABASES AND NUMBER OF ARTICLES

DATABASE	SEARCH TERM	NUMBER OF ARTICLES
MEDLINE (PUBMED)	Problem-based learning	4484
	Problem-based learning nursing	759
	Problem-based learning nurse	377
	Nurse competence	9149
	Problem-based learning nurse competence	16
	Problem-based learning nurse competency	16
	Problem-based learning nurse competencies	17
CINAHL	Problem-based learning	4779
	Problem-based learning nursing	739
	Problem-based learning nurse	75
	Nurse competence	9149
	Problem-based learning nurse competence	178
	Problem-based learning nurse competency	29
	Problem-based learning nurse competencies	23

Once the initial search had been conducted, the identified search terms and keywords were used for the second search (Table 2.2). The remaining databases were searched using the same search terms:

- PUBMED including MeSH
- JBI (Joanna Briggs Institute Library)
- SABINET (for published and unpublished studies)
- EBSCO Host - ERIC
- Cochrane Library
- Google Scholar

TABLE 2.2: SECONDARY DATABASES AND NUMBER OF ARTICLES

DATABASE	SEARCH TERM	NUMBER OF ARTICLES
PUBMED	Problem-based learning	7026
	Problem-based learning nursing	1072
	Problem-based learning nurse	545
	Nurse competence	15337
	Problem-based learning nurse competence	223
JBI	Problem-based learning	0
	Problem-based learning nursing	0
	Problem-based learning nurse	0
	Nurse competence	0
	Problem-based learning nurse competence	178
SABINET	Problem-based learning	13
	Problem-based learning nursing	0
	Problem-based learning nurse	0
	Nurse competence	0
	Problem-based learning nurse competence	0
EBSCO HOST –ERIC	Problem-based learning	1041
	Problem-based learning nursing	2
	Problem-based learning nurse	385
	Nurse competence	1
	Problem-based learning nurse competence	148
COCHRANE LIBRARY	Problem-based learning	172
	Problem-based learning nursing	0
	Problem-based learning nurse	0
	Nurse competence	0
	Problem-based learning nurse competence	10
GOOGLE SCHOLAR	Problem-based learning	2470
	Problem-based learning nursing	799
	Problem-based learning nurse	1100
	Nurse competence	11500
	Problem-based learning nurse competence	504
	Problem-based learning any effect on nurse competence	275

2.3.3 Article selection

This describes the methods used to select high quality articles for the systematic review. It allows the eligible articles to be included according to relevance and avoids any duplication (Ng & Peh, 2010).

The selection of articles was first done according to the title of the article, followed by reading of the abstracts, and lastly by reading of the full text article. This allowed for screening and eligibility of the articles and avoided duplication of articles from the various databases.

Once the articles had been chosen, they were subjected to critical appraisal by the researcher and co-reviewer in order to include or exclude them for analysis. The articles were captured in the Joanna Briggs Summari programme (http://www.joannabriggs.edu.au), consisting of a Qualitative Assessment Review Instrument (QARI – Appendix C) and a Meta Analysis and Statistics Assessment Review Instrument (MAStARI - Appendix D) where the primary analysis was done by the researcher. The co-reviewer did the secondary analysis. The final analysis was done by the researcher and the articles were selected for inclusion or exclusion for further analysis and data extraction.

2.3.3.1 Papers reviewed

Papers that have both quantitative and qualitative research designs relating to the effects that problem-based learning has on nurse competence were reviewed and included in this systematic review.

Quantitative papers reviewed:

Only one paper was suitable to include in this systematic review. The author used a self-developed survey instrument to gather the data needed. Analysis of the data included descriptive statistics and frequency distributions.

Qualitative papers reviewed:

For this systematic review, four qualitative papers were reviewed. A combination of methods was used to gather data from the various authors.

These methods included:

- A phenomenological design using in-depth, individual interviews, as well as an interview guide, using open-ended, semi-structured questions.
- A qualitative evaluation study, which was descriptive and comparative in nature, and in-depth interviews were conducted.
- A descriptive study using focus groups interviews.

2.3.3.2 Participants

This systematic review focused on post qualification nursing staff, both degree and diploma, in their first year post qualification, who had been exposed to PBL in their curriculum. Both quantitative and qualitative papers were reviewed.

Quantitative paper participants:

The participants were all graduates from a Baccalaureate nursing program leading to a formal qualification, selected by a non-probability convenience sampling.

Qualitative paper participants:

This review focused on four papers. The participants were included using:

- The snowball effect, using a purposeful, criterion-referenced sampling method.

- The snowball effect by asking people to identify participants to join in a focus group.

- All the participants who had graduated from four PBL schools and four non-PBL schools.

2.3.3.3 Outcomes measured

In this review, the competence of nurse graduates who were in their first year of practice post-registration, and who had undergone a problem-based learning education, were analysed.

2.3.4 Data extraction

This involves the extraction of data from the articles only if they met the inclusion criteria, and was done by two independent researchers to avoid biased opinions, making the research of a high standard. The data are reviewed by the researcher and then by the co-reviewer against the checklists (Appendix C and D). The relevant data are then extracted for further analysis (Ng & Peh, 2010).

Data was extracted using the Joanna Briggs Summari MAStARI, and QARI programme. The quantitative articles were entered into the Joanna Briggs MAStARI programme, where they were all critically appraised by the researcher and a co-reviewer. Analysis on the extracted data was done. The qualitative articles were done in the exact manner; they were entered into the Joanna Briggs Summari QARI programme, where the primary and secondary

review was done. The articles were then either included or excluded for further analysis.

- **QARI checklist (Appendix C)**

The qualitative articles were critically appraised using checklists from the Joanna Briggs Summari QARI programme. The researcher, also the primary reviewer, entered the data into the programme and reviewed the studies using the instruments. The process was an initial assessment of the studies to make a decision to include them for the systematic review or not. This was done by answering ten (10) questions according to Yes, No, Unclear, Not Applicable and Comment. Once this was done, the co-reviewer then reviewed and critically appraised the studies and answered the same ten (10) questions. If the primary and co-reviewer reached consensus, the study was included for the systematic review. The next step was to extract the data from all the studies included. This was done by extracting the method, setting, participants, number of participants, interventions, and the author's conclusion from the study. From the above steps, the reviewers comments were made. The next step in this checklist was to extract the findings of the studies. All the findings were extracted from the appropriate evidence and illustrations from the studies. From these summaries were made from the findings, and categories were formed which ultimately lead to the synthesised findings of the systematic review.

- **MAStARI checklist (Appendix D)**

The quantitative articles were critically appraised using this checklist from the Joanna Briggs Summari programme. The primary reviewer (researcher) entered the data into the programme and reviewed the studies using this instrument. As with the qualitative articles, assessment was done by answering ten (10) questions specific to quantitative studies according to Yes, No, Unclear, Not Applicable and Comment. The studies were then co-reviewed and a consensus was reached to include the relevant studies. Extraction of data was then done according to the method, setting, participants, number of participants, interventions, the author's conclusion and the reviewer's conclusion. Once complete, the results are usually extracted by comparing studies with each, but in this systematic review, only one quantitative study was used so no comparison could be made.

2.3.5 Quality assessment

Ng and Peh (2010) describe quality assessment criteria that can be used for most systematic reviews. This involves using guidelines for reporting research and ensuring that the research is transparent and of high quality. The guidelines for reporting research were discussed in Chapter one:13-15.

For the purpose of this systematic review, critical appraisal was used to ensure transparency and a high quality study review. This will be discussed under assessment of methodological quality (Chapter two:42).

2.3.6 Data analysis

This describes the methods of analysing the data, and depends on the amount of data available (Ng and Peh, 2010).

Checklists (Appendix C and D) were used to check both quantitative and qualitative articles for relevance. A co-reviewer also appraised all articles to be included in the systematic review. All data from the articles were analysed using packages from the Joanna Briggs Institute. A statistical programme designed to analyse meta-analysis was used to analyse the quantitative data, and a programme designed to analyse meta-synthesis was used to analyse the qualitative data. This programme was accessed from the Joanna Briggs Institute, Summari MASTARI and QARI (http://www.joannabriggs.edu.au).

In this systematic review a meta-synthesis was used to analyse the qualitative data, but a meta-synthesis could not be used as only one article was analysed.

2.3.7 Assessment of methodological quality

The articles that were included in the systematic review underwent critical appraisal to ensure good quality results. This entailed using methods that were free from bias. This was done by ensuring that all articles underwent a secondary review by a co-reviewer, as well as using levels of evidence that ensured that only articles of high quality were entered for the systematic review (Evans, 2004).

Critical appraisal involves independent reviewers and includes levels of evidence to ensure high quality results. This will be discussed next.

2.3.7.1 Independent reviewers

Two independent reviewers assessed the eligibility of each study used in the systematic review. This allowed for the research to be of high quality and rigor, and no bias occurred. The co-reviewer of this systematic review is an Associate Professor at the Centre for Health Science Education, University of the Witwatersrand and has done numerous studies on problem-based education, and has an interest in systematic reviews.

2.3.7.2 Level of evidence

Levels of evidence are important in any research as it indicates whether the research is reliable and trustworthy and can be used in practice, or if it is vulnerable to bias and therefore not be used as guidelines or in practice (Rich, 2005).

The level of evidence of each study was assessed according to the Joanna Briggs Levels of Evidence. The levels of evidence are listed in table 2.3 and will be used in Chapter three.

TABLE 2.3: JBI - LEVELS OF EVIDENCE

Levels of Evidence	Feasibility F(1-4)	Appropriateness A(1-4)	Meaningfulness M(1-4)	Effectiveness E(1-4)	Economic Evidence
1	Metasynthesis of research with unequivocal synthesised findings	Metasynthesis of research with unequivocal synthesised findings	Metasynthesis of research with unequivocal synthesised findings	Meta-analysis(with homogeneity) of experimental studies (eg RCT with concealed randomisation) OR One or more large experimental studies with narrow confidence intervals	Metasynthesis (with homogeneity) of evaluations of important alternative interventions comparing all clinically relevant outcomes against appropriate cost measurement, and including a clinically sensible sensitivity analysis
2	Metasynthesis of research with credible synthesised findings	Metasynthesis of research with credible synthesised findings	Metasynthesis of research with credible synthesised findings	One or more smaller RCTs with wider confidence intervals OR Quasi-experimental studies(without randomisation)	Evaluations of important alternative interventions comparing all clinically relevant outcomes against appropriate cost measurement, and including a clinically sensible sensitivity analysis
3	a. Metasynthesis of text/opinion with credible synthesised findings b. One or more single research studies of high quality	a. Metasynthesis of text/opinion with credible synthesised findings b. One or more single research studies of high quality	a. Metasynthesis of text/opinion with credible synthesised findings b. One or more single research studies of high quality	a. Cohort studies (with control group) b. Case-controled c. Observational studies(without control group)	Evaluations of important alternative interventions comparing a limited number of appropriate cost measurement, without a clinically sensible sensitivity analysis
4	Expert opinion	Expert opinion	Expert opinion	Expert opinion, or physiology bench research, or consensus	Expert opinion, or based on economic theory

2.3.8 Presentation of results

The results of the systematic review are presented in the form of tables and flow diagrams for the qualitative and quantitative data. A meta-synthesis was conducted for the qualitative data and a narrative summary was done for the quantitative data analysis.

2.4 CONCLUSION

An extensive search was conducted using applicable databases to acquire published and unpublished articles. All steps were followed as discussed in the methodology and all possible articles were retrieved for this systematic review. Articles were assessed by a co-reviewer in order to maintain quality and all articles were analysed against checklists from JBI.

The data analysis and results will be discussed in the following chapter.

CHAPTER THREE

DESCRIPTION OF STUDIES USED IN THE SYSTEMATIC REVIEW

3.1 INTRODUCTION

This chapter describes the studies included in the systematic review in detail, and the studies excluded from the review. The types of papers, as well as a description of all the studies included for the systematic review, will be discussed. All the designs, sampling methods, data collection and data analysis of the studies included will be described in detail.

3.2 TYPES OF PAPERS FOR THE SYSTEMATIC REVIEW

Papers that have both quantitative and qualitative research designs related to the effects that problem-based learning has on nurse competence were included in this systematic review for the period from 1999 - 2009.

3.3 DESCRIPTION OF STUDIES USED IN THE SYSTEMATIC REVIEW

This systematic review yielded 72,591 articles on the topic of problem-based learning and nurse competence (Table 3.1). The researcher had to use very specific search criteria (described in Chapter 2) to ensure that the correct articles were obtained from the databases. The number of articles from the

databases decreased substantially when these search terms and criteria were used, as shown in Table 3.2.

TABLE 3.1 TOTAL NUMBER OF ARTICLES INITIALLY RETRIEVED FROM DATABASES

DATABASE	NUMBER OF ARTICLES
CINAHL	14972
COCHRANE	182
ERIC (EBSCO HOST)	1577
GOOGLE SCHOLAR	16648
JOANNA BRIGGS INSTITUTE	178
MEDLINE	14818
PUBMED	24203
SABINET	13
TOTAL	**72591**

TABLE 3.2 TOTAL NUMBER OF ARTICLES RETRIEVED USING SPECIFIC SEARCH CRITERIA

DATABASE	NUMBER OF ARTICLES
CINAHL	392
COCHRANE	0
ERIC (EBSCO HOST)	314
GOOGLE SCHOLAR	1630
JOANNA BRIGGS INSTITUTE	0
MEDLINE	456
PUBMED	23
SABINET	0
TOTAL	**2815**

The number of articles was narrowed down further by looking at the titles and reading the abstracts. By doing this, the researcher chose the articles that were the most pertinent to the systematic review. The total number of articles initially identified in the systematic review was eleven (n = 11). As indicated in Table 3.3, the same articles could be found in different databases. From this point, the researcher used the Joanna Briggs database, and entered the articles for critical appraisal. Once all the articles were appraised by the primary researcher, the co-reviewer appraised the articles, and a consensus was reached by both as to which articles to include and which to exclude for the systematic review. This left a total number of four qualitative articles and one quantitative article (Figure 3.1).

The process of the search strategy started with the primary search where two databases were searched: MEDLINE and CINAHL. Only the titles of the studies were considered and where there was uncertainty with the titles, the abstracts were read. From this, the initial search terms were developed and the secondary search then took place using key terms. All the databases that were mentioned in Chapter two were searched and 24,591 articles were available. From this point the specific search terms were used to decrease the number of articles for the systematic review. This left a total of 2,815 abstracts for the primary reviewer to read. At this point, the primary reviewer included the inclusion criteria which narrowed the articles down to eleven (11) that were chosen for critical appraisal. These eleven (11) articles underwent critical appraisal by the primary reviewer and co-reviewer, and when consensus was reached, a total of five articles were included for the systematic review – one (1) quantitative article and four (4) qualitative articles (Figure 3.1).

TABLE 3.3 ARTICLES FROM SAME DATABASES

ARTICLE	CINAHL	COCHRANE	ERIC	GOOGLE	JBI	MEDLINE	PUBMED	SABINET
A comparison of competence between problem-based learning and non-problem-based graduate nurses	√			√			√	
Competence of accelerated second degree students after studying in a collaborative model of nursing practice education	√			√		√	√	
Competence of newly qualified registered nurses from a nursing college				√			√	
Critical thinking ability of new graduate and experienced nurses	√			√		√	√	
Employer perceptions of knowledge, competency, and professionalism of baccalaureate nursing graduates from a problem-based programme	√			√		√	√	
Influence of training experience of Makerere University medical and nursing graduates on willingness and competence to work in rural health facilities				√			√	
Problem based learning – "bringing everything together" a strategy for graduate nurse programmes				√			√	
Problem-based learning and clinical practice: the nurse practitioners' perspective				√			√	
Problem-solving competency of nursing graduates	√			√		√	√	
The competence of nursing graduates from problem-based programmes in South Africa	√			√		√	√	
The effect of teaching method on long-term knowledge retention	√			√		√	√	

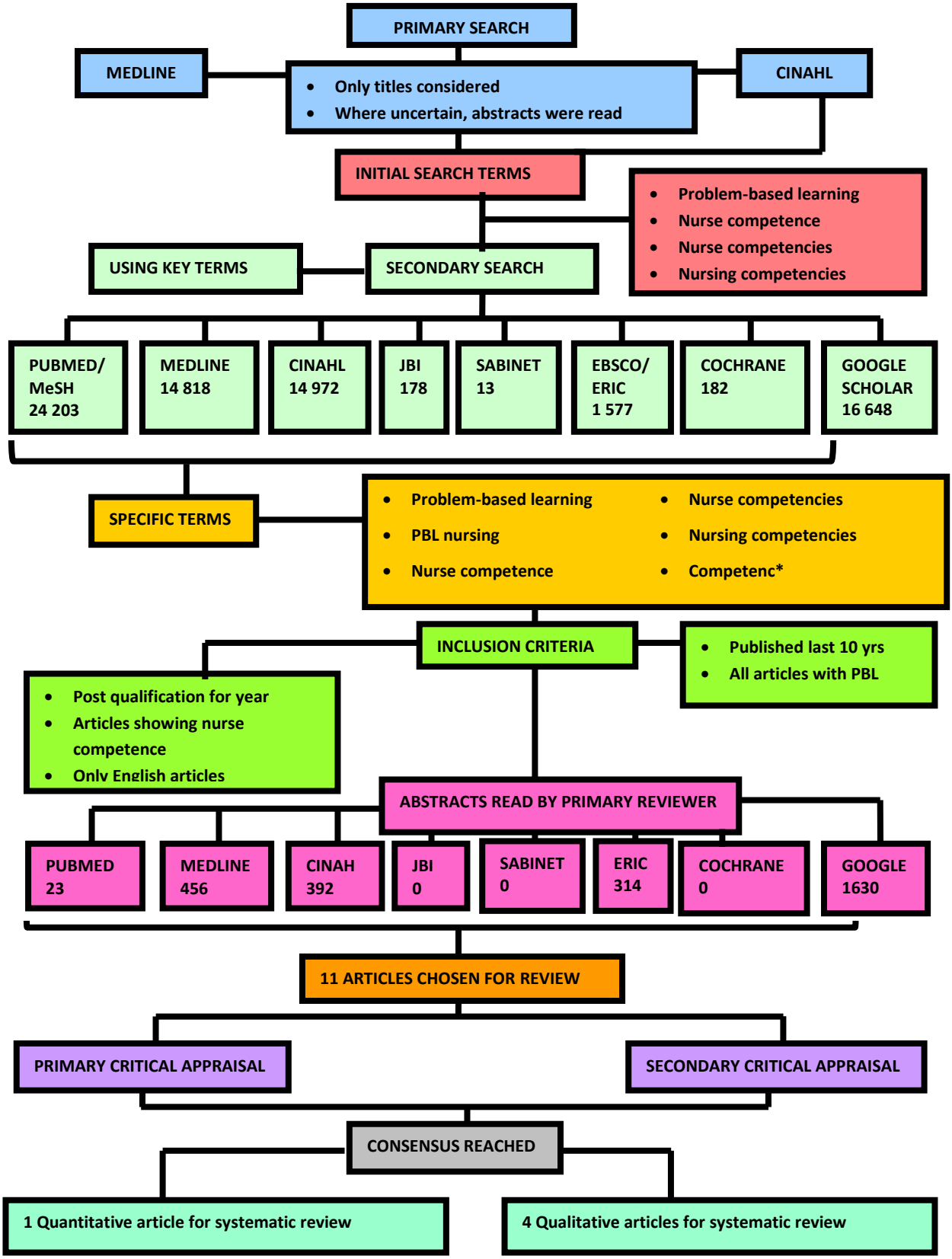


FIGURE 3.1 PROCESS OF SEARCH STRATEGY

3.3.1 Studies selected for the systematic review

Once the researcher had the specific search criteria in place, the number of studies to be reviewed reduced significantly. All the selected studies were reviewed with their abstracts, and if the abstracts seemed sufficient to meet the inclusion criteria, the researcher read the full research study. Most studies were not included due to their titles or abstracts not meeting the set criteria. The studies still had to undergo critical appraisal by the researcher and co-reviewer to be included for this systematic review. Both the researcher and co-reviewer used the Joanna Briggs Institute SUMMARI package including: QARI (qualitative assessment and review instrument) and MAStARI (meta analysis and statistics assessment review instrument), (http://www.joannabriggs.edu.au/).

Of the thousands of studies initially identified, and using the specific search criteria, the number of relevant studies from the databases was decreased significantly. Only eleven studies which met all the inclusion criteria were suitable for the full systematic review. Of these eleven studies, six were qualitative and five were quantitative.

The eleven studies underwent critical appraisal by the researcher and co-reviewer. Five of these studies were included for the systematic review and further data extraction (Tables 3.4 and 3.5); the remaining six were excluded as they did not meet the set criteria (Tables 3.6 and 3.7). For this systematic

review, there were four qualitative review studies and one quantitative review study that were fully reviewed and included.

- Critical appraisal process

This process includes the criteria used to determine the quality of articles used, the method of appraisal used and the outcome of the appraisal which will determine the final results in the systematic review (Evans, 2004).

The researcher was the primary reviewer who searched for all the articles. The researcher ensured that all the criteria were adhered to in the search for the articles (as discussed in Chapter two). The primary reviewer selected the eleven articles to be reviewed and entered the data into the Joanna Briggs Database SUMMARI package (QARI and MAStARI) to start the critical appraisal process. The secondary reviewer then appraised the data independently. The researcher and co-reviewer agreed on the articles to be included for further data extraction. These included one quantitative and four qualitative articles. The researcher then entered these articles into the JBI database and proceeded with the data extraction, resulting in a meta-synthesis for the qualitative articles and a narrative summary for the quantitative article. This critical appraisal process ensured that no bias took place and that rigor had been maintained.

3.3.2 Studies excluded from the systematic review

Six studies were excluded from the systematic review for the following reasons (Table 3.6 and 3.7):

- Not within the period of study mentioned, from 1999 – 2009.
- Not a problem-based learning method being used - the researchers used outcomes based education or based on performance.
- Graduates only underwent partial PBL programmes instead of an entire PBL training programme.
- Graduates were already in the workplace and only exposed to a PBL programme at that point for the first time.
- No cognitive or psychomotor competencies mentioned in the articles related to PBL.

TABLE 3.4 QUALITATIVE REVIEW ARTICLES INCLUDED IN THE STUDY

STUDY	DESIGN	SAMPLE / PARTICIPANTS	DATA COLLECTION	RIGOR	DATA ANALYSIS	MAIN FINDING	LEVEL OF EVIDENCE
Chikotas **(8)**	Qualitative, phenomenological exploration	Purposeful sampling. Snowball effect, criterion-referenced sampling. Graduates from two universities in United States of America. n = 13	In-depth, individual interviews. Interview guide using open-ended, semi-structured questions.	Member checks done twice.	Constant comparative method to determine key themes and patterns which were coded and compared to make categories.	PBL has a positive effect in the practical environment for nurse graduates showing psychomotor competence.	2
Uys, Van Rhyn, Gwele, McInerney, Tanga **(51)**	Qualitative, evaluation study, descriptive and comparative in nature.	Purposeful sampling. Graduates from four PBL schools and four non-PBL schools working in the same province. n = 128	Interviews with open-ended questions, all interviews recorded and transcribed verbatim.	Triangulation of sources by interviewing graduates & their employers. Interviewees were from different university & different researcher transcribed the recorded tapes.	Each researcher analysed the data of one group and developed categories.	PBL graduates are able to problem-solve better than graduates from a non-PBL background, showing cognitive competence.	2
Uys, Van Rhyn, Gwele, Gwele,	Qualitative, evaluation study, descriptive and	Purposeful sampling. Graduates from four universities in South	In-depth interviews with graduates and their supervisors.	One researcher coded first set of data & developed guide for	Each researcher analysed the data of one group and developed categories.	PBL graduates tend to function at a higher level and are able to cope in the clinical setting.	2

McInerney, Tanga **(52)**	comparative in nature.	Africa offering PBL programmes and three conventional programmes in the same provinces. n = 49		coding. Second researcher reviewed coding of first group of respondents. The two researchers worked together on first coding and taught others process. Rest of researchers met to discuss coding before final coding done and report written.			
Williams and Day **(56)**	Descriptive, qualitative study using focus groups	Purposeful sampling. Snowball effect – asking nursing faculty to identify from six - eight graduates from a PBL programme. n = 53	Focus groups – 10 in total	A research assistant managed the focus groups. Both researcher & research assistant met at the end of the interviews to discuss changes to interview guide, and verify key points for validity. All interviews were taped and transcribed.	Independent review of transcripts and audio tapes done by both researcher and assistant. Then used coding to get categories and eventually themes.	Graduates from a PBL programme have essential qualities of a competent nurse.	2

TABLE 3.5 QUANTITATIVE REVIEW ARTICLES INCLUDED IN THE STUDY

STUDY	DESIGN	SAMPLE / PARTICIPANTS	DATA INSTRUMENT	DATA COLLECTION	DATA ANALYSIS	MAIN FINDING	LEVEL OF EVIDENCE
Raines **(44)**	Quantitative design using descriptive statistics and frequency distributions.	Purposeful sampling. Graduates at time of graduation and again six months later in the work place. n = 66	Investigator-developed survey instrument based on Benner's domains of nursing practice.	Individuals completed a survey at end of study programme and did the same survey again at six months.	Descriptive statistics and frequency distributions used.	At the end of the programme the graduates rated themselves as competent but at the end of the six months, the graduate's level of competence increased in all domains measured.	2

TABLE 3.6 REVIEW ARTICLES EXCLUDED FROM THE STUDY - QUALITATIVE

STUDY	DESIGN	FOCUS	REASON FOR EXCLUSION
Kaye, Mwanike, Sewankambo **(25)**	Qualitative, participatory approach	To assess the influence of training experience from a PBL background on the participants' willingness, readiness and competence in working in rural health facilities.	The article did not meet the inclusion criteria – did not mention any cognitive or psychomotor competencies of the graduates and did not answer the research question.
Vittrup and Davey **(53)**	Qualitative, case study	To give a learning activity (PBL based) to graduate nurses to see if graduate could obtain strategies, review and mange information.	Article did not meet the inclusion criteria. They were twelve months post graduates working in an Acute Care Setting (who have never done PBL, and were being exposed to it for the first time). No competencies spoken of in article.

TABLE 3.7 REVIEW ARTICLES EXCLUDED FROM THE STUDY - QUANTITATIVE

STUDY	DESIGN	FOCUS	REASON FOR EXCLUSION
Applin, Williams, Day, Buro **(2)**	Quantitative, comparative design	The objective of the study was to see if there was a difference in competence between graduates from a PBL programme and a non-PBL programme.	The article did not meet the inclusion criteria – not within the specified time period.
Beers, Bowden **(3)**	Quantitative, quasi-experimental design	To see if the retention to learning was different between the graduates from PBL background and traditional background.	The article did not meet the inclusion criteria. The graduates only underwent a programme with partial PBL and not an entire degree or diploma as in a nursing programme. Also did not show competencies of the graduates.
Fero, Witsberger, Wesmiller, Zullo, Hoffman **(17)**	Quantitative, post hoc retrospective analysis	The purpose of the study was to identify critical thinking and/or learning needs of new and experienced nurses.	The article did not meet the inclusion criteria. The article was based on performance and not PBL.
Morolong, Chabeli **(35)**	Quantitative, descriptive, statistical, non-experimental design	To evaluate the competence of newly qualified nurses.	The article did not meet the inclusion criteria as it was not based on PBL but on outcomes based education.

3.4 METHODS OF STUDIES USED IN THE SYSTEMATIC REVIEW

The design, sampling methods, data collection and data analysis of all the qualitative and quantitative studies will be discussed in detail.

3.4.1 Design of the studies

The design of the qualitative and quantitative studies that the authors used is described in detail below.

- **Qualitative designs**

There were four studies used for the qualitative analysis in the systematic review. Of these four studies, two used the same methodological design to ascertain if problem-based learning had any influence on nursing graduates' competence in South Africa. The researchers used a qualitative evaluation study, which was descriptive and comparative in nature, and gathered data by using in-depth interviews.

One study used a descriptive, qualitative study design by means of focus groups, using interview scripts. The researcher used this design to determine if problem-based programmes were successful in producing graduates with competence and knowledge.

The researcher of the last qualitative study investigated what effect problem-based learning had on graduates' current clinical practice. The researcher based her study on phenomenological exploration of the lived experiences of the graduates. In-depth interviews were used to gather data.

- **Quantitative designs**

In the systematic review, there was only one quantitative study used for analysis. The researcher used descriptive statistics and frequency distributions to analyse the data collected, which was done at two different times: one at the time of graduation and one six months later in the clinical area, using the same survey questionnaire.

3.4.2 Sampling methods in the studies

The sampling methods used by the authors of the studies will be described.

- **Qualitative sampling methods**

The sampling methods of the qualitative articles were all different. The researchers used all the nursing graduates from four problem-based schools, and four non-problem-based schools in the same province, who

were in the country at the time of the study, and who responded to the mail. The total number of participants was one hundred and twenty eight (n = 128). The same researchers as above, but using a different qualitative study, used graduates from the four problem-based programmes from the same universities (as above), and three conventional groups (control group) from the same province. The total number of participants was forty nine (n = 49).

Two qualitative studies used the snowball effect. One used the snowball effect together with a purposeful, criterion-referenced sampling method to identify participants to take part in the study**.** The total number of participants was thirteen (n = 13). The remaining study used the snowball effect alone and had a total number of fifty three participants in ten focus groups (n = 53).

- **Quantitative sampling methods**

In the quantitative article, the researcher used the whole population, incorporating all the students who enrolled in, and graduated from, the programme. The total number of the study population was sixty-six (n = 66).

3.4.3 Data collection in the studies

Data collection techniques used by the authors in the studies will be discussed.

- **Qualitative data collection methods**

Most of the qualitative studies used interview methods to collect data. Two studies made use of in-depth interview guides with open-ended questions. One study used face-to-face in-depth interviews with the participants. The last qualitative study made use of focus groups using interview scripts**.**

- **Quantitative data collection methods**

The author made use of the T-test. The participants completed a survey questionnaire at the end of their programme and again at six months while employed in a clinical setting.

3.4.4 Data analysis in the studies

This describes how the authors analysed their data to attain their results.

- **Qualitative analysis**

In two of the qualitative studies, the authors each analysed a group of students using templates. One template was based on the style described by Crabtree and Miller (1999) and the theoretical framework from Benner's stages of practice. The other template was based on Fitzpatrick, While and Roberts' (1996) theoretical framework together with Benner's stages of practice. From these two templates, the authors were able to derive categories and entered them into a computer programme to analyse and manage their data - this enabled them to quantify numbers in each category.

In the remaining two qualitative studies, one author used constant comparison methods to analyse the data to determine themes and patterns, which were then coded and categorised. The other author used independent reviews of all the interview transcripts and audio tapes, and using different types of coding, categories were identified and themes were generated.

- **Quantitative analysis**

The author used descriptive statistics and frequency distributions to analyse the data. Data from test 1 (participants at graduation) and test 2 (graduates at six months in a clinical setting) were compared using the mean scores of each, with the scores being normally distributed.

3.5 CONCLUSION

The process of the search strategy for the systematic review yielded thousands of articles, and as has been indicated, only a few articles were appropriate to be reviewed. The selection process as shown resulted in one quantitative article and four qualitative articles that were used. The studies that were selected have been discussed in this chapter.

In the next chapter, the results will be discussed in more detail.

CHAPTER FOUR

RESULTS OF THE SYSTEMATIC REVIEW

4.1 INTRODUCTION

The results of the systematic review provide a complete record of all the studies analysed and discusses the issues pertaining to the systematic review:

- Problem-based learning has a positive effect on nurse competence
- Employees are generally positive about problem-based learning graduates' competence.
- Competence of post graduate nurses on graduation compared to after six months in clinical practice showed improvement.

In this chapter, the data and information synthesised from various studies, both qualitative and quantitative, regarding the effects of problem-based learning on nurse competency are discussed. The meta-synthesis of the qualitative evidence is fully described according to the findings and categories that were found and analysed. Since only one study was analysed, the quantitative evidence will be discussed as a narrative summary.

4.2 QUALITATIVE EVIDENCE

Due to the critical appraisal, four qualitative studies of high quality and found to contain sufficient evidence were included for the systematic review. Data were extracted from the four studies and fourteen relevant findings were identified and placed into four categories. The four categories were re-organised into two main synthesised findings (Figure 4.1). A meta-synthesis was compiled and presented below.

4.2.1 Employers generally positive about PBL graduates competence

This finding was synthesised from one category from the various qualitative articles used in the systematic review. The category was based on findings using qualitative articles from various researchers who had similar thought patterns on problem-based learning and nurse competence.

FINDING	CATEGORY	SYNTHESISED FINDING
A new generation of nurse	Feelings of contrast	**Employees generally positive about PBL graduates competence** Some employers of the PBL graduates had negative comments about the graduates but most were positive and wanted them to succeed.
Level of practice		
Levels of problem-solving		
Shades of gray		
All-encompassing	Changing thinking	**PBL has positive effects on nurse competence** Graduates from a PBL background were able to take on a leadership role and make decisions more easily. They showed both cognitive and psychomotor competence.
Journey		
Problem-solving strategies		
Functions that formed the focus of the incidents selected	Nurse practice affirmation	
Incident results		
Potential to lead us into the future		
Still rough around the edges		
Supervisors perceptions		
We want them to succeed		
Freedom	Soaring high	
Respondents' feelings		

FIGURE 4.1 SYNTHESES FOR THE SYSTEMATIC REVIEW

4.2.1.1 Feelings of contrast

This category was synthesised from four findings in the studies analysed. These findings include: "*a new generation of nurse*", "*level of practice*", "*levels of problem-solving*" and "*shades of gray*". This describes the feelings of both the practitioners who have a PBL background, and their employers while working in the clinical area.

Chikotas (2009) reports from her study that the PBL graduates felt that they had not learnt enough during the programme and that their knowledge base was not sufficient to meet the needs of the clinical areas upon graduation. The graduates did, however, feel confident that they were in a situation that enabled them to gain that knowledge. PBL gave them the skills needed to find the answers - this shows feelings of contrast. This finding was referred to as "*shades of gray*". One graduate said that she thought that things would be "*black or white*" when in the clinical setting, as they had been taught everything that they should know. However, in the clinical field, there is no "*black and white*", but rather "*shades of gray*", and if the knowledge is needed they would be able to access and acquire it (Chikotas, 2009:395).

Uys et al. (2004a; 2004b) describe findings in their studies that form part of this category, "*levels of practice*" and "*levels of problem-solving*". In "*levels of practice*", both graduates and employers describe different incidents at different levels according to Benner's (1984) characteristics of nursing practice.

Graduates invariably described the incidents in the clinical areas in which they were practicing in at a different level to their employer. These levels of practice ranged from the novice level, where PBL graduates could not cope with the incidents, to the proficient level, where PBL graduates could anticipate a clinical problem based on their own assessment and act on that problem with insight.

"*Levels of problem-solving*" involved incidents that required problem-solving according to Benner's (1984) characteristics of nursing practice. Again, there was a difference between the graduates (PBL and non-PBL) and the employers describing the incidents. Most of the incidents at the novice level were described by the non-PBL graduate group compared to the PBL group that described incidents at the proficient level. The employers could not specify any incidents at any levels for either group. This again shows areas of contrast.

Williams and Day (2009:7) found that employers identified behaviours that could be attributed to a "*new generation of nurse*". These behaviours included an opinionated attitude of "*you are lucky to have me*", some PBL graduates viewed nursing as a job only, and not as a commitment to quality patient care, and employers implied that the high absenteeism rate experienced was due to the newly qualified PBL graduates. Other employers reported that most of the PBL graduates practiced skills and established leadership roles in the clinical area due to the PBL programme that they had gone through, and that they

were able to problem-solve and think more broadly. Again, these show areas of contrast.

4.2.2 Problem-based learning has a positive effect on nurse competence

This finding was synthesised from three categories from the qualitative articles used in the systematic review (Figure 4.1). The categories were based on the findings using qualitative studies from various researchers who had similar thought patterns on problem-based learning and nurse competence. The findings were then categorised by the researcher to form categories where similar findings could be grouped together.

4.2.2.1 Changing thinking

This category is based on three findings from the authors of the studies. The findings include: *all-encompassing*, *journey* and *problem-solving strategies* which influence and change the way nurses think.

Chikotas (2009:395) found that the nurse practitioner sees the patient as a whole, and gets the "*full story*" - the nurse practitioner must be "*all-encompassing*". When a nurse practitioner has a PBL background, the literature supports that the practitioner takes all aspects of the patient's life into consideration, allowing the practitioner to manage the patient holistically. Chikotas (2009:395) also describes how a PBL nurse practitioner is able to move from one point to another by using problem-solving skills, and is able to

make clinical decisions about patients. Chikotas describes this as the "*journey*" of a practitioner from one point to the next. This demonstrates that PBL produces a practitioner who is an individual that is self-directed, can problem-solve and can make decisions in the clinical area. PBL graduates had more job satisfaction and were better prepared for the clinical practice due to the PBL programme, showing how the professionals were able to adjust and change their thinking to ensure quality, holistic professional nursing care (Chikotas, 2009). Graduates from a PBL programme will continue to improve in their skills and will remain competent practitioners throughout their professional careers due to their constant need for knowledge and their ability to adapt to new practices in nursing (Chikotas, 2009).

Uys et al. (2004a:506), describe nurse practitioners from a PBL background as having "*problem-solving strategies*", which include using people skills, the ability to improvise where necessary, the ability to suggest policy changes, who are assertive and who can access help when needed. These strategies show changes in thinking patterns due to the practitioners' problem-solving abilities, their viewing of the patient as a whole and their being able to move from one point to another.

4.2.2.2 Nurse practice affirmation

Nurse practice affirmation is based on six findings. These findings include: functions that formed the focus of the incidents selected, incident results, the potential to lead us into the future, still "*rough around the edges*", supervisor's perceptions and desires for them to succeed. All the findings in this category confirm competence in the practice of the nurse practitioner.

Uys et al. (2004a; 2004b) discuss three findings in their studies that affirm nurse practice. In one study, the researchers focused on the outcomes of problem-based learning programmes on actual clinical practice and on the competence of the graduate compared to those who did not have a problem-based learning programme. The graduates from the PBL programmes were found to have more positive incidents and outcomes than the non-PBL graduates. The reason for this was that they were able to overcome the barriers that they were facing, and that they were able to learn from the incident. This, in turn, had a positive effect on their thinking patterns which lead to nurse practice affirmation. The majority of the incidents were related to their clinical roles and the rest were related to management and the teaching roles that they took on in their clinical practice. Another finding from their second study confirms that nurse practice is that of the supervisor's perceptions. The supervisors were positive about the PBL graduates, describing them as the best in the clinical field, and that they wanted them to succeed. The

supervisors felt more confident towards the PBL graduates as they were autonomous practitioners and were leaders in the clinical areas.

Williams and Day (2009:5) describe PBL graduates as "*still rough around the edge*". The PBL graduates have the ability to realise in the first few months of clinical practice that they had not yet acquired many of the skills in their programmes that they were now expected to know and to have. They were also labelled by their employers as "task-orientated", as they could only focus on the task at hand. However, the more time the graduates spent in clinical practice, the more they were able to practice with autonomy, allowing the graduate to focus on the patient and apply their skills.

Williams and Day (2009) concur with Uys et al. (2004b) that employers and supervisors would like PBL graduates to succeed in their practice. Williams and Day (2009) found that the employers felt an obligation to support the graduates' learning through coaching and mentoring, and to continue doing this throughout their employment, encouraging lifelong learning. Graduates from a PBL programme appear to have a stronger need for lifelong learning and are more self-directed to gain current knowledge. Employers also identified clinical leadership skills possessed by PBL graduates and that these skills were lacking in graduates from a non-PBL programme. Graduates from a PBL programme have the "*potential to lead us into the future*" due to the skills that they have learned, from practicing with autonomy, having the ability to gain new, current knowledge and having the leadership skills to take control of

the clinical areas, confirming good nurse practice and competence (Williams and Day, 2009:8).

4.2.2.3 Soaring high

This category is based on two findings from studies analysed and include: freedom and respondents' feelings. It describes how the respondents are able to pursue knowledge at a higher level independently and are less reliant on others. It also shows that they are more confident to make decisions and that they feel more comfortable in the practical setting.

Chikotas (2009:395) describes the finding as "*freedom*", where the graduates felt that they had the ability to pursue a knowledge base as independent, self directed learners, and that they were at no point reliant on anyone to provide or guide them to access that knowledge. Problem-based learning programmes provide the graduate with the ability to practice in the clinical area with full autonomy and freedom due to the knowledge base that they have gained during their education and the ability to gain further knowledge during their clinical practice. Through PBL programmes, practitioners realise that their confidence, independence, autonomy, and leadership abilities are skills learnt and will be used throughout their professional careers (Chikotas, 2009). These skills will always allow the practitioner to problem-solve and find the resources to update their knowledge, allowing the practitioners to feel positive and confident in the care that they are delivering (Chikotas, 2009).

Uys et al. (2004) describe in their findings, the "*respondents' feelings*". The majority of the PBL graduates felt content with the incidents that they had described in the clinical areas which they were part of. The incidents that the graduates had to respond to were positive and reflected competence and good performance.

PBL graduates have the freedom to pursue knowledge independently and are able to practice with competence, allowing them to soar high and accomplish many things. They have the ability to find the knowledge that they need to soar higher in clinical practice without having to depend on anyone, and have the insight to perform at a higher level when necessary.

4.3 QUANTITATIVE EVIDENCE

4.3.1 Comparison of post graduate nurses at graduation to after six months in clinical practice

One quantitative article of high quality was found to contain sufficient evidence to be used in the systematic review. As there was only one article for the systematic review, there was no meta-analysis done. The article was reviewed and results presented as a narrative summary.

The purpose of Raines' study (2009) was to compare the competence of the graduate at graduation and then again at six months post graduation after an accelerated programme of study (e.g. PBL). Raines (2009) used an investigator-developed instrument based on Benner's (1984) domains of nursing practice, and measured each domain using a Likert scale. The same instrument was used at the time of graduation (T 1) and again at six months post graduation (T 2).

At graduation (T 1), 64 participants (96%) completed the instrument, and at six months (T 2), 58 participants (88%) completed the instrument. Raines (2009) therefore used the 58 matched pairs of participants (88%) from both groups to gather the data.

4.3.1.1 Competence at the end of programme of study

- Individual's average level of competence at time of graduation on the domains of nursing practice ranged from 3.50 – 6.18.

  (Scale: 1= not competent, 4=competent, 7=highly competent)
- Overall average of perceived competence on domains of nursing practice was 3.99 with a standard deviation of 0.82, showing that the individuals perceive themselves as competent at time of their graduation.
- A p-value of < 0.0001 was found in the study at graduation. This is significant, as a p value of <0.05 shows that there is less than a 5% chance that the results are random, and that the results are a true reflection of the data collected.

4.3.1.2 Competence six months after graduation

- Individual's average at six months after graduation on the domains of nursing practice ranged from 5.41 – 6.19.

  (Scale: 1= not competent, 4=competent, 7=highly competent)
- Overall average of perceived competence on domains of nursing practice was 5.74, with a standard deviation of 0.88, indicating that at six months there was an increase in all domains of nursing practice, and showing that they had achieved greater competence in the clinical area.

- A p-value of < 0.05 and < 0.0001 was found at six months post graduation. This is significant as a p value of <0.05 shows that there is less than a 5% chance that the results are random, and that the results are a true reflection of the data collected.

In this quantitative study, it is clearly shown that graduates felt that they were competent to practice from the start, but recognised downfalls in certain nursing domains. After six months of practicing in the workplace, all levels of competence increased and the graduates could practice with ease and could demonstrate competence at all levels, including cognitive and psychomotor areas. This was due to the graduates having gone through a programme like PBL.

4.4 CONCLUSION

The results of both qualitative and quantitative articles were discussed in this chapter. A meta-synthesis was fully described and discussed in this chapter, however, a meta-analysis was not done due to only one study being entered into the systematic review; therefore a narrative summary was done. The next chapter will discuss the results and conclude the systematic review.

CHAPTER FIVE

DISCUSSION, LIMITATIONS AND CONCLUSION

5.1 INTRODUCTION

In this chapter, the results of the systematic review are discussed. This will include summaries of both the qualitative and quantitative findings. Limitations of this study will be discussed, including recent studies that were published but could not be included due to the time frame and inclusion criteria. Implications of the study with regards to practice, future research, and teaching and learning will be addressed. Finally the systematic review will be concluded.

5.2 QUALITATIVE SUMMARIES

Four of the six articles were analysed and included in the systematic review. From the final results, there were two synthesised findings:

5.2.1 Employers are generally positive about PBL graduates' competence

From the articles, some of the employers of PBL graduates had negative comments about the graduates, but most were positive and wanted the graduates to succeed. One category was synthesised from the articles analysed: "feelings of contrast".

- ***Feelings of contrast***

Uys et al. (2004a) describe problem-solving as the competency of nursing graduates in the clinical area, comparing PBL to non-PBL graduates. In their study, Uys et al. (2004) discuss how supervisors could not identify any specific incidents, but that the graduates could identify and describe incidents without hesitation. The majority of incidents that were described by the graduates were at the advanced-beginner level or above, according to Benner's (1984) levels of nursing practice. The majority of novice level incidents were described by the non-PBL group, compared to the proficient level incidents, which were identified and described by the PBL group.

In a second article by Uys et al (2004b), they describe and evaluate the outcomes of PBL programmes with regard to clinical practice and competence of graduates, and compare it to non-PBL programmes. Again, incidents were identified and described according to Benner's (1984) levels of nursing practice. Graduates from both groups described incidents from novice to proficient levels. Both groups of graduates had incidents from the novice level, but only the PBL group had incidents from the proficient level. The supervisors and graduates did not agree on the level of incident. The supervisor often described the incident at a higher level than the graduate. In both the articles from Uys et al. (2004a; 2004b), it can be seen that graduates from a PBL background were able to identify and describe incidents better than non-PBL

graduates. This resulted in problem-solvers who were competent in the clinical area.

Chikotas (2009) describes in her study how the graduates doubted the content that they were learning, and if it was adequate for them to enter the clinical area to practice competently. Once in the clinical area, the participants felt that they did not have enough knowledge to practice. The participants did, however, feel confident that PBL provided them with skills to acquire the knowledge and the understanding that they needed when confronted with a problem, allowing them to become competent in both psychomotor and cognitive components.

Williams and Day (2009) found that most employers considered PBL graduates as disciplined and professional, but that there were a few graduates in interviews that had negative attitudes. Some of the employers stated that graduates viewed nursing as only a job and not as a commitment to the quality nursing care of a patient, and that they could resign at any stage and get a job anywhere. Williams and Day (2009) found that other employers had very positive comments about PBL graduates: they were assertive, knew how to problem-solve, were aware of their professionalism and ethics, were advocates for their patients, were able to initiate a conversation with patients and discuss their problems and solutions, and mostly wanted to continue to learn and gain knowledge.

As can be seen by these articles, there were feelings of contrast between employers and graduates from a PBL education. Some employers were satisfied with the graduates and wanted to employ them as they showed skills like problem-solving and decision making, while other employers disliked them as they thought that they had the wrong attitude. The graduates from a PBL background also displayed feelings of contrast, as they were unsure of their competencies at the beginning of their employment. As they spent more time in the clinical areas, they became more confident in their competencies.

There are some negative perceptions about PBL graduates, but research shows more positive than negative comments. This shows that PBL graduates have psychomotor and cognitive competencies which have developed through PBL programmes, as can be seen by their ability to find information, problem-solve and make decisions when required and be assertive and professional (Uys et al. 2004(a) & 2004(b), Chikotas, 2009, Williams & Day, 2009).

5.2.2 PBL has positive effects on nurse competence

Graduates from a PBL background were able to take on leadership roles and make decisions more easily. They showed both cognitive and psychomotor competence. Three categories were synthesised from the articles analysed: “nurse practice affirmation”, “changing thinking” and “soaring high”.

- ***Nurse practice affirmation***

Uys et al (2004) showed that most of the incidents that were described were positive for the graduates, as well as for the patients. The employers were impressed that the graduates were able to assess situations, make decisions and initiate procedures in order to improve the quality of patient care. The employers were positive about the PBL graduates and their competencies in the clinical areas.

Williams and Day (2009) showed in their study that employers felt that PBL graduates were more comfortable with their knowledge base than with their clinical skills. Employers felt that at the time of graduation, PBL graduates were more “task focused”, but as they spent more time in the clinical area, they learnt to focus on patient and quality care. The research also showed that some employers thought that PBL graduates had more confidence at graduation, and this allowed them to ask questions when they were unsure of what to do.

Employers wanted new PBL graduates to succeed, but felt that it was hard for them as they had to take responsibility for the clinical area after only being employed for a short period of time. The study showed that employers had greater expectations of the PBL graduates, expecting them to perform from the start, and to have a better knowledge compared to non-PBL graduates.

Williams and Day (2009) further showed in their study that PBL graduates are curious to find answers to questions that they did not know. They are keen to find answers through research, and tend to share their findings with others. They seem to have the ability and willingness to continue to study throughout their professional lives, making them leaders in their profession, and giving them the capability of leading the nursing profession into a better future.

These articles show affirmation of nurse practice. Graduates from a PBL background have the ability to lead nurses into the future, to do research and continue to learn, and are competent in both cognitive and psychomotor areas after they have been in the clinical area for at least six months.

- ***Changing thinking***

Chikotas (2009) showed that PBL graduates are able to assess, diagnose, treat and manage patients' illnesses by approaching the patient holistically. This involves looking at all the facts presented and making a conclusion based on these facts. In the research, Chikotas (2009) also provided evidence that in order to look at a patient holistically, the practitioner has to follow certain steps to work through the problem and reach a conclusion. These steps involve prioritising the problem, researching the information, gaining more knowledge and formulating a conclusion, including the treatment and management of the problem.

Uys et al. (2004) describe the problem-solving strategies which are mostly used by PBL graduates: being assertive and using people skills. The PBL graduates use people skills to argue or negotiate when communicating with others. These people skills make them leaders in the clinical area, allowing them to make decisions for various situations and showing their assertiveness in a positive manner.

Williams and Day (2009) found that PBL graduates have excellent leadership abilities as they are advocates for their patients, they can communicate well with the multidisciplinary team, they can be assertive when needed, they can prioritise and treat the patients' correctly, they are accountable for their actions and lastly they are able to conduct research to add to their knowledge and share it with others.

The studies mentioned show that the way of thinking has changed. Practitioners from a PBL background look at a patient as a whole and form a conclusion by following steps around a problem, and formulating treatment and management plans for that problem. PBL graduates also have certain skills which are acquired in their programme, such as people skills and assertiveness, which facilitate decision making. This shows cognitive and psychomotor competencies and the positive effects that they have on nurse practitioners' clinical skills.

- ***Soaring high***

Uys et al. (2004) described the respondents' feelings in their study. The research showed that the respondents were positive about the incidents, as most of the incidents were described as having good competencies. The researchers found that some PBL graduates were not positive during the incident, but once the incident was over, they felt that they had accomplished their goal and felt more confident and positive.

Chikotas (2009) described how PBL influences a practitioner's practice in the clinical area. PBL enables a practitioner to practice as an independent, self-directed individual, who is able to research and find answers using various means and resources, and make decisions based on evidence. They are able to think critically due to their PBL background, and this enables them to give quality patient care.

These studies demonstrate how the graduates from a PBL education are leaders in clinical areas, as they have the potential to achieve greatness and succeed in their profession.

5.3 QUANTITATIVE SUMMARIES

One out of the five studies was analysed and included in the systematic review.

Raines (2009) discussed the competence of accelerated second degree students after studying a collaborative model of nursing practice education. The collaborative model of nursing involves practice-based education, which promotes educational and learning experiences, where students are placed in a clinical area, and together with an expert, practice clinical competencies and skills. This allows the students' opportunities to experience and reflect on the competencies and skills acquired in the clinical area and encourage the students to take responsibility for their own knowledge and learning processes (Raines, 2006). These experiences will stay with the students where they may reflect on them in the future as they practice in a professional capacity.

Collaborative practice-based education is much the same as problem-solving education, where students also take responsibility for their own learning and knowledge, which comes from old and new experiences. They work together in groups to solve problems, and collaboration is needed from others in order for problem-based learning to work. The problem and solution is shared, analysed and discussed with others and finally reflection occurs (Savery, 2006).

Raines (2009) compared the same group of participants at two different time frames. The first time frame was at the time of the participants' graduation when they rated their competence at the end of their study. The same group of participants was asked to rate their competence again six months after graduation.

The students' perception at graduation was that they were competent in nursing practice. Raines (2009) concluded in the study that the graduates perceived more competence in psychomotor than cognitive behaviours, and had three low scoring areas: quality health care practice, patient diagnosis and monitoring roles, and an inability to keep up with changing situations.

At the six month data collection time frame, the participants' levels of competence increased in all areas, and the psychomotor and cognitive behaviours were well balanced. Raines (2009) concluded that there was a relationship between the learning experienced by the participants and their perceived competence to practise as professional nurses. The study showed that experiences learnt throughout their programme enabled the participants to utilise reflective thinking skills in clinical practice - this was evident at the six month data collection time frame.

Raines (2009) found at the six month time frame that the transition from a student nurse to a practitioner was easier for the participants as they believed that they were more prepared for clinical practice than they were at the end of

the programme. This allows for the practitioners to be part of the workforce from the start, and to practice independently and with ease, showing all levels of competence (psychomotor and cognitive).

Learning experiences are an essential component in a programme to allow students to develop into independent, self-reflecting, autonomous practitioners, demonstrating their psychomotor and cognitive competence, and making them leaders in their profession.

5.4 LIMITATIONS

The limitations of the systematic review will be discussed:

- ***Time frame for the systematic review***

The time frame stipulated in the systematic review was a ten year period, 1999 – 2009. The researcher found few studies that incorporated all of the inclusion criteria, one being time frame, to include in the systematic review.

During the data analysis, the researcher and co-reviewer found that one quantitative study could not be analysed as the article fell outside the review date, but met all the other inclusion criteria. The article was accepted in 2010 and could therefore not be used for the systematic review. The study was

titled: A Comparison of Competencies between Problem-Based Learning and Non-Problem-Based Graduate Nurses (Applin, Williams, Day, Buro, 2010).

In summary, Applin et al. (2010) found that PBL and non-PBL graduates were similar in competencies at the time of graduation. They found this significant as it suggests that graduates believe that they are competent to practice as they enter the clinical workplace, regardless of what educational medium they had been through. Applin et al. (2010) found that the PBL graduates used critical thinking and research skills, as well as self directed learning, to be independent practitioners with cognitive and psychomotor competencies. The knowledge and information that the PBL graduates possess is all evidence-based and is practiced in the clinical areas. Non-PBL graduates did not think it important to have critical thinking in clinical practice and they did not comment on self-directed learning and evidence-based practice. This shows that problem-based learning does indeed have an effect on nurse competency.

The researcher attempted to contact the authors of other studies done to gain information on, and an understanding of, problem-based learning. Electronic mail was sent to Noreen Chikotas, Bloomsburg University, USA, and Beverly Williams, University of Alberta, Canada. The only response received was from Beverly Williams who had just done a study on PBL, and with permission from her co-investigator, agreed to share their findings (Appendix E). Unfortunately, the findings could not be part of the systematic review, as the article was outside of the time frame, and the study was not yet published.

The study title was: The Influence of an Undergraduate Context Based Learning Program on Evolving Professional Nursing Graduate Practice (Williams, Spiers, Fisk, Richards, Gibson, Kabotoff, McIlwraith, Sculley, 2010).

In the summary of the study, Williams et al. (2010) found that the Problem-Based Learning (PBL)/Context Based Learning (CBL) graduates perceived that their entry into the clinical area as no different from other graduates in traditional non-PBL programmes - the transition from graduation to working in the clinical area was the same for both. The PBL/CBL graduates felt they were sufficiently educated and competent to start practicing in the clinical area immediately after they had completed the programme. They felt that the programme equipped them with the skills necessary for the clinical situation, and that the programme would further develop those skills. The graduates also knew that if they did not know something, they had the knowledge to research it. PBL/CBL allows the graduates to be critical thinkers and, together with research, allows them to provide holistic, quality care to all patients. This study shows that PBL does have an effect on nurse practice, and influences their competencies.

- ***Participants in the studies***

A large number of the articles that were found in the databases researched predominantly undergraduate students who were studying in a problem-based programme. A limited number of articles were found on post-graduate

practitioners who had studied in a problem-based programme, and were in practice for six months.

5.5 IMPLICATIONS

- **Practice**

There is a positive implication for nursing practice as it shows that PBL has an effect on nurse competence, producing practitioners that are leaders who can practice with autonomy. These nurse practitioners who take on leadership roles will be the voice of the nursing profession, and will take the practice of nursing to new levels where patient care is of high quality, maintaining the standards of the profession and ensuring that all nursing practice is evidence-based. They are lifelong, self-directed learners who are accountable for their decisions and actions.

- **Research**

There has been much research done on PBL and competence in students, but minimal research on PBL and graduates. More research is needed on PBL post graduation, while practicing in the clinical situation and when the graduate progresses in the profession.

- **Teaching and learning**

Nursing programmes and institutions should include PBL as a teaching and learning strategy to ensure competent practitioners who can provide quality care to patients and are able to maintain standards of the nursing profession.

5.6 CONCLUSION OF THE SYSTEMATIC REVIEW

The objectives of the systematic review as stated in Chapter one, are discussed and clarified in this section, and the systematic review is concluded.

- ***Critically evaluate all the relevant articles found in the databases***

As discussed in the previous chapters, a strict search strategy was followed to access the databases and retrieve the relevant studies for the systematic review.

All the studies that were found underwent strict critical appraisal using the SUMMARI package from the Joanna Briggs Institute (QARI and MAStARI instruments). Studies that contained both qualitative and quantitative findings were used in the systematic review. The studies underwent critical appraisal from two reviewers, the researcher and a co-reviewer, in order to maintain rigor. Once the two reviewers agreed on the articles, the articles were further analysed and data extracted for the systematic review.

Only eleven articles were entered into the appraisal tool. These were further narrowed down to five articles that were finally accepted, and from which data were extracted for the systematic review. There were four qualitative articles and one quantitative article.

The data were extracted and synthesised from all the articles and addressed the objectives of the systematic review by:

- critically evaluating all the relevant articles found in the databases
- describing the effects of problem-based learning on nurse competence
- describing competence associated with problem-based learning most commonly identified in the literature.

- ***Effects of problem-based learning on nurse competence***

From the systematic review, it is evident that problem-based learning does have an effect on nurse competence. Problem-based learning has positive effects on nurse competence as evidenced by nurse practitioners being leaders in the clinical areas, and through them being independent, self-directed, autonomous individuals. The graduates from a problem-based background are able to do research and find answers to questions, allowing them to gain knowledge at any stage of their career development. Problem-

based learning prepares graduates to make decisions and solve problems in a systematic manner, which is of benefit to the patient and ensures quality, holistic care of the patient and his/her family.

Employers of graduates from a problem-based education are generally positive about their clinical work and would like them to succeed in their working environment. The employers are generally positive about graduates' competence as a result of problem-based learning, and usually put them in some sort of leadership role, such as in charge of a ward or shift, early in their employment.

- ***Competencies most commonly associated with problem-based learning***

From the literature, the competencies most described in the articles were psychomotor and cognitive.

Cognitive competencies were learnt through the problem-based learning that the graduates had undergone. They were given problems and were facilitated through several different methods to look for the answers. The graduates were then able to gain insight and knowledge by exploring and searching for the information and sharing this with others. This was achieved by following the current world trend of using evidence-based research. This also helped to make the graduates leaders in their profession.

Psychomotor competencies were the skills that the graduates learnt in their course, and the skills needed for quality care in clinical practice. Not all procedures could be learnt in a course, but graduates were able to learn and grasp the techniques quickly as they were trained to explore, investigate and learn the knowledge behind the skills.

In the systematic review, the researcher analysed all the relevant articles to answer the research question: Is there supporting evidence that problem-based learning has any effect on nurse competence?

There is supporting evidence that problem-based learning has positive effects on nurse competence, both cognitive and psychomotor. PBL is the future of nursing education.

PBL should be incorporated into all nursing programmes, as there is supporting evidence that it produces competent nurses with leadership skills, who will promote PBL in future generations of nurses, ensuring a continuously developing and improving nursing profession for the benefit of patients worldwide.

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APPENDICES

APPENDIX A

Approval of Title from Post Graduate Committee

Faculty of Health Sciences
Medical School, 7 York Road, Parktown, 2193
Fax: (011) 717-2119
Tel: (011) 717-2745

Reference: Ms Tania Van Leeve
E-mail: tania.vanleeve@wits.ac.za
14 October 2009
Person No: 9301206J
PAG

Miss PJ Cartwright
P O Box 413
Florida
1710
South Africa

Dear Miss Cartwright

Master of Science in Nursing: Approval of Title

We have pleasure in advising that your proposal entitled "*The effects of problem-based learning on nurse competence: A systematic review*" has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

APPENDIX B

Ethics Clearance Certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Academic & Research)

MEMORANDUM

TO: **Miss Penelope Cartwright**
Department of Nursing Education
EMAIL pennycartwright@telkomsa.net

FROM: Ms Anisa Keshav
Secretary: Human Research Ethics Committee (Medical)
Tel 717-1234 fax 011 717 1265
e-mail: anisa.keshav@wits.ac.za

DATE: 12 October 2009

REF: ***R14/49***

The protocol below was considered at a meeting of the Human Research Ethics Committee (Medical**) on Friday 2 October 2009. Please see the Committee's decision:**

M090907 The Effects of Problem-Based Learning on Nurse Competence: A Systemic Review
APPROVED UNCONDITIONALLY

A copy of your clearance certificate will be e-mailed to you in due course.

APPENDIX C

JBI – Qualitative Assessment and Review Instruments (QARI)

Assessment for:

Type:	
User:	
Design:	

	Criteria	Yes	No	Unclear	Not applicable	Comment
1)	There is congruity between the stated philosophical perspective and the research methodology.					
2)	There is congruity between the research methodology and the research question or objectives.					
3)	There is congruity between the research methodology and the methods used to collect data.					
4)	There is congruity between the research methodology and the representation and analysis of data.					
5)	There is congruity between the research methodology and the interpretation of results.					
6)	There is a statement locating the researcher culturally or theoretically.					
7)	The influence of the researcher on the research, and vice-versa, is addressed.					
8)	Participants, and their voices, are adequately represented.					
9)	The research is ethical according to current criteria or, for recent studies, there is evidence of ethical approval by an appropriate body.					
10)	Conclusions drawn in the research report do appear to flow from the analysis, or interpretation, of the data.					
	Include: Reason:					

Update Undo Cancel

JBI - Extraction details:

Method:	
Setting:	
Participants:	
# Participants:	
Interventions:	
Author's conclusion:	
Reviewer's comments:	
Complete:	

Save Details Undo Cancel

JBI - Findings:

Finding	Illustration of study	Evidence	Actions
			Edit Delete
			Edit Delete

JBI - Summary:

Name	Summary	Actions
		Edit Delete
		Edit Delete

JBI - Categories:

Finding	Category	Synthesised finding

APPENDIX D

JBI – Meta Analysis and Statistical Assessment Review Instruments (MAStARI)

Assessment for:

Type:	
User:	
Design:	

	Criteria	Yes	No	Unclear	Not applicable	Comment
1)	Was study based on a random or pseudo-random sample?					
2)	Were the criteria for inclusion in the sample clearly defined?					
3)	Were confounding factors identified and strategies to deal with them stated?					
4)	Were outcomes assessed using objective criteria?					
5)	If comparisons are being made, was there sufficient descriptions of the groups?					
6)	Was follow up carried out over a sufficient time period?					
7)	Were the outcomes of people who withdrew described and included in the analysis?					
8)	Were outcomes measured in a reliable way?					
9)	Was appropriate statistical analysis used?					
	Include: Reason:					

Update Undo Cancel

JBI - Extraction:

Method *	
Setting	
Participants *	
# Participants	
Interventions *	
Authors Conclusion	
Reviewers Comments *	
Complete:	

Save Details Undo Cancel

JBI - Results:

Review Outcome	Intervention A	Intervention B	
			Results Delete
			Results Delete

APPENDIX E

Electronic Correspondence

Hi Penny,

I have spoken to my Co-Investigator and we agree to share our final report findings with you.

Please keep in mind that the document is copyrighted so can be sighted.

We will be publishing these findings in the near future!!

We would ask you to share a copy of your final systematic review with us in return.

Thank you, Penny, and hope you find the report helpful!!

Bev Williams PhD, RN
Associate Professor, Faculty of Nursing
Adjunct Asst. Professor, Department of Family Medicine
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Phone: 780 492-8054
Fax: 780 492-2551
E-mail: beverly.williams@ualberta.ca

From: Penny [mailto:pennycartwright@telkomsa.net]
Sent: Tuesday, September 07, 2010 11:20 AM
To: Bev Williams
Subject: RE: Problem-based learning

Hi Beverly

Thank you so much for replying and for all the info on articles – I have a few articles from Noreen Chikotas, she has also done a bit on PBL,

but I will definitely try and get the others you have suggested.

Your study sounds interesting, and is exactly what I am looking for. Thank you for considering sharing your findings with me.

Kind regards

Penny

From: Bev Williams [mailto:beverly.williams@ualberta.ca]
Sent: 07 September 2010 04:10 PM
To: Penny
Subject: RE: Problem-based learning

Hi Penny,

Wonderful to hear about your interest in PBL!!

We are just completing a research study where we asked graduates to identify how they thought PBL contributed to their practice as professional nurses.

We presented preliminary results at the Canadian Association of Schools of Nursing (CASN) conference in May and will present further findings at conferences this year.

Let me talk to my colleagues to see what we can share with you!!

In the meantime Chikotas, Noreen has written about PBL and Nurse Practitioner practice. Biley & Smith (1998) also wrote about PBL graduates. Otherwise the research has been in Medicine Jones, McArdle & O'Neill (2002)

Bev Williams PhD, RN
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From: Penny [mailto:pennycartwright@telkomsa.net]
Sent: Sunday, September 05, 2010 7:31 AM
To: Bev Williams
Subject: Problem-based learning

Hi Beverly

My name is Penny Cartwright; I am currently doing my masters degree in nursing education at Wits University in South Africa.

My topic of interest is problem-based learning, and I am doing a systematic review, and am wanting to

know if problem-based learning has had any effect on nurse competencies on qualified registered nurses. My

title of my research is: **THE EFFECTS OF PROBLEM-BASED LEARNING ON NURSE COMPETENCE: A SYSTEMATIC REVIEW**

I have noticed while doing my review that you have done quite a bit on the topic of problem-based learning.

I have not managed to get many articles regarding my topic while searching the databases, as most information is

on students and not qualified registered nurses. If you have any information for me or advice, it will be highly appreciated!

Looking forward to hearing from you.

Regards,

Penny Cartwright