Exploring an Innovative Educational Approach to Facilitating Student Nurses’ Clinical-reasoning Skills in North Sulawesi Province, Indonesia

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Keywords

Clinical judgement, clinical reasoning, cognitive apprenticeship, educational intervention, nursing education, North Sulawesi Province, Indonesia
Abstract

Background and Significance

In Indonesia, it was found that approximately 60 per cent of nurses and midwives have inadequate training and preparation to function professionally, contributing to substandard care provision (Henessy, Hicks, Hilan & Kawonal, 2006a). Developing clinical judgement is one of the top three training needs identified for nurses in Indonesia, particularly in the East Kalimantan and North Sulawesi regions (Henessy et al, 2006b). Accordingly, curricula and teaching approaches that facilitate the development of skills that underpin nurses’ clinical judgement, such as clinical-reasoning skills, are of great importance for enabling nursing graduates to provide effective care. Traditionally in Indonesia, the teaching approaches used to facilitate students’ development of clinical reasoning are delivered through lectures, individual and group assignments, and panel discussion of group assignments.

However, contemporary educational research highlights the importance of students’ active engagement in learning, particularly in relation to the development of complex thinking skills, for example, reasoning skills in making clinical decisions. This raises important questions about teaching approaches that might achieve better outcomes. Cognitive apprenticeship offers the opportunity to develop a novel educational approach to the development of clinical-reasoning skills within the undergraduate nursing context. Teaching students through cognitive apprenticeship enables making tacit processes visible to learners so that they can observe and practise them (Collins, Brown & Holum, 1991). These characteristics highlight the potential of cognitive apprenticeship as an innovative educational approach for facilitating the development and application of clinical-reasoning skills in undergraduate nursing students within the context of high-risk pregnancy.
Hence, this study aimed to examine the effect of an innovative teaching approach facilitating active engagement in clinical reasoning within the context of high-risk pregnancy on the learning experience of undergraduate nursing students at a university in North Sulawesi Province, Indonesia.

**Design and Methods**

The study employed a non-equivalent control group design to evaluate students’ clinical reasoning skills. The study was undertaken in two phases. Phase 1 was the development and content validation of an educational-intervention package. Following review by an expert panel, Phase 2 implemented and evaluated the revised educational intervention with a cohort of Indonesian undergraduate nursing students. Survey questionnaires and focus group discussions were utilised to collect quantitative and qualitative data from study participants.

**Results**

The Phase 2 results indicated that educational intervention had a positive impact on the accuracy of participants’ clinical reasoning. This was indicated by their responses to a purpose-built clinical vignette and comments in regard to their learning experiences within each of the study conditions. However, whilst there were some positive trends in the results on the inaccuracy of participants’ clinical reasoning and their perceived confidence in clinical reasoning, these did not reach statistical significance.

**Conclusion**

The results of this study indicate that the educational intervention developed for this study had a positive effect on students’ development of clinical-reasoning skills in the nursing context. Three key factors appear to be important in achieving this
outcome: 1) situating knowledge through case-based learning; 2) making thinking visible through thinking aloud with students; 3) facilitating collaboration through small peer-group discussion. These factors worked interdependently in achieving the positive outcomes in this study. Findings from this study inform the further development of student-centered teaching models for nurse education in Indonesia. Therefore, it is argued that this study makes an important contribution to nursing education by providing evidence to understand how best to facilitate nursing students’ development of clinical judgement.
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Abbreviations

ANCOVA  Analysis of Covariance
BPP    biophysical profile
CALM   Cognitive Apprenticeship Learning Model
CBC    complete blood count
CCTDI  California Critical Thinking Disposition Inventory
CCTST  California Critical Thinking Skills Test
CD-ROM compact disc read only memory
CJ     clinical judgement
CMT    case-method teaching
CNE    cumulated noise exposure
CNS    central nervous system
CQ     Confidence Questionnaire
CUDLSM Catholic University of De La Salle Manado
CVI    Content Validity Index
DIKTI  Directorate General of Higher Education
DNT    Developing Nurses’ Thinking
DTR    deep-tendon reflexes
EI     educational intervention
FHR    fetal heart rate
GPA    grade point average
HFS    high-fidelity simulation
HPS    human-patient simulation
HSRT   Health Science Reasoning Test
I&O    intake and output
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
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<tbody>
<tr>
<td>I-CVI</td>
<td>Item – Content Validity Index</td>
</tr>
<tr>
<td>IDEAS</td>
<td>identify, deepen, enumerate, assess, and scrutinize</td>
</tr>
<tr>
<td>IHBI</td>
<td>Institute of Health and Biomedical Innovation</td>
</tr>
<tr>
<td>IUD</td>
<td>intrauterine device</td>
</tr>
<tr>
<td>LSI</td>
<td>Learning Style Inventory</td>
</tr>
<tr>
<td>MCAR</td>
<td>missing completely at random</td>
</tr>
<tr>
<td>MCQ</td>
<td>Multiple-choice question</td>
</tr>
<tr>
<td>MD ANOVA</td>
<td>Mixed-Design Analysis of Variance</td>
</tr>
<tr>
<td>MVA</td>
<td>Missing Value Analysis</td>
</tr>
<tr>
<td>NANDA</td>
<td>North American Nursing Diagnosis Association</td>
</tr>
<tr>
<td>NLN</td>
<td>National League for Nursing</td>
</tr>
<tr>
<td>NPO</td>
<td>nil per os</td>
</tr>
<tr>
<td>NST</td>
<td>non-stress test</td>
</tr>
<tr>
<td>PES</td>
<td>problem, etiology, signs and symptoms</td>
</tr>
<tr>
<td>QUT HDR</td>
<td>Queensland University of Technology Higher Degree Research</td>
</tr>
<tr>
<td>SA</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>S-CVI</td>
<td>Scale – Content Validity Index</td>
</tr>
<tr>
<td>SD</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Package for the Social Sciences</td>
</tr>
<tr>
<td>UHREC</td>
<td>University Human Research Ethics Committee</td>
</tr>
<tr>
<td>WGCTA</td>
<td>Watson–Glaser Critical Thinking Appraisal</td>
</tr>
<tr>
<td>ZPD</td>
<td>zone of proximal development</td>
</tr>
</tbody>
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Related Presentations


Glossary

**Accurate problem:** a health problem that is consistent with a particular pattern of verbal and/or physical data relevant to the clinical vignette [as identified by Ackley (2011) and Chapman (2010)].

**Inaccurate problem:** a health problem that is inconsistent with patterns of verbal and/or physical data relevant to the clinical vignette [as identified by Ackley (2011) and Chapman (2010)].

**Relevant data items:** verbal and/or physical data that is consistent with a particular health problem relevant to the clinical vignette [as identified by Ackley (2011) and Chapman (2010)].

**Irrelevant data items:** verbal and/or physical data that is inconsistent with a particular health problem relevant to the clinical vignette [as identified by Ackley (2011) and Chapman (2010)].

**Possible accurate interventions:** nursing interventions that, in general, are relevant to the clinical vignette context.

**Possible inaccurate interventions:** nursing interventions that, in general, are irrelevant to the clinical vignette context.

**Accurate interventions chosen:** nursing interventions that are specific, relevant and feasible to be implemented in the provided clinical vignette context.

**Inaccurate interventions chosen:** nursing interventions that are not specific, relevant and/or feasible to be implemented in the provided clinical vignette context.
Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature: QUT Verified Signature

Date: August 2015
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Chapter 1: Introduction

This chapter outlines the background and significance of this research (Section 1.1), and its purposes (Section 1.2). Section 1.3 describes the research questions for this study and Section 1.4 provides an outline of the remaining chapters of the thesis.

1.1 Background and Significance

The quality of nursing care depends greatly on the clinical judgements made by nurses (Thompson & Stapley, 2011). Thompson and Stapley argue that this involves an interpretation of client cues in the provision of care by relating components of reasoning to the process of clinical judgement. Further to Thompson and Stapley’s perspective, Facione (2008) describes clinical reasoning as ‘the process we use to make a judgement about what to believe and what to do about the symptoms our patient is presenting for diagnosis and treatment’ (p. 2). Thus, developing nurses’ clinical-reasoning skills is likely to contribute positively to the quality of clinical judgement in clinical practice (Banning, 2007; Chabeli, 2006; Kuiper, Pesut & Kautz, 2009; Redding, 2001; Tanner, 2009; Thompson & Stapley, 2011).

Accordingly, curricula and teaching approaches that support student nurses’ development of clinical-reasoning skills are of prime importance in enabling nursing graduates to provide effective care (Brunt, 2005a; Simpson & Courtney, 2002, 2009; Vittrup & Davey, 2010). However, although a great deal of effort has been put into the development and improvement of the quality of nursing education, some studies conclude that development of students’ clinical reasoning skills have not yet been fully achieved (Benner, Sutphen, Leonard, Day & Shulman, 2010; Gillund, Rystedt, Wilde-Larsson, Abubakar & Kvigne, 2012; Henessy, Hicks, Hilan & Kawonal,
2006b; Tanner, 2010). Indeed, Benner et al. (2010) argues that the nursing students in their study were poorly prepared to meet the current challenges of the healthcare sector, which led to their inability to cope with contemporary practice. The study found that students lacked the ability to make decisions about appropriate interventions for patient care possibly as a result of the inability to apply classroom knowledge in clinical practice.

Similarly, Tanner (2010), in an action-oriented plan for the future development of the nursing profession argued that nurses in the United States of America entering the field are not equipped with essential knowledge and clinical-reasoning skills for current practice, nor are they prepared to continue learning to meet the challenges of the nursing profession in the future. Further, Tanner (2010) notes that teaching strategy used by teachers do not support the development of habits of enquiry that equip graduates to make required decisions.

In the Indonesian context, Henessy et al. (2006a) conducted a descriptive observational study among 524 nurses and midwives within five provinces in Indonesia. The study aimed to enhance healthcare provision in Indonesia. Data were collected using an established and psychometrically valid questionnaire representing training and development needs and differences between nurses working in different regions within hospital or community settings. Their results demonstrated that approximately 60 per cent of nurses and midwives in Indonesia have inadequate training and preparation to function professionally, and the authors conclude that this contributes to substandard care provision. Another study, also conducted in Indonesia (Gillund et al., 2012), argues that learning for, and teaching of, nursing students in this context has not been conducive to, or focused on, the development of clinical reasoning and clinical judgement. Notably, Gillund et al. (2012) and Henessy
et al. (2006a) believe that the lack of clinical-practice experience of many Indonesian nursing teachers (frequently fewer than three years) has contributed to an increased emphasis on theory learnt in the classroom in place of clinical-competence development in nursing education. As a consequence of their lack of clinical experience, teachers may be inadvertently separating the teaching of knowledge from its context. As the result, the learnt knowledge and its practice are disconnected. Not surprisingly, students may less be able to apply their knowledge in practice situations and make accurate clinical judgments when delivering nursing care. In fact, developing clinical judgement was one of top three training needs identified for nurses in Indonesia, particularly in East Kalimantan and North Sulawesi (Henessy et al., 2006b).

Understanding how best to facilitate students’ development of clinical judgement is fundamental for producing nursing graduates that possess these capabilities (Clayton, 2006; Freed & McLaughlin, 2011; Horan, 2009; Kennison, 2006; Kuiper, 2005; Lisko & O’Dell, 2010; Maneval, Filburn, Deringer & Lum, 2011; Mikol, 2005; Schaffer, Nelson & Litt, 2005; Turner, 2005; Zygmont & Schaefer, 2006). However, in a systematic review of the effectiveness and efficacy of educational interventions on clinical judgement, Thompson and Stapley (2011) found that results were unclear and the means to achieve positive effects are not yet known. Therefore, they argue that if clinical judgement is to be improved, nursing teachers need to focus on developing student nurses’ clinical-reasoning skills by improving the pedagogical basis of educational interventions in this area (Kuiper, 2005; Kuiper et al., 2009; Kuiper & Pesut, 2004).

This study aimed to make a significant and unique contribution to knowledge about educational strategies for facilitating the application of clinical-reasoning skills
by undergraduate nursing students in Indonesia. It is the first of its kind to be undertaken in this context. This study is timely given the current emphasis on clinical judgement as a core element of contemporary nursing practice and the work of Henessy et al. (2006b), which highlights the development of skills that underpin clinical judgement as one of top three training needs identified for nurses in Indonesia, particularly in East Kalimantan and North Sulawesi (Henessy et al., 2006b).

1.2 Research Aims and Objectives

The primary aim of this study was to examine the impact of an innovative educational approach to enhancing clinical reasoning on the experience of undergraduate nursing students at a university in North Sulawesi Province, Indonesia.

1.2.1 Phase 1.

Phase 1 focused on the development of an educational intervention and its evaluation by an expert panel.

The specific objectives of Phase 1 were the following:

1. design an educational intervention and delivery strategy (collectively referred to as the educational package) focusing on clinical reasoning within the context of high-risk pregnancy
2. validate the educational package through review by an expert panel.

1.2.2 Phase 2.

In Phase 2 the effect of the educational intervention on students’ learning outcomes and the perception of students regarding the learning experience were evaluated. The specific objectives of Phase 2 were the following:
1. examine the effect of the educational package on attitudes regarding clinical reasoning for students who receive the educational package as compared to those who receive the usual teaching approach

2. examine the effect of the educational package on clinical reasoning by assessing responses to a clinical vignette (as measured by accuracy in clinical reasoning, inaccuracy in clinical reasoning and perceived level of self-confidence in responding to the clinical-vignette questions) for students who receive the educational package as compared to students who receive the usual teaching approach

3. examine perceptions of the learning experience for students who receive the educational package compared to those who receive the usual teaching approach.

1.3 Research Questions

To achieve the objectives of Phase 1, the following research questions were pursued:

1. How does the expert panel rate the relevance, clarity and feasibility of the educational package?

2. What are the perceptions of the expert panel of the relevance, clarity and feasibility of the educational-intervention package?

To achieve the objectives of Phase 2, the following research questions were pursued:

3. Is there a significant difference (at Time 1/Time 2) in California Critical Thinking Disposition Inventory (CCTDI) (as measured by overall CCTDI scores and scale scores) for students who received the
educational intervention compared to students who received usual teaching?

4. Is there a significant difference (at Time 1/Time2) in students’ accuracy in clinical reasoning responses to the clinical vignette (as measured by overall accuracy score, number of accurately identified problems, data items, possible interventions and interventions chosen) for students who received the educational intervention compared to students who received usual teaching?

5. Is there a significant difference (at Time 1/Time2) in students’ inaccuracy in clinical reasoning responses to the clinical vignette (as measured by overall inaccuracy score, number of inaccurately identified problems, data items, possible interventions and interventions chosen) for students who received the educational intervention compared to students who received usual teaching?

6. Is there a significant difference (at Time 1/Time 2) in the perceived level of self-confidence in responding to the clinical-vignette questions for students who received the educational intervention compared to students who received usual teaching?

7. What are the perceptions of students who received the educational intervention of the learning experience compared to those who received usual teaching?

1.4 Thesis Outline

This chapter has outlined the background of the study, delineated the aims and objectives of the study, presented the research questions, and stated the definition of terms.
Chapter 2 provides a critical review of the relevant literature and provides arguments to support the focus of the study. It presents evidence of the importance of clinical-reasoning skills and the conceptualisation of clinical reasoning in the nursing context. It also discusses studies that affect the development of clinical-reasoning skills.

Chapter 3 discusses cognitive apprenticeship, which was used as the theoretical framework underpinning this study for the development of the educational intervention. As discussed in Chapter 3, cognitive apprenticeship is informed by the theoretical perspective of situated cognitive/learning posited by Lave. The Cognitive Apprenticeship Learning Model (CALM) was employed to provide a conceptual and practical basis for the educational intervention employed in this study. Chapter 3 provides an elaboration of these concepts and discusses studies that have used cognitive apprenticeship.

Chapter 4 examines the development and review process of the educational-intervention package. It presents the design of the educational intervention, as well as its development. Review process of the expert panel and student review is discussed. Quantitative and qualitative methodologies, results and a discussion of the findings are also presented in Chapter 4.

Chapter 5 discusses the research methodology employed for the educational intervention and the development of the evaluation instrument. The research methodology for the educational intervention is first presented and is followed by a discussion of the development of the evaluation instrument.

Chapter 6 presents the results from Phase 2 of the study. Quantitative and qualitative results are discussed individually. The quantitative results consist of students’ responses to the CCTDI and their responses to the clinical vignette. The
qualitative results present an elaboration of the three themes that emerged from the focus-group data.

Chapter 7 discusses the results of Phase 2, presenting an analysis of the key findings from the quantitative and qualitative data. Discussion of factors influencing the educational-intervention outcomes is also presented.

Chapter 8 addresses the strengths and limitations of this study, also delineating the implications for nursing education and providing recommendations for future research.
Chapter 2: Literature Review

This chapter presents a review of the literature related to clinical reasoning and clinical judgement in nursing and several teaching methods that affect clinical-reasoning skills. The review will be followed by a description of cognitive apprenticeship as an innovative approach to the development of clinical-reasoning skills.

Computer-database searches of relevant literature were performed using the MEDLINE, CINAHL (Cumulative Index of Nursing and Allied Health Literature), and ERIC (Education Resources Information Center) databases by entering a number of keywords selected in consultation with the nursing librarian. Keywords included in the search strategies included ‘clinical judgement’, ‘clinical reasoning’, ‘cognitive apprenticeship’, ‘nursing education’, ‘educational intervention’ and ‘North Sulawesi Province, Indonesia’. Most of the literature found was in the form of research articles. Relevant concepts were also derived from reports, theses and monographs.

This chapter begins with a discussion of clinical judgement and the relationship of clinical-reasoning skills to the development of clinical judgement in nursing. This discussion is followed by an examination of teaching methods that affect clinical-reasoning skills, particularly within the context of nursing education. Finally, cognitive apprenticeship as an instructional design in this study is reviewed. Chapter 2 concludes with a brief summary.

2.1 Clinical Reasoning and Clinical Judgement in Nursing

In nursing, clinical reasoning is widely recognised as pivotal to the development of clinical judgement and quality nursing graduates who can meet the demands of complex health settings. Several studies suggest that developing nurses’
clinical-reasoning skills allows nurses to apply more accurate clinical judgement (Alfaro-LeFevre, 2004; Benner, Hughes & Sutphen, 2008; Davis & Kimble, 2011; Simpson & Courtney, 2007a). Consequently, the provision of effective learning experiences that positively affect the clinical reasoning of nursing graduates is important.

In the literature, the term ‘clinical reasoning’ has been articulated as interchangeable with the terms ‘clinical judgement’, ‘clinical inference’ and ‘clinical decision making’ by some nursing educationists (Davis & Kimble, 2011; Tanner, 2000; Thompson & Dowding, 2002). However, Dowie (1993 as cited in Thompson & Dowding, 2002) argues that while these terms are interconnected, they have different meanings. According to Dowie (1993), when referring to clinical judgement, the judgement element is taken to refer to the ‘the assessment of the alternatives’ (p. 8), while within clinical decision making, the decision element is subtly different and is taken a step further to mean ‘choosing between alternatives’ (p. 8), after conducting a set of judgement processes (Thompson & Dowding, 2002). Another definition offered by Tanner (2006) is that clinical judgement is ‘an interpretation or conclusion about a patient’s needs, concerns, health problems, and/or decision to take action (or not), use or modify standard approaches or improvise new ones as deemed appropriate by the patients response’ (p. 204). This definition combines the judgement and decision elements. This is consistent with Simmons (2010) and Anderson’s (2006) proposition that the terms ‘clinical judgement’, ‘decision making’, and ‘problem solving’ suggest that judgement and decision elements refer to an endpoint of the process of thinking, while ‘clinical reasoning’ is seen as a cognitive process employed by nurses prior to a final decision and action aimed towards solving health problems in the nursing
context (Fawcett, McDowell & Newman, 2010; Kautz, Kuiper, Pesut, Knight-Brown & Daneker, 2005; Murphy, 2004). In this nursing context, nurses ‘sort through a cluster of features presented by a patient and accurately assign a diagnostic label, with the development of an appropriate treatment strategy as the end of goal’ (Pinnock & Welch, 2014, p. 253). Despite these definitions, it is argued that clinical reasoning in nursing is equally concerned with the process (cognition) and the outcomes: choices or decisions (Simmons, 2010).

Given the above discussion, it is perhaps not surprising that, for a number of researchers, clinical reasoning is synonymous with the application of critical-thinking skills in the provision of nursing care (Simpson & Courtney, 2002; Victor-Chmil, 2013). Recently, Thompson and Stapley (2011) drew attention to the role of critical thinking within the context of clinical judgement. According to Thompson and Dowding (2002) and Thompson and Stapley (2011), clinical judgement involves the interpretation of client cues in the process of care by relating critical-thinking skills to the more specific process of clinical judgement. Thompson and Stapley (2011) build on the work of previous researchers who emphasise that the use of critical-thinking skills allows nurses to employ better clinical judgement (Agbedia, Ofi & Ibeagha, 2008; Alfaro-LeFevre, 2004; Chabeli, 2006; Davis & Kimble, 2011; Kuiper, Murdock & Grant, 2010; Kuiper et al., 2009; Kuiper & Pesut, 2004; Redding, 2001) to recognise a patient’s health problems and enable nurses to select a course of action and manage care (Alfaro-LeFevre, 2004).

While there has been some debate on the role of critical thinking in the process of clinical reasoning, there appears to be wide agreement that, critical thinking can be described as a process of thinking that is underpinned by thoughtful reasoning and reflective-based decision making (Facione, 1990, 2011; Facione, P. &
Facione, N., 2007). More precisely, Facione (2011) defines critical thinking as follows:

> purposeful, self-regulatory judgement that results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgement is based. (p. 16)

Building on his earlier work, Facione (2011) suggests a five-step ‘IDEAS’ model—‘Identify Problems and Set Priorities; Deepen Understanding and Gather Relevant Information; Enumerate Options and Anticipate Consequences; Assess the Situation and Make a Preliminary Decision; Scrutinise the Process and Self-Correct as Needed’—to facilitate student’s utilisation of critical-thinking skills in reasoning clinically. According to Facione’s model, the first step is to identify the health problem and set priorities. Therefore, in this step, the key problems to be addressed and their reasons are interpreted from patient’s signs and symptoms, family members, and/or nursing-observation records. The second step is to deepen and extend understanding, and collect relevant information. In this step, analytical skills are employed to explain relevant facts or characteristics of the patient’s health problem, for example, the frequency, severity, persistency and duration of the problem (Facione & Facione, 2008). The third step is to enumerate options and anticipate consequences. This step demands reasons and evidence for proposed solutions and proffered analyses. After analysing all the relevant information and facts, potential options and possible drawbacks of the options are evaluated. The fourth step aims to assess the situation and make preliminary decisions. This step can be performed through an evaluation of the most promising alternatives and deciding on the most appropriate and feasible interventions to be employed. Finally, the fifth
step is to scrutinise the process and self-correct as needed. This step requires students to justify the decision and present a clear explanation of the reason behind the decision. Students are also asked to reflect on the previous steps, identify weaknesses, correct errors and learn from the experience to make better clinical judgements. Importantly, the IDEAS model emphasises a continuous and cyclical process of high-level thinking that facilitates purposeful, reflective judgement. The author believes that these cognitive skills are the cognitive engine that drives professional judgement in the nursing practice field.

An equally important factor in clinical reasoning discussed in the literature is the thinking attitude of the individual. Dewey (1991) believed that without a proper attitude, knowledge of reasoning has little value because of the contextual nature of the knowledge forms (Dewey, 1991; Geertsen, 2003). Similarly, Facione (2011) discusses the influence of attitudes on the thoughtful consideration of problems and subsequently shaping of thinking skills (Facione, 2011; Geertsen, 2003).

The significance of nurses’ attitudes in relation to making clinical judgements is discussed in some nursing literature (Benner & Tanner, 1987; Facione, Facione & Sanchez, 1994; Facione, 2011; Kuiper & Pesut, 2004; Simpson & Courtney, 2002; Tanner, 2006). Benner et al. (1996) commented that the evaluation of what is good and right affects nurses’ action in the clinical setting. More specifically, Facione (2011) believes that having a positive attitude to thinking enables a diligent approach to complex patient problems, and fosters tolerance of multiple perspectives and interpretations that are supported by evidence and reason. Similarly, fair-mindedness to new evidence and a willingness to reconsider clinical judgements are supported by a positive-thinking attitude (Facione & Facione, 2008; Geertsen, 2003).
From the foregoing, the position taken within this study is that well developed clinical reasoning processes, underpinned by principles of critical thinking, are fundamental to accurate clinical judgement and effective decision making and are, thus, the focus of this study. It is hypothesised that the utilisation of an appropriate cognitive approach in designing learning instruction will facilitate students’ application of clinical-reasoning skills to clinical situations and, hence, enhance their ability to make sound clinical judgements.

2.2 Teaching Methods to Affect Clinical Reasoning

A variety of studies have been undertaken to investigate the effect of particular educational approaches on nursing students’ development of clinical-reasoning skills. Strategies that have been researched commonly include concept mapping, problem-based learning, simulation and active learning.

Studies by Abel and Freeze (2006), Maneval et al. (2011), Nejat, Kouhestani, and Rezaei (2011) and Passmore, Owen and Prabakaran (2011) have investigated concept mapping as a strategy to assist clinical-reasoning skills among nursing students. Abel and Freeze’s work (2006) suggests that concept mapping can enable students to create a hierarchy of concepts and create a scaffold that highlights relationships among concepts and increases the opportunity for analysis, synthesis and clinical-reasoning skills. Measurement methodologies used in these studies included mapping scores, study-process scores, and care-planning scores. However, due to methodological issues such as small sample sizes and lack of control groups to compare outcomes in these studies, the effect of concept mapping on clinical-reasoning outcomes remains unclear.

Some studies have focused on problem-based learning as a means of improving nursing students’ abilities in critical thinking. For example, in the Hong
Kong context, Tiwari, Lai, So and Yuen (2006) conducted a randomised control trial to investigate the effect of problem-based learning (in the form of scenario cases and reflective groups) on the development of critical thinking in nursing students ($N = 79$) from year one to year four. Data were collected using the CCTDI and perceptions of the learning experience at four time points spanning three years. The study results revealed that intervention-group students had significantly greater development in their overall critical-thinking disposition score ($p = 0.0048$), analyticity ($p = 0.0368$), systematicity ($p = 0.0440$) and critical-thinking self-confidence ($p = 0.342$). From the qualitative data, students perceived that it was important to learn to think to be competent in making judgements in the clinical setting. Recently, Yuan, Kunaviktikul, Klunklin and Williams (2008) conducted an experimental study to examine the effect of problem-based learning on the development of critical-thinking skills in second-year undergraduate nursing students ($N = 46$). Results suggested that the critical-thinking scores of the problem-based learning intervention group were significantly higher ($p = 0.040$) than the control group’s scores. However, qualitative data revealed that students reported high levels of stress related to the problem-solving tasks, which also raises a question about the focus of the study.

Simulation has also been used as an educational medium for enhancing nursing students’ critical thinking. For example, Linden (2008) conducted a pre-test post-test quasi-experimental design of undergraduate nursing students’ ($N = 97$) critical-thinking skills by comparing traditional lectures and high-fidelity simulation (HFS). Results demonstrated a significant difference ($p < 0.000$) in cognitive-learning outcomes in the group intervention. Nonetheless, the use of a single data source, convenience sampling and a non-standardised instrument are limitations of the study. Similarly, Shinnick and Woo (2012) conducted a quasi-experimental, pre-
test and post-test design using human-patient simulation (HPS). Results provided evidence of Kolb’s Learning Style Inventory (LSI) knowledge improvement ($p < 0.001$) but there was no statistically significant change in the Health Science Reasoning Test (HSRT) scores. This study argues that knowledge enhancement with HPS is not associated with critical-thinking development. Accordingly, the authors note the need for an optimal learning design to improve knowledge and critical-thinking skills.

Studies have also been undertaken to examine the effects of interactive-learning approaches such as using case studies, questioning, debate, role play and small-group activities, and journal writing on the development of critical-thinking skills (Burbach, Matkin & Fritz, 2004; Dinç & Görgülü, 2002; Huang, Chen, Yeh & Chung, 2012; Popil, 2011; Simpson & Courtney, 2009). In a professional-development programme, Simpson and Courtney (2009) investigated the effects of case study, questioning, debate, role play and small-group activities on Middle Eastern nurses’ critical-thinking skills ($N = 20$). Data collection included direct participation and observation of students’ interactions in discussing thought provoking questions designed to assess students’ understanding of the stimulus material. The researchers also evaluated the critical thinking questions (CTQs) that were generated by students. Findings indicated that students who received the educational intervention developed greater critical-thinking skills. These were followed by focus-group interviews. Findings indicated that students who received the educational intervention developed greater critical-thinking skills. Simpson and Courtney (2009) argue that the programme successfully transformed students’ learning from memorisation to interactive participation. Nonetheless, the use of a single data source, convenience sampling and a non-standardised instrument are
limitations of their study. Similar to Simpson and Courtney (2009), Burbach et al. (2004) conducted a pre-test and post-test quasi-experimental design of undergraduate nursing students’ \((N = 80)\) critical-thinking skills after receiving active-learning strategies, including journal writing, service learning, small group, scenario, case studies and questioning in an introductory leadership course. Data were collected using the Watson–Glaser Critical Thinking Appraisal (WGCTA). Results demonstrated that the total critical-thinking post-test scores were significantly higher \((p < 0.05)\) than the pre-test scores. The coefficient alpha was 0.81. The study concluded that the active-learning strategies were able to improve critical-thinking skills. However, Burbach et al. (2004) acknowledge that the inability to control external variables was a limitation of the study. Arguably, the use of a single data source and convenience sampling are further limitations of their study. Several studies using an individual strategy, that is, only case study, have also been found to improve critical-thinking skills significantly (Dinç & Görgülü, 2002; Mayo, 2004; Popil, 2011). Popil (2011) argues that case study is a valuable teaching and learning strategy to promote active learning and assist students to apply their knowledge in the clinical setting and develop clinical-reasoning skills.

### 2.3 Summary and Implications

In summary, there is a growing body of research examining educational strategies for improving critical thinking among undergraduate nursing students. However, there is wide variability in the types of interventions that have been used, the study methods employed and the results achieved. In some cases, the outcomes have been measured solely with standard critical-thinking instruments, and the extent to which students are able to apply the critical thinking within a nursing clinical-
judgement context is not clear. In addition, the applicability of these studies to the Indonesian context remains unknown.
Chapter 3: Theoretical Framework

This study was underpinned by the Cognitive Apprenticeship Learning Model (CALM), developed by Collins et al. (1991), which is informed by situated-cognition/learning theory. This chapter consists of two sections. The first section provides an overview of CALM and describes the model’s four key constructs. The second section discusses several studies that use CALM and their related outcomes. The chapter concludes with a brief summary of Cognitive Apprenticeship theory and its relevance within the context of this study.

3.1 Cognitive Apprenticeship Theory

3.1.1 Situated cognition theory.

Cognitive apprenticeship theory, developed by Collins, Brown and colleagues emerged from situated-cognition theory (Brown, Collins & Duguid, 1989). Situated cognition is a theory of instruction that suggests that learning is naturally tied to authentic activity, context, and culture (Brown et al., 1989). Jean Lave is often credited with starting the situated-cognition movement, although John Dewey and Lev Vygotsky both advocated similar approaches (Kincheloe & Horn, 2007). Consistent with Vygotsky’s notion of human cognition resulting from the intimate interaction between culture and cognition, Lave believed that ‘context created and reflected different forms of mental functioning and problem solving’ (Jackson, 2007, p. 149). Hence, Lave’s situated-cognition/learning theory is based on the interdependent relationship of authentic activity, context and culture in the process of learning (Jackson, 2007; Korthagen, 2010; Matusov, Bell & Rogoff, 1994). According to this theory, learning must be situated in an authentic context, that is, situations that would normally involve application of the relevant knowledge and skills. Social interaction and collaboration are essential components of situated
learning. Learning is viewed as the process and/or outcome of social participation (Jackson, 2007) and, consequently, gained knowledge and skills reflect the collective goals and relationship of the members of the group (Collins et al., 1991; Collins, Brown & Newman, 1989; Jackson, 2007). Wenger (1998) states:

Being alive as human beings means that we are constantly engaged in the pursuit of enterprises of all kinds, from ensuring our physical survival to seeking the most lofty pleasures. As we define these enterprises and engage in their pursuit together, we interact with each other and with the world and we tune our relations with each other and with the world accordingly. In other words we learn (p. 45).

These concepts resonate strongly with clinical reasoning which comprises a set of skills that are applied in practice situations which are essentially collaborative in nature. Consistent with these notions, ‘situatedness’ and ‘community of practice’ are two key principles of situated-cognition/learning theory.

The concept of situatedness is based on the belief that learning needs to be in an environment that reflects the use of the knowledge and skills that are being learnt (Collins et al., 1991). Thus, situatedness refers to a perspective of authenticity of learning. Active participation in an authentic situation is believed to facilitate relevant and transferable learning more effectively than traditional learning in an environment that is characterised by an information-dissemination approach (Collins et al., 1991; Dennen & Burner, 2008). Authenticity allows students to perform tasks and solve problems in environments that reflect multiple uses of their knowledge and skills in real practice (Collins et al., 1991). Maintaining authenticity of the learning context enables students to understand the purpose of the knowledge, actively
practice the knowledge, and learn particular strategies to employ the knowledge in the real-life situations (Collins et al., 1991).

The term ‘community of practice’ was collaboratively coined by Lave and Wenger (1991) in an effort to provide a social perspective on learning and knowing. A community of practice consists of members that share more than simply an interest; a community of practice shares expertise, competence, learning, activities, discussions, information, tools, stories, experiences and a knowledge base (Collins et al., 1991; Karagiorgi & Symeou, 2005). Thus, learning occurs by sharing, creating, organising, and passing on knowledge among the members of community. Learners become involved in a community of practice that can transform passive ways of learning to active participation in the learning experience. Therefore, learning occurs in a ‘participation framework’, that is, among participants in the community, rather than as an individually mediated activity. Participation in the learning community enables students to observe and construct understanding of how cognitive tools are employed by people with expertise in the relevant area to solve problems and obtain adequate learning support from their authentic environment (Brown, Collins & Newman, 1987). Students collaborate with each other and their teacher or instructor to arrive at a shared understanding. Instructors who advocate such approaches believe there is a ‘culture’ of learning that can be cultivated. That is, students can process concepts and information more thoroughly when multiple opinions, perspectives, or beliefs are shared within a group (Brown, Collins & Duguid, 1989).

3.1.2 Cognitive apprenticeship theory.

apprenticeship is aimed at “uncovering the processes and methods used by experts to enable students to develop cognitive and metacognitive skills needed to solve complex problems” (Brown et al., 1987, p. 5). From the perspective of cognitive apprenticeship, situatedness involves locating knowledge in an authentic context, that is, in situations that would involve application of the knowledge in the real world (Brown et al., 1987; Dennen, 2004). Situating knowledge in a context-specific domain enables students’ development of the cognitive skill and metacognitive skills that are important for solving complex tasks. The learning content and activities are contextualised according to the culture—the environment where the knowledge is constructed and employed. This enables students to develop conceptual models of the targeted tasks or procedures before attempting to practice them (Brown et al., 1989; Brown et al., 1987). Explicated

Equally important is the community-of-practice concept, which involves teachers and students engaging in purposive activity and social interaction for the provision of shared understanding among participants in the learning environment. As discussed previously, learning occurs when the participants share their view, m, beliefs and attitudes within a group. However, teachers and learners interact in the learning context from the perspective of their own understandings and therefore need to find a shared understanding and learning goal between teacher and learner (as well as between the learners in the process of learning) to promote the learning activity (Brown et al., 1989; Brown et al., 1987; Collins et al., 1991; Kaptelinin & Cole, 1997). Application of the principle of community of practice in a cognitive-apprenticeship approach to learning and teaching facilitate active participation and collaboration in group discussions among students and teachers to achieve mutual learning goals.
In summary, cognitive apprenticeship offers a model for the learning of conceptual and factual knowledge that is aimed at teaching the cognitive processes that experts use to handle complex tasks. The focus of this ‘learning through guided experience’ (Brown et al., 1987, p. 5) is on the development of cognitive and metacognitive skills that are uncovered, or made transparent, through the authentic contextualisation of what is to be learnt, supported by the community-of-practice interactions between students and teachers. According to Brown et al. (1987), the focus on expert processes and situated learning within a collaborative environment enables students to build conceptual models of complex target skills and, thus, ‘encourages both a deeper understanding of the meaning of the concepts themselves and a rich web of memorable associations between important concepts and problem-solving contexts’ (p. 3).

To employ cognitive apprenticeship effectively, Brown et al. (1987) proposed that CALM is ‘a framework for designing a learning environment’ (p. 15). The four key elements within CALM: ‘content’, ‘method’, ‘sequencing’ and ‘sociology’ are mutually dependent elements and collectively work to underpin the learning environment to achieve the goals. Consistent with the cognitive-apprenticeship perspective, CALM aims to facilitate students’ development of cognitive and metacognitive skills by providing learning experiences that effectively connect theory to practice through scaffolded approaches by teachers.

To achieve the stated aims, CALM operationalises situatedness and community-of-practice concepts from situated cognition/learning. The manifestation of these concepts in the four CALM elements is as follows. The sociology element involves the creation of a learning environment that enables students to see the skills they are learning being applied to a realistic problems within a culture that is focused
on, and defined by, expert practice (Collins et al., 1989, p. 20). Contextualised by the social element, the content element relates to the types of knowledge required for the expertise that is to be developed, for example, domain knowledge, problem-solving strategies, control strategies and/or learning strategies. The method element comprises the teaching approaches needed to help students attain the relevant expertise. This element plays an important role not only in assisting students’ cognitive and metacognitive development but also in providing teachers with facilitation strategies. Finally, the sequencing element involves ordering the learning activities to facilitate the development of robust problem-solving skills by adjusting the complexity and the diversity of materials and activities to the students’ learning needs. While each of the elements focuses on certain functions, the CALM elements also work interdependently to achieve both the theoretical and practical aims of the learning model. The visualisation of the elements of CALM can be seen in Figure 3.1. (Collins et al., 1991) Detailed explanations of the four key elements of CALM are presented below.

![CALM Diagram](image)

*Figure 3.1. CALM for the study. Adapted from Collins et al. (1991)*

### 3.1.2.1 Content.

The content dimension explains the form of knowledge essential for the development of expertise in a particular area (Brown et al., 1987; Darabi, 2005). This element is built on four other elements: ‘domain knowledge’; ‘problem-solving’ and ‘heuristic strategies’; ‘control strategies’; ‘learning strategies’. Domain
knowledge incorporates concepts, facts, and procedures, as necessary, to solve problems and accomplish tasks in a discipline-specific area of practice (Collins et al., 1991). For example, within the present study, the relevant domain knowledge involved key concepts, principles and demonstration of procedures in high-risk-pregnancy nursing care. However, knowledge alone is insufficient for students to solve problems relating to clinical care effectively. They also need to develop problem-solving strategies and heuristic strategies or ‘tricks of the trade’ (Collins et al., 1989, p. 14) that constitute effective techniques or approaches for making judgements and decisions. Control strategies (Collins et al., 1991) are metacognitive skills that enable students to select appropriate problem-solving strategies, make decisions and change strategies when needed (Collins et al., 1991). Learning strategies is the fourth element in the content dimension. These are general and/or specific strategies that assist students to explore new concepts and relate meaningfully to their existing knowledge/skills base. For example, students relate their knowledge about biological, psychosocial and spiritual systems in humans to the process of holistic physical assessment in clinical practice. Hence, a solid grounding of discipline-specific concepts, facts and/or procedures, problem-solving strategies and learning strategies are crucial for this dimension.

3.1.2.2 Method.

The method dimension can be described as teaching approaches to promote the development of expertise (Darabi, 2005). The method dimension interacts synergistically with the content dimension in providing both teaching and learning strategies for the learnt content. The methods used should be designed to enable students to observe, engage in, and discover strategies used by experts in the field to solve complex problems. The method dimension also provides teachers with
instructional strategies to guide the process of learning (Collins et al., 1991). Six teaching and learning approaches or strategies are incorporated within this dimension: ‘modelling’, ‘coaching’, ‘scaffolding’, ‘articulation’, ‘reflection’ and ‘exploration’, which can be delineated as follows. Modelling is defined as the demonstration of cognitive-skills utilisation by the expert to allow the externalisation of basic conceptual and thinking processes of knowledge application. By making the knowledge and thinking processes visible to students, they can observe and develop conceptual models of the processes that are important for accomplishing the tasks (Collins et al., 1991; Herrington & Kervin, 2007; Herrington, Reeves & Oliver, 2010; Woolley & Jarvis, 2007). Modelling can occur by direct demonstration of certain procedures or by processes that include thinking aloud and concept mapping or by using media such as videos or the internet (Chang, Sung & Chen, 2001; Dennen, 2004). Chang et al. (2001) found that the use of expert concept-map structures to scaffold students’ learning experience has been effective in promoting learning by reducing cognitive load while keeping students focused on other related learning material.

Coaching can be described as a strategy in which teachers observe students performing a task and offer learning support through modelling, hints, feedback or reminders to bring the students’ performance closer to expert performance (Collins et al., 1991; Darabi, 2005; Woolley & Jarvis, 2007).

Scaffolding refers to the support provided by teachers to assist students to achieve their learning goals. To scaffold students’ learning experience, the teacher must identify the students’ zone of proximal development (ZPD). ZPD can be explained as the area or distance measured from what is already known to what is to be known (Karagiorgi & Symeou, 2005; O’Hara, 2007). Therefore, it identifies the
assistance needed by the students to accomplish their tasks independently. Scaffolding of students’ learning is not only facilitated by teachers but also by more able students or peers through their participation and collaboration within the learning community. The support given can be in the form of suggestions or through physical support (Collins et al., 1991). For example, students might be given prompts to think about factors that have not been fully considered or they might be shown learning resources such as diagrams to promote their understanding of the subject matter. Importantly, teachers need to assess when the learning support needs to be removed (e.g. when the students can accomplish their tasks independently) or continued (e.g. when the students are still unable to complete their task independently).

Articulation is a strategy used by teachers to help students that requires students to verbalise their knowledge or reasoning processes (Collins et al., 1991). Being able to articulate reason in a logical and coherent manner enhances students’ reasoning-skills capability (Collins et al., 1991; Facione, N., & Facione, P., 2008). Articulation can be seen when teachers enable students to ask questions, defend their arguments or share their ideas (Darabi, 2005; Woolley & Jarvis, 2007). By employing this strategy, teachers gain insight to students’ growing understanding (Herrington & Kervin, 2007; Herrington & Oliver, 2000).

Reflection is a teaching strategy that enables students to compare their own problem-solving strategies with those employed by experts, peers and, ultimately, their own cognitive models of expertise. This strategy enables students to develop internalised conceptual models of expert performance which then provides them with the basis for reflective thinking (i.e. self-monitoring and self-correction) (Brown et

The final strategy is exploration. This method involves the teacher providing opportunities for students to identify their own questions or problems that need to be solved and find ways of solving them (Facione, 2011). This strategy includes sharing of knowledge and experience among peers, finding appropriate learning resources (textbook, articles, journals) or searching learning information or tools through internet.

3.1.2.3 Sequencing.

This dimension elaborates on how learning activities are arranged in relation to the diversity and complexity of the content (Darabi, 2005) ‘to give students tasks that structure their learning but that preserve the meaningfulness of what they are doing’ (Collins et al., 1991, p. 15). There are three basic principles behind the sequencing concept: ‘global before local skills’, ‘increasing complexity’, and ‘increasing diversity’ (Collins et al., 1991). The first principle, global before local skills, involves conceptualising the situation as a whole before focussing on the more specific aspects. The second principle, increasing complexity, emphasises the importance of increasing complexity in the process of learning. Increasing the complexity of a task can be revealed by constructing sequential parts of the task that gradually increase in their level of difficulty. This principle requires the concomitant use of well-prepared scaffolding approaches by teachers (Collins et al., 1991). For example, within the context of the present study, students’ learning was sequenced in a manner that allowed the development of problem-solving expertise with low-risk-pregnancy situations before proceeding to high-risk-pregnancy situations. The third principle, increasing diversity, refers to the construction of a sequence of tasks so
that an increasingly wider diversity of knowledge and/or skills is required. Hence, for the purposes of the present study, these principles were applied by foregrounding the learning activities with an overview of high-risk pregnancy, and designing the case studies so that, throughout the intervention, there was an increased level of complexity in the data provided and diversity in clinical problems being addressed.

3.1.2.4 Sociology.

The fourth dimension, sociology, involves the social aspect of the learning environment. According to the cognitive-apprenticeship perspective, learning occurs within the social context (Carlson, May, Loertscher & Cobia, 2003) and is developed through social participation (Wenger, 2011). The social nature of this process provides opportunities for students to observe procedures and attitudes demonstrated by the expert, as well as the values, judgement processes and cultural elements that inform the thinking process and decisions made. Engaging students in realistic tasks through a process of guided social practice in the context of professional practice is likely to provide a meaningful learning experience, as they can actively conceptualise, and apply and modify the knowledge and skills being learnt (Carlson et al., 2003; Wenger, 2011). Thus, students are involved in the professional practice environment of the learned knowledge and skills so as to provide a clear view of how this knowledge is employed in the real situations. Pedersen and Liu (2003) argue that knowledge is frequently presented in an isolated manner, in which there is no interconnection between the knowledge and how it is used in context. However, the sociology dimension focuses on providing students the opportunity to interact continually with experts; through these social communications, students increase their understanding of different manner in which to complete meaningful tasks. Importantly, this element also focuses on providing guidance for students to work
together to accomplish their goals (Brown et al., 1989; Brown et al., 1987; Collins et al., 1991). According to Collins et al. (1991), this guidance in working together enhances learning motivation and is a mechanism for exploration. Through their participation in a social learning environment Cognitive Apprenticeship theory suggests that students are subsequently able to move from being peripheral members, or ‘less able learners’, towards being ‘more able learners’, eventually becoming full participatory members in the community of practice when they gain the expertise to accomplish complex tasks independently.

3.2 Studies Using Cognitive Apprenticeship

Cognitive apprenticeship has been used in learning situations that involve interpretation and judgement in diverse fields such as nursing, medicine, science and teacher education (Dickey, 2008; Liu, 2005; Maher, Gilmore, Feldon & Davis, 2013; Stalmeijer, Dolmans, Wolfhagen & Scherpbier, 2009; Wu, Hwang, Su & Huang, 2012; Zurmehly, Lynd & Leadingham, 2011) and has been growing in respect and popularity during the 2000s due to its emphasis on social-constructivist methods of supporting learning (Austin, 2009; Poitras & Poitras, 2011; Woolley & Jarvis, 2007). Several studies from the past 10 years have examined the effect of CALM on the development of cognitive skills and metacognitive skills.

Zurmehly, Lyn and Leadingham (2011) conducted a pre-test/post-test quasi-experimental design to compare the effect of a cognitive-apprenticeship approach on the development of nursing students’ physical-assessment skills over a period of 10 weeks. The students (N = 31) were given an educational intervention based on cognitive apprenticeship that included think-aloud and critical-dialogue approaches in a maternity–child nursing course. The measurement methodology used in this study included the students’ overall and individual mean scores of physical
assessment and accuracy of the nursing interventions for antepartum, intrapartum and postpartum clients. Data were collected using continuous dialogue and the think-aloud assessment instruments. The results indicated that post-test mean scores for physical assessment were significantly higher \((p < 0.000)\) than pre-test scores in total scores and in each individual-assessment score. What remains speculative in this study is the generalisability of the findings to the real-practice context given the small sample size, the lack of control group, convenience sampling, and the use of a non-standardised instrument, all of which are limitations of the study. Therefore, the conclusions drawn have significant limitations.

A qualitative study conducted by Stalmeijer et al. (2009) explored medical students’ \((N = 21)\) experiences on the application of the six cognitive-apprenticeship methods: modelling, coaching, scaffolding, articulation, reflection and exploration in assisting their development of problem-solving skills. Focus-group interviews explored students’ experiences of the application of these methods to develop their problem-solving skills in clinical practice. Students’ comments suggested that modelling, coaching and articulations were more frequently used by experts to assist them develop problem-solving skills while scaffolding, reflection and exploration were occasionally employed by the teachers. Therefore, these strategies were experienced only when they have longer clerkships. The authors indicated that variability in usage of the scaffolding, reflection and exploration methods by some teachers, which was attributed to teachers’ lack of time and formal training, proved to be a difficulty in implementing the study. Although the author concluded that cognitive apprenticeship appeared to be a useful teaching and learning approach in students’ clinical practice, this study did not measure the effect of cognitive-apprenticeship instruction on the students’ clinical learning performance, particularly
the application of cognitive and metacognitive skills. Further, qualitative results
drawn from this study were context dependent. Therefore, these conclusions should
be considered with caution.

To analyse the learning and teaching practices of interdisciplinary
cooperation, Pimmer, Pachler, Nierle and Genewein (2012) conducted a multiple-
case-study research focused on how consults (i.e. doctor-to-doctor consultations
between medical doctors) from different disciplines were conducted. The
participants consisted of five (requesting) doctors from the emergency department
and five participants who regularly adopted the role of on-call doctors. Data were
collected using semi-structured interviews with doctors of all levels of seniority from
two hospital sites in Switzerland. A priori constructs based on the ‘methods’
underpinning cognitive apprenticeship were used (Pimmer et al., 2012, p. 759) The
authors revealed three important findings: the relevance of consults for learning from
the perspective of cognitive apprenticeship, the cooperation of doctors in consults
across boundaries of clinical speciality, how intradisciplinary as well as
interdisciplinary learning was initiated and if experiences offered numerous and
varied opportunities for learning. The authors also indicated the relationship between
pedagogical ‘methods’ of cognitive apprenticeship in informal clinical learning
contexts in the developed model was useful in prompting help seeking and
collaborative problem solving. However, the use of the small sample size ($N = 10$)
for quantitative-data collection limited the generalisability of the study outcomes.
Hence, conclusions drawn from this study should be treated cautiously.

3.3 Summary

This chapter has described the theoretical framework for this study.
Cognitive apprenticeship has been selected as the theoretical framework
underpinning the design of the educational intervention implemented in this study and the discussion in this study of the effect of the educational intervention on students’ development of clinical-reasoning skills. Cognitive apprenticeship is an approach that aims to facilitate the development of cognitive and metacognitive skills through guided experience within an authentic environment. It is a shift away from more traditional models of teaching and learning to a model that focuses on explicit guidance and scaffolded learning experiences to improve the quality of students’ learning outcomes. Given the applied nature of clinical reasoning with respect to nursing practice, it was felt that cognitive apprenticeship provided an appropriate theoretical underpinning for the development of an intervention to improve student nurses’ abilities to apply these skills within the context of high risk pregnancy situations.
Chapter 4: Development and Review of the Educational-intervention Package—Phase 1

As described in Chapter 1, the specific objectives of Phase 1 were to design an educational intervention focussed on the facilitation of clinical reasoning within the context of high-risk pregnancy, and validate this educational intervention through review by an expert panel. Chapter 4 provides a detailed description of the development of the educational intervention and the process of review by the expert panel. The chapter concludes with a brief summary.

4.1 Development of Educational Intervention

4.1.1 Overview.

The educational intervention for this study represents a shift away from a more traditional model of learning and teaching to one that provides a contextualised, guided learning experience for students. Clinical reasoning is a complex cognitive activity, and the development and application of clinical reasoning skills is not an intuitive process for many people (Alfaro-LeFevre, 2004; Davis & Kimble, 2011; Simpson & Courtney, 2007a; Facione, N., & Facione, P. (2008). Drawing on the work of Facione, N and Facione, P (2008) and Collins, Brown and Newman (1989), the educational intervention for this study was designed to provide explicit, well-designed educational support to assist student nurses with the development of clinical-reasoning skills and their application in clinical-practice situations.

4.1.2 Aims.

The overall aim of the educational intervention was to facilitate the development of clinical-reasoning skills by undergraduate nursing students for
application in clinical situations in which judgement is required. The specific objectives of the educational-intervention learning experience were to enable students to perform the following: 1) recognise key clinical characteristics of the case scenario; 2) determine whether problems exist; 3) prioritise the identified problems and their possible interventions; 4) select the most relevant and feasible intervention/s and justify decisions made; 5) reflect on the effectiveness of decisions made and the thinking process that was undertaken.

4.1.3 Design.

Drawing on work by Facione (2011) and Collins, Brown and Newman (1989), the educational intervention for this study was designed to achieve the overall aim and stated learning objectives. As presented in Figure 4.1, the model for the educational intervention features four key teaching/learning strategies (critical questioning, expert modelling, peer discussion and reflective thinking), which are complemented by four learning-enhancement strategies (contextualisation, sequencing, scaffolding and articulation). These strategies are described in the following section.
4.1.3.1 Key teaching/learning strategies.

4.1.3.1.1 Critical questioning.

The critical-questioning strategy can be described as a strategy designed to facilitate purposeful questions that target the development of clinical-reasoning skills. Paul and Elder (2008) believe that purposeful questions delivered to the students can foster students’ conceptual development and their engagement and subsequently, assist their active participation in the learning experience. A number of researchers have reported that facilitating critical questioning can significantly enhance clinical-reasoning skills (Loy, Gelula & Vontver, 2004; Snyder & Snyder, 2008). Within the context of the vignette developed for this study, critical questions were developed to help students in the high-risk-pregnancy nursing context undertake further patient-data collection; decide whether high-risk-pregnancy problem/s existed; prioritise identified problems; select the most relevant and
feasible intervention/s based on a process of decision making; and reflect on the effectiveness of the decision made.

4.1.3.1.2 Expert modelling.

The expert-modelling strategy involved the demonstration of clinical-reasoning skills application by the expert (i.e. the teacher) to provide a ‘real-life’ model that would help students observe, conceptualise and develop a conceptual model of the processes important to accomplishing abstract skills that are largely ‘hidden’ from students’ direct view (Collins et al., 1991; Herrington & Kervin, 2007; Herrington et al., 2010; Woolley & Jarvis, 2007). Recent evidence suggests that embedding expert modelling within learning instruction can foster meaningful learning (Carlson et al., 2003; Durabi, 2005; Herrington & Kervin, 2007; Oriol, Tumulty & Snyder, 2010; Stalmeijer et al., 2009; Woolley & Jarvis, 2007). For example, a qualitative study conducted by Stalmeijer et al. (2009) among medical students found that teachers who explained and demonstrated the learnt topics repeatedly and actively engaged students in the process of learning greatly enhanced students’ learning. Similarly, a study conducted by Oriol, Tumulty and Snyder (2010) on instructional strategy for teaching the Statistical Package for the Social Sciences (SPSS) online found that a modelling strategy using the Adobe Captivate tutorials to illustrate and explain SPSS functions explicitly enhanced students understanding of the required statistical operation. Another study conducted by Herrington and Oliver (2000) also reported very positive comments from pre-service secondary teachers on expert modelling using video clips and scenarios performed by an experienced teacher in a realistic context of assessment technique. Using these approaches the pre-service secondary teachers were enabled to observe utility of the assessment technique.
Expert modelling was employed in the educational intervention in this study using the ‘think-aloud’ approach, which is a process that involves the teacher verbalising their thinking. This approach includes the discussion of the assumptions, relevant evidence and the logic of the thinking process when solving problems (Calleja et al., 2011; Lundgrén-Laine & Salanterä, 2010). Through verbalising the expert’s thinking, students are able to access the mental process used by the teacher in solving problems. Researchers have found that the think-aloud approach is an effective strategy for teaching clinical reasoning (Cox, Irby & Bowen, 2006; Pinnock & Welch, 2014), which makes it a valid choice for this study.

4.1.3.1.3 Peer discussion.

The peer-discussion strategy focuses on the learner sharing ideas with other learners. Collins et al. (1989) believe that the presence of other learners provides learners with ‘calibrations for their own progress, helping them to identify strengths and weaknesses and thus focus their efforts on improvement’ (p. 486). Consequently, peer discussion was implemented as part of the key teaching/learning strategies in this study to allow students to share their thinking with the group and reflect on others’ experiences (Chang, Chang, Kuo, Yang & Chou, 2011; Herrington et al., 2010; Wiggs, 2011). Several studies have found that collaborative construction of knowledge and reflection are significant positive outcomes of peer discussion (Herrington & Oliver, 2000; Herrington et al., 2010; Woolley & Jarvis, 2007). This study considered that learning through peer discussion would provide students with multiple roles and perspectives and assist the development of students’ clinical-reasoning skills to solve clinical problems.

Peer discussion is not only an effective learning strategy for students, but also a purposeful facilitation strategy for teachers. The advantage of observing the peer-
discussion processes is twofold. First, for teachers and students, it can provide rich information about the use of clinical-reasoning skills in the students (i.e. how well the thinking skill been developed; the difficulties the students might have, the factors that might contribute to the learning problems). Second, having identified the students’ clinical-reasoning skills and therefore their learning needs, the teacher can provide relevant learning supports (e.g. coaching, scaffolding or modelling) and reflect on the effectiveness of the strategies employed by the teacher so that they can be refined or adapted to the students’ learning needs (Lai, 2006; Wiggs, 2011).

4.1.3.1.4 Reflective thinking.

As a form of metacognition, reflective thinking is the deliberate monitoring and correction of the one’s cognitive strategies (Facione, 2011; Khun, 1999; Lai, 2011). It is argued that reflective thinking enables students to recollect the prominent features of their experience and verify them (Herrington & Kervin, 2007; Herrington & Oliver, 2000). When reflecting on experiences, students are able to identify both positive and negative experiences and construct a conceptual framework from their experiences. This will subsequently support association and integration of new knowledge into the existing conceptual framework (Herrington & Kervin, 2007; Herrington & Oliver, 2000). Studies have found that facilitating learning using reflective thinking enhances clinical reasoning (Arafeh, Hansen & Nichols, 2010; Kennison, 2006; Kuiper et al., 2010; Kuiper & Pesut, 2004; Mann, Gordon & MacLeod, 2009; Simpson & Courtney, 2007b). To stimulate students’ reflective thinking, this study provided guiding reflective questions to the students after they completed each learning activity.
4.1.3.2 Enhancement strategies.

To operationalise the key teaching/learning strategies, the learning strategies were complemented by four enhancement strategies that provided practical support for the delivery of the learning activities. The strategies are as follows.

4.1.3.2.1 Contextualising.

Contextualising learning instruction assists students to construct meanings of concepts which facilitate their usage in practice. Collins et al. (1991) argue that contextualising learning must not only represent the real world of practice, but also, more importantly, must involve situations that would normally involve the knowledge being taught. Context should reflect how historical, cultural and institutional factors control the actions of people’s daily lives (Brown et al., 1989; Dennen & Burner, 2008). According to this perspective, learners need to participate actively in problems connected to real-world practice and interact within a particular sociocultural context. Involvement in a real-life context such as the nursing-practice context enables students to observe and practice their reasoning and attitudes, as they learn through experiencing realistic tasks. Importantly, teachers must ensure contextual elements of the learnt subject are visible to students by integrating context-based tasks in the design of learning activities. As a result, students can more easily make connections between theory and practice and apply their understanding in practice.

In the educational intervention applied in this study, the contextualisation strategy framed learning activities based on the intended learning objectives within the context of high-risk-pregnancy nursing. Students were guided to build on their existing nursing knowledge and skills and develop new conceptual knowledge and clinical-reasoning skills relevant to high-risk-pregnancy care. Five clinical-reasoning
questions were used in this context as the guiding questions in all learning activities. Those were Q1: what are the relevant facts about your patient? ; Q2: what is/are the key problems to be addressed, and why? ; Q3: what intervention/s might be used? ; Q4: which intervention/s is/are most appropriate, and why? ; Q5: has all the important information been taken into account? How confident am I about this decision? Thinking back, is there anything that should have been done differently? What have I learned, and how will I use this learning in the future? As elaborated in Chapter 2, the five clinical reasoning questions were derived from the five-step ‘IDEAS’ model (Identify, Deepen, Enumerate, Assess and Scrutinise) suggested by Facione (2011) to facilitate students’ application of critical thinking skills in the clinical reasoning activities.

4.1.3.2.2 Sequencing.

Sequencing learning instruction refers to a strategy used by the teacher to organise diversity and complexity of the learning content. In this study, students were assisted to work through three clinical vignettes that are structured with incremental levels of complexity: a simple clinical vignette, a more complex clinical vignette and a complex clinical vignette. This strategy aims to assist students to build a deeper and wider conceptual foundation of the learnt subject. By sequencing the learning activities, students obtain a general picture and comprehensive understanding of the tasks (Durabi, 2005; Pritchard & Woollard, 2010). In addition, this strategy enables teachers to assess the developed understanding of the concepts and effectively control task complexity according to the students’ level of understanding of the tasks.
4.1.3.2.3 Scaffolding.

The scaffolding strategies in this study were informed by the concept of ZPD, which was originally designed to assist children to do something that could not be done without assistance (Dennen, 2004; Dennen & Burner, 2008). ZPD can be explained as a dynamic area or distance in which assistance is needed by the students to enable them to accomplish their tasks independently. The teacher should be able to identify the needs of the students and deliver relevant scaffolding strategies. In doing this, the teacher plays a more supportive than didactic role (Herrington et al., 2010).

In this study, scaffolding was performed in several ways. First, the teacher was located in the learning environment and actively listened to the peer discussion. Second, during the peer discussion, the teacher gave students hints to think about, for example, the teacher might prompt students to think about factors that were missing in the patient’s clinical information or had not been fully considered by the student. In addition to the hints, students were given an example of how to think and do things (e.g. the teacher might say, ‘If I were you, I would do this and this’). Further, the teacher offered alternative means by which to perform tasks (e.g. the teacher might say, ‘Instead of doing this, you could possibly do “a” or “b”; let us think about its implication and consequences’, before choosing the most relevant and feasible intervention/s). Importantly, the teacher also provided a debriefing session to provide general feedback to the students and emphasise the main ideas at the end of the discussion. Having done this, the teacher was able to attain more information about the students’ thinking process and development or learning difficulties to enable the teacher to provide adequate learning guidance.
4.1.3.2.4 Articulation.

The articulation strategy involved facilitating students to express their ideas in the group. Being able to articulate reason in a logical and coherent manner indicates the use of the cognitive skills essential for reasoning (Facione, 2011). This study considered that this strategy would enable students to ‘describe methods and results, justifying procedures, proposing and defending with good reasons one’s causal and conceptual explanation of event or points of view’ (Facione, 2011, p. 6). Similarly, the use of articulation demands that students articulate their knowledge or reasoning process (e.g. by asking questions, defending arguments or sharing ideas) (Durabi, 2005; Woolley & Jarvis, 2007). In the educational intervention implemented in this study, the students were prompted with questions that were designed to facilitate discussion about contradictions, inconsistencies, strong/weak points in students’ thinking or to motivate the students to challenge each other’s reasoning. In addition, students were given opportunities to present their argument to the group as a whole. By doing this, the teacher obtained insight into students’ growing understanding of the learning content (Herrington & Kervin, 2007; Herrington & Oliver, 2000).

4.1.4 Student workbook.

The student workbook comprised a set of learning activities designed to help students to apply clinical-reasoning skills using clinically based vignettes. Importantly, the workbook provided a step-by-step clinical-reasoning pathway. Thus, students were guided to apply clinical reasoning skills using several strategies provided in the workbook.

This book consisted of two sections. The first explained the conceptualisation of clinical-reasoning skills and several essential strategies used to apply these skills...
in the context of clinical judgement. The learning objectives were presented in the workbook, followed by an explanation of the basic concepts of clinical-reasoning skills to provide the students with insight into what constitutes clinical-reasoning skills. Five clinical-reasoning questions employed in the five steps of clinical reasoning were used to formulate a clinical judgement. The five clinical-reasoning questions (described in p. 42) were developed to assist students to apply clinical-reasoning skills in a logical order. This study hypothesised that habitually answering these questions would lead students to gain better clinical judgement.

The second section in the workbook provided clinical-vignette learning activities to facilitate students’ application of clinical-reasoning skills (Appendix A). These learning activities were undertaken through a peer discussion and the clinical vignettes were discussed among the group members. Thus, every student was provided with an opportunity to articulate their thinking related to the clinical vignettes. This idea was consistent with the work of Gagne, Wager, Golas and Keller (2005) who argue that the use of cognitive strategies by students cannot be observed directly and so need to be inferred from their performance. Arguably, using the clinical vignettes within the workbook not only supported the application and development of the students’ clinical-reasoning skills but also provided valuable information to the teachers about the students’ use of reasoning strategies (Jeffries & Maeder, 2006, 2009, 2011; Kish, 2006).

4.1.5 Teacher guide.

The teacher guide comprised a set of strategies for facilitating students’ application of clinical-reasoning skills within the context of high-risk-pregnancy nursing. As a complement to the educational-intervention package, this guide provided a step-by-step guide to learning assistance in clinical-reasoning skills for
use by the teacher. Some educationists agree that teachers play an important role in assessing students’ learning needs, and planning and delivering instructional strategies, as well as measuring learning outcomes (Oriol et al., 2010; Stalmeijer et al., 2009; Woolley & Jarvis, 2007). Thus, providing the teacher with a guide in the learning context equipped them to function optimally.

This book consisted of two sections. As in the student workbook, the first section explained the concept of clinical-reasoning skills and the intended learning objectives. In contrast to the learning activities in the student workbook, the second section of the teacher guide provided teaching strategies and comprehensive information related to the clinical vignettes, as well as prompts designed to aid the teachers to stimulate students’ reasoning skills when answering each clinical-reasoning question in the clinical-judgement steps. To ensure the validity of the educational-intervention package, expert panel review of the intervention was undertaken; this process is discussed in the following section.

4.2 Expert-panel Review of Educational-intervention Package

4.2.1 Methodology.

The second key element of Phase 1 involved enlisting an expert panel to evaluate the relevance, clarity and feasibility of the draft educational intervention in relation to the stated study aims and objectives (Polit & Beck, 2012; Polit, Beck & Owen, 2007; Ramsbotham, 2009). The effectiveness and rigour of an expert-panel approach in validating assessment instruments and educational packages has been widely recognised and employed in several nursing projects and has included the development of the following: a post-encounter form for assessing clinical reasoning (Durning et al., 2012); an instrument for measuring the role of advanced practice in an international contemporary health service (Chang, Gardner, Duffield & Ramis,
2010); a modified Quality of Simulated Patient Feedback Form (Schlegel, Woermann, Rethans & van der Vleuten, 2012); an innovative model of clinical decision making and educational delivery strategy (the Pediatric Nursing Physical Assessment [PNPA] CD-ROM) (Ramsbotham, 2009); validation of the core elements of perioperative nursing (Rauta, Salanterä, Nivalainen & Junttila, 2012). Consistent with Squires et al. (2013), the present study considered the expert-panel approach particularly important because it provided a means by which the specifically designed intervention could be critically reviewed by nurse educators whose expertise lies in the current operation and realities of nursing education in the Indonesian context. As such, it was concluded that this approach added rigour to the educational-intervention package.

For this study, the expert panellists were asked to use their expertise to assess the clarity, relevance and feasibility of the learning objectives, teaching strategy, educational content and materials, and planned delivery of the educational intervention. In addition, panellists reviewed the educational intervention for its suitability to be used in an Indonesian nursing-education context. Importantly, the panellists’ opinions were also sought on possible barriers to successful implementation of the educational intervention, as well as other related advice designed to enhance the quality of the final educational intervention.

4.2.2 Participants.

Five experts were invited to participate. According to Polit et al. (2007), to provide an adequate level of control for chance agreement, a minimum of five experts must be involved in the review process. Prospective panellists were selected based on their relevant professional expertise, including teaching experience,
relevant academic qualifications, and practice experience in the Indonesian context.

The inclusion criteria applied to expert-panel participation were as follows:

- postgraduate qualification in nursing education
- minimum of five years of teaching experience in nursing-related undergraduate education in Indonesia
- relevant teaching practice/professional experience in Indonesia.

Participation as a member of the expert panel involved providing comments on the proposed educational strategies, assessing the educational content to determine whether it clearly addressed the learning objectives, and reviewing the educational intervention for its suitability to be used in an Indonesian nursing-education context. Each prospective member of the expert panel was approached by email and invited to participate in the study. They were given an explanatory overview of the project explaining the underpinning concept and theory, as well as the procedure instructions. To facilitate the provision of unbiased comments, nursing academics from areas of Indonesia other than the location in which the present study was to be undertaken were invited to participate. Five nursing academics from the western, middle and eastern regions of Indonesia agreed to participate as members of the expert panel. Completed ethical consents were submitted by the panellists before data collection. The demographic characteristics of the panellists are presented in Table 4.1.
### Table 4.1

*Demographic Characteristics of Expert Panel*

<table>
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<tr>
<th>Characteristics</th>
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<th>%</th>
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<tbody>
<tr>
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<td></td>
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<tr>
<td><strong>Age:</strong></td>
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<td>40–49 years</td>
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<tr>
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<td>20</td>
</tr>
<tr>
<td><strong>Educational Background:</strong></td>
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<td></td>
</tr>
<tr>
<td>Master</td>
<td>3</td>
<td>60</td>
</tr>
<tr>
<td>Doctor</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td><strong>Professional Practice:</strong></td>
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<td></td>
</tr>
<tr>
<td>16–20 years</td>
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<td>40</td>
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<tr>
<td>&gt;20 years</td>
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<td>40</td>
</tr>
<tr>
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<td>1</td>
<td>20</td>
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<tr>
<td><strong>Teaching Nursing-related Subjects:</strong></td>
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<td></td>
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<tr>
<td>11–15 years</td>
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<td>3</td>
<td>60</td>
</tr>
<tr>
<td><strong>Major Teaching Responsibility:</strong></td>
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<tr>
<td>Curriculum Development, Subject Coordinator, Lecturer and Clinician</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>Curriculum Development, Subject Coordinator, Lecturer</td>
<td>3</td>
<td>60</td>
</tr>
</tbody>
</table>

#### 4.2.3 Instruments.

A specifically constructed feedback instrument was developed for evaluating the content validity of the educational-intervention package. The feedback instrument consisted of 31 items encompassing an overview of the educational-
intervention model, the student workbook and the accompanying teacher guide. The panellists recorded their views using a Likert scale where the relevance, clarity and feasibility of the educational intervention were rated as follows: 1 = strongly agree, 2 = agree, 3 = disagree, 4 = strongly disagree (Polit & Beck, 2012). The panellists also had the opportunity to make recommendations and further comments in an open-question section. The expert-panel feedback instrument is presented in Appendix B.

4.2.4 Recruitment and procedure.

A purposive-sampling approach was used to recruit the expert panel. Potential participants who fulfilled the inclusion criteria were identified through the researcher professional working relationships with nursing institutions in Indonesia. Phone numbers and email addresses were obtained from the database of the Faculty of Nursing of the Catholic University of De La Salle Manado (CUDLSM) and the social-networking service: facebook and LinkedIn. Using electronic communication, potential participants were forwarded information about the study.

Electronic communication from the researcher explained the study’s aim and processes, and outlined the time commitment. The participants who agreed to participate signed the research consent form and returned it electronically to the researcher before the research was conducted. Subsequently, the draft educational-intervention package materials, including a cover letter, background information related to the package and target population, and reviewer instructions were sent to the expert panel. The panellists were provided with the educational package, as well as an overview of the conceptual underpinnings of the cognitive-apprenticeship approach used in the educational-intervention package being assessed, the student workbook and the teacher guide. The expert-panel process was conducted over a
period of approximately five weeks, which allowed sufficient time for the panellists to examine and comment on the educational-intervention materials.

4.2.5 Data analysis.

In this study, numerical data obtained from the feedback instrument were analysed using the Content Validity Index (CVI) method (Grant & Davis, 1997; Haynes, Richard & Kubany, 1995; Polit et al., 2007). This technique was selected because it focuses on the level of agreement between panellists (rather than the individual ratings) and is easy to calculate and understand (Polit & Beck, 2012; Squires et al., 2013). Content validity can be calculated at both Item (I-CVI) and Scale (S-CVI) levels. Polit and Beck (2012) suggest that to be considered as having excellent content validity, an I-CVI of 0.78 or higher and an S-CVI of 0.90 or higher are desirable (Polit & Beck, 2012). Consistent with this standard, a benchmark of 0.78 or higher was applied to judge the adequacy of the I-CVI. Accordingly, any components of the educational-intervention package with an I-CVI score of less than 0.78 were judged as requiring improvement. Detailed computation of the I-CVI is presented in Appendix C. The expert-panel CVI scores are summarised in Table 4.2.
Table 4.2

Summary Expert Panel CVI Results

<table>
<thead>
<tr>
<th>The Package</th>
<th>Proportion of agreement: average I-CVI scores for each subscale</th>
<th>Proportion of agreement S-CVI Scores*</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Relevance Clarity Feasibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The educational-intervention overview</td>
<td>1 1 1</td>
<td>1</td>
<td>Excellent</td>
</tr>
<tr>
<td>Student workbook</td>
<td>1 1 1</td>
<td>1</td>
<td>Excellent</td>
</tr>
<tr>
<td>Teacher guidance</td>
<td>0.93 1 0.93</td>
<td>0.95</td>
<td>Excellent</td>
</tr>
<tr>
<td>Average proportion of expert-panel agreement</td>
<td>0.98</td>
<td></td>
<td>Excellent</td>
</tr>
</tbody>
</table>

*Average CVI derived from the three subscales: relevance, clarity and feasibility.

As presented above, the S-CVI of both the educational-intervention overview and the student workbooks were 1.00, while the S-CVI of the teacher guide was 0.95. Accordingly, the average proportion of expert agreement on the educational-intervention package was 0.98. When compared to the benchmark S-CVI value of 0.90 or higher (Polit & Beck, 2012) the package as a whole (and the three individual components) were shown to have excellent content validity and, thus, it was determined that no further improvement on the educational package was required.

Recommendations and further comments from panellists’ written comments regarding the relevance, clarity and the feasibility of the educational intervention were translated into English, as not all the comments were in English. The comments were used to guide the refinement of the educational-intervention package.
4.2.6 Ethics.

Ethics approval for Phase 1 was formally obtained from the University Human Research Ethics Committee (UHREC) (Reference No. 1200000588). Participation was voluntary after signed informed consent. All participants could leave this study whenever they wanted without facing any consequences. The answers in the questionnaire remained confidential and all completed survey questionnaires were stored securely. A copy of the ethics-approval document is provided in Appendix D.

4.2.7 Results.

Research question 1: How does the expert panel rate the relevance, clarity and feasibility of the educational package?

Research question 2: What are the perceptions of the expert panel of the relevance, clarity and feasibility of the educational-intervention package?

CVI calculations were undertaken at both Item (I-CVI) and Scale levels (S-CVI) (Polit & Beck, 2012). Feedback from the panellists was summarised and coded into a dichotomous Yes/No variable where Yes represented the Likert-scale response of 3 (agree) and 4 (strongly agree) while No represented the Likert-scale response of 1 (strongly disagree) and 2 (disagree). As the calculation was focused on the agreement among experts that the items are relevant, clear and feasible, only items with response Yes (Likert scale of 3 or 4) had an I-CVI of 1.00, and items with response No (Likert scale of 1 or 2) did not have any value, and were excluded from the I-CVI calculation. The average I-CVI for each of the items and the expert-panel response as a whole were calculated by adding the I-CVI for each item and dividing the total by the number of items (Grant & Davis, 1997; Haynes, Richard & Kubany, 1995; Polit, Beck & Owen, 2007). The suggested evaluation criteria of excellent CVI
values are ≥0.78 for I-CVI and ≥0.90 for S-CVI (Polit, Beck & Owen, 2007).

Detailed educational intervention overview I-CVI is presented in Table 4.3. This is followed by the student workbook I-CVI in Table 4.4. The teacher guide I-CVI results are reported in Table 4.5.
Table 4.3

*Educational-intervention Overview I-CVI*

<table>
<thead>
<tr>
<th>No.</th>
<th>Educational Intervention</th>
<th>Relevance</th>
<th>Clarity</th>
<th>Feasibility</th>
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<td>Experts in Agreement</td>
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<td>5</td>
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<td>1</td>
<td>5</td>
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<td>2</td>
<td>Learning objectives (p. 2)</td>
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<tr>
<td>3</td>
<td>Educational-intervention model (Figure 1, p. 3)</td>
<td>5</td>
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<tr>
<td>4</td>
<td>Key teaching/learning strategies (pp. 3–5)</td>
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<td>5</td>
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<tr>
<td>5</td>
<td>Learning-enhancement strategies (pp. 6–7)</td>
<td>5</td>
<td>1</td>
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<tr>
<td>6</td>
<td>Presentation of information in Tables 1 and 2</td>
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<td>5</td>
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<tr>
<td></td>
<td>Subscale I-CVI scores</td>
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Table 4.4

*Educational-intervention Student Workbook I-CVI*

<table>
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<tr>
<th>No.</th>
<th>The Student Workbook</th>
<th>Relevance</th>
<th>Clarity</th>
<th>Feasibility</th>
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<td>Experts in Agreement</td>
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<td>1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Overview</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
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</tr>
<tr>
<td></td>
<td>[What are critical-thinking skills?]</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>[Why do I need critical-thinking skills?]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[How do I use critical-thinking skills in my clinical judgement?]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
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<td>Characteristics of Learning Activity 1 as a simple vignette (pp. 4–9)</td>
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<tr>
<td>4</td>
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<td>5</td>
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<tr>
<td>5</td>
<td>Application of thinking-challenge questions to vignette 1 (pp. 6–9)</td>
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<td>No.</td>
<td>The Student Workbook</td>
<td>Relevance</td>
<td>Clarity</td>
<td>Feasibility</td>
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<td>I-CVI</td>
<td>Experts in Agreement</td>
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<td>7</td>
<td>Application of thinking-challenge questions to vignette 2 (pp. 11–14)</td>
<td>5</td>
<td>1</td>
<td>5</td>
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<tr>
<td>8</td>
<td>Case data</td>
<td>5</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>Application of thinking-challenge questions to vignette 3</td>
<td>5</td>
<td>1</td>
<td>5</td>
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<tr>
<td>10</td>
<td>Visual-presentation strategies (use of graphics)</td>
<td>5</td>
<td>1</td>
<td>5</td>
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<tr>
<td></td>
<td>Subscale I-CVI scores</td>
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<td></td>
<td></td>
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<td>No.</td>
<td>The Teacher Guide</td>
<td>Relevance</td>
<td>Clarity</td>
<td>Feasibility</td>
</tr>
<tr>
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</tr>
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<td></td>
<td></td>
<td>Experts in Agreement</td>
<td>I-CVI</td>
<td>Experts in Agreement</td>
</tr>
<tr>
<td>1</td>
<td>Introduction to critical thinking (pp. 2–4)</td>
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<td>1</td>
<td>5</td>
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<tr>
<td></td>
<td>[Overview and objectives]</td>
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<td></td>
<td>[What are critical-thinking skills?]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[Why do students need critical-thinking skills?]</td>
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<td>2</td>
<td>Learning facilitation approaches used by the teacher (pp. 4–6)</td>
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<td>Characteristics of Learning Activity 1 as a simple vignette (pp. 7–11)</td>
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<td>3</td>
<td>Teacher prompts used in vignette 1</td>
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<td>5</td>
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<tr>
<td>4</td>
<td>Case data</td>
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<td>Characteristics of Learning Activity 2 as a medium-complexity vignette (pp. 12–17)</td>
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<td>7</td>
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<td>5</td>
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<td>8</td>
<td>Case data</td>
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<tr>
<td>9</td>
<td>Health problems</td>
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(continued)
<table>
<thead>
<tr>
<th>No.</th>
<th>The Teacher Guide</th>
<th>Relevance</th>
<th>Clarity</th>
<th>Feasibility</th>
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<tr>
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<td>Experts in Agreement</td>
<td>I-CVI</td>
<td>Experts in Agreement</td>
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<td>5</td>
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<td>Characteristics of Learning Activity 3 as a complex vignette (pp. 18–25)</td>
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<td>11</td>
<td>Teacher prompts used in vignette 3</td>
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<tr>
<td>12</td>
<td>Case data</td>
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<tr>
<td>13</td>
<td>Health problems</td>
<td>5</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>14</td>
<td>Possible nursing intervention</td>
<td>5</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>Visual-presentation strategies (use of graphics, colours, and tables) in the teacher guide</td>
<td>5</td>
<td>1</td>
<td>5</td>
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</tbody>
</table>

Subscale I-CVI scores

1

1

1
As presented in Table 4.3, the representative comments from the expert-panel review about the relevance, clarity and feasibility of the educational-intervention package suggested that the educational-intervention package was found to be relevant, clear and feasible for Indonesian undergraduate nursing students. Several minor issues were raised in relation to the relevance and feasibility of the student workbook (e.g. specific inclusion of placenta praevia) and such issues were refined accordingly. In addition, attention was also drawn to the importance of teacher support in relation to implementing the intervention. Minor refinement was performed for the student workbook and the teacher guide. Representative comments from the *expert-panel* review are presented in Table 4.6.

Table 4.6  
*Key Evaluation Criteria and Representative Comments from Expert-panel Review*

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Example Comments</th>
</tr>
</thead>
</table>
| Relevance           | ‘I agree with the proposed model used for clinical reasoning enhancement. This is a good learning preparation’  
|                     | ‘Placenta praevia is (also) an important topic’  
|                     | ‘Cultural and spiritual aspects need to be included in the case’ |
| Clarity             | ‘Wording used for the learning activities is simple’  
|                     | ‘Learning objectives in the intervention package are clear’ |
| Feasibility         | ‘This is a good learning preparation’  
|                     | ‘Teachers who will facilitate these approaches should be well prepared’ |
4.2.8 Discussion.

Research question 1: How does the expert panel rate the relevance, clarity and feasibility of the educational package?

Research question 2: What are the perceptions of the expert panel of the relevance, clarity and feasibility of the educational-intervention package?

The earlier section (4.1.3) describes the design and development of the educational intervention designed for this study. The results of the expert-panel review demonstrated high interrater agreement with I-CVI ranging from 0.93 to 1.00. Therefore, the package as a whole (including the three individual components) were found to have excellent content validity (S-CVI = 0.98). The panellists’ opinions on the potential barriers to successful implementation of the educational package and other related comments important to enhancing the quality of the educational intervention were also sought. The consistency of views among the panellists suggested that the educational-intervention package was a relevant, clear and feasible educational package for the nursing-education context, for example, one panellist commented, ‘I agree with the proposed model used for clinical-reasoning skills’ enhancement. This is a good learning preparation’. However, two panellists suggested that relevance to practice could be increased by including cultural and spiritual aspects in the case study. Two factors might have limited the validity of their comments that should be considered: 1) familiarity/unfamiliarity with the social context of the educational intervention (i.e. students’ learning and cultural characteristics); 2) the size of the panel. These two factors might had influenced the expert-panelists’ rating and comments of the educational intervention package. Case (2013) argues that employing an expert panel to evaluate the quality of a research programme is a valuable approach; however, the outcomes are still potentially
subject to bias. For the purpose of this study, panellists were chosen who worked and lived in different parts of the country and therefore contributed to the adaptability of the educational intervention, thus, mitigating the risk of obtaining biased feedback. Therefore, it was considered that the educational intervention reviewed by the expert panel could be implemented in most nursing-education contexts in Indonesia.

4.2.9 Summary.

The educational intervention for this study was to facilitate the development of clinical-reasoning skills by undergraduate nursing students for application in clinical situations in which judgement is required. The results from Phase 1 of this study provided evidence for the validity of the educational intervention as a relevant, clear and feasible educational package that could be used to facilitate the teaching and assessment of clinical reasoning.
Chapter 5: Research Methodology for Educational Intervention and Development of Evaluation Instrument

This chapter discusses the methodology involved in the main study (Phase 2) and the procedures involved in the development of the evaluation instrument. Phase 1 of the study was elaborated in Chapter 4. This chapter begins by presenting an overview of the research design, which is followed by a brief introduction of the research setting and ethical consideration. The chapter then concludes with a brief summary.

5.1 Research Methodology

5.1.1 Study design.

A quasi-experimental, non-equivalent control-group design was used in this study, as practical challenges such as student tutorial allocation, and resource limitations made random-sampling procedures impractical. The purpose of Phase 2 was to examine the effect of an innovative educational approach on student nurses’ clinical-reasoning skills. In this phase, the finalised educational intervention (discussed in Chapter 4) was implemented with a cohort of Indonesian nursing students enrolled in the Bachelor of Nursing offered by the Faculty of Nursing of the CUDLSM. Data were collected pre-test (Time 1) and post-test (Time 2). Time 1/Time 2 data collection involved administration of the CCTDI and a clinical vignette focusing on clinical reasoning within the context of high-risk-pregnancy nursing. Following the educational intervention in this phase, focus-group discussions were conducted to identify both the intervention and control groups’ perceptions of their learning experience. Thus, the evaluation process involved
quantitative and qualitative components. The Phase 2 design is presented in Figures 4.1 and 4.2.

Figure 5.1 Non-equivalent control-group design for study
Figure 5.2 Phase 2 research design
5.1.2 Quantitative component.

5.1.2.1 Research setting.

Implementation of the educational intervention occurred in the Faculty of Nursing at the CUDLSM, which is a Lasallian University that is a part of the De La Salle Education Institute worldwide, and was established in Indonesia in 2000. The university is a private university built on approximately 12,000 m² in the capital city of North Sulawesi Province of Indonesia (Tanod, 2010). The Faculty of Nursing is one of the six faculties in the university, which has approximately 700 students (Tanod, 2010).

5.1.2.2 Sampling.

Convenience sampling was used for this study. Participants were drawn from the cohort of third-year student nurses in the Bachelor of Nursing undergraduate programme (five-year degree) who were registered for the subject ‘Reproductive System II’ nursing care in the Faculty of Nursing of CUDLSM. The total pool was 175 students (Unika De La Salle Manado, 2012). Eighty-five (N = 85) students agreed and consented to participate. At the end of the study, 76 students completed the post-test. The same inclusion criteria for the intervention and control groups were employed; these were the following:

- third-year nursing student enrolled in five-year programme at the Faculty of Nursing of CUDLSM
- registered and studying Reproductive System II under the national nursing curriculum and having fulfilled the prerequisite course Reproductive System I.

A formal permission to conduct the research from the rector of CUDLSM was obtained. At the semester assembly, students who were registered in
Reproductive System were invited to participate in the study. They were given the participant information sheet, which provided an overview of the study and the researcher’s contact telephone number and email address, as well as details about an information session at which they could ask questions or seek clarification about the study. Subsequently, students who wished to participate were asked to sign a consent form indicating their agreement before completing the pre-intervention measures. Eighty-five students agreed to participate and were consented to participate.

5.1.2.3 Procedures.

The implementation phase of this study occurred over a period of six weeks (three hours per week) within the high-risk-pregnancy nursing care subject that was part of the National Bachelor of Nursing curriculum. At the beginning of the six weeks, students from both the intervention and control groups were given information about the subject learning goals, assessment strategies and the teaching processes that would be employed. The specific topics covered during the subject were similar for both the intervention and control groups, including abortion, ectopic pregnancy, placenta praevia, hyperemesis gravidarum, and gestational hypertension.

5.1.2.3.1 Control group.

The primary teaching modes utilised in the control-group condition (i.e. usual teaching approaches) were lectures and group presentations that were organised as follows:

- The lectures mainly involved teacher-centred learning and focused on relevant content and learning outcomes. During a period of a six-week educational intervention, lectures occurred in week 1 and week 2. Learning in the control group was facilitated by the subject teachers.
For the group presentations, students formed groups of approximately seven to eight students and each group was allocated a specific topic to prepare and present to the class. During each group’s presentation, there were questions and answers between the presenters and the audience/peers and/or between the audience and the teacher of the content presented. There was also an assessment of the presentation by the teacher. Student presentations were conducted in weeks 3 to 6.

Student preparation for the presentations was outside the lecture time and no teacher guidance was provided during the preparation.

5.1.2.3.2 Intervention group.

In contrast to the control group, the teaching modes utilised in the intervention-group condition were lectures, teacher-facilitated peer discussions and class presentations organised as follows:

- The two lectures attended by the intervention group were the same as for the control group.

- The teacher-facilitated peer discussions were contextualised within the case scenarios relevant to the high-risk-pregnancy topic. These discussions occurred in a small-group context (four to five students per group). In this group, the teacher verbalised her thinking to reveal the reasoning processes employed in the management of high-risk-pregnancy cases. Students’ thinking was stimulated through the provision of prompts and hints. They were encouraged to articulate their clinical reasoning, and share their knowledge and experience to solve the clinical problems collaboratively.

- In the class presentations each member of the small groups presented their groups’ clinical-reasoning process and outcomes, discussed the differences
between and similarities with their processes and outcomes and those of the other groups. The aim of this activity is for all groups to gain a shared understanding of the learnt topic. As for the control group, students’ peer-group discussions and presentations also occurred during weeks 3 to 6. The detailed teaching and learning strategies used in this study are presented in Appendix B.

5.1.2.4 Data collection.

The quantitative data for Phase 2 was collected using two measurement instruments: the CCTDI and students’ responses to a specifically developed clinical vignette. The intervention and control groups completed a survey questionnaire and a clinical vignette before the implementation phase of the study (pre-test) and after the implementation phase (post-test). The main purpose of the pre-test was to establish comparative baseline data for both intervention and control groups and, in addition, a comparison point for the post-test results (Dimitrov & Rumrill, 2003). Importantly, both intervention and control group students had completed the normal pregnancy pre-requisite subject prior to participating in the study. For reasons outlined earlier, the pre-test clinical vignette involved normal pregnancy whereas the post-test vignette involved high-risk pregnancy. However, it is important to note that, at both data collection points, the focus of the clinical vignette was on students’ clinical reasoning skills – not specific knowledge related to pregnancy conditions. To maintain anonymity and enable data matching, students were asked to write their student number instead of their name on the pre-test and post-test response sheets. Descriptions of the instruments are presented in the following sections, and the details are summarised in Figure 5.3.
Figure 5.3. Variables and sub-variables measured in the study.

5.1.2.4.1 CCTDI.

The CCTDI is comprised of 75 forced-choice items (Likert scale 1–6) measuring the attitudes and values that influence students’ capacity to learn and apply critical-thinking skills (Facione, N. & Facione, P., 2007). CCTDI is clustered into seven scales including truth-seeking, open-mindedness, analyticity, systematicity, critical-thinking self-confidence, inquisitiveness and maturity of judgement. The seven subscales are scored ranging from 10 to 60. The lower scores (below 20) indicate a possible negative attitude to thinking. Conversely, obtaining a score of 50 to 60 can be an indication of having a positive attitude to thinking that is essential for reflective thinking and problem solving, particularly in high-stakes situations such as in nursing-care contexts. Internal-consistency reliability (Cronbach’s alpha) for the seven individual scales of the CCTDI ranges from 0.71 to
0.80, and the alpha coefficient for the overall instrument is 0.90 (Facione, N. & Facione, P., 2007).

While the CCTDI does not relate directly to clinical reasoning, this study considered there were several reasons for its relevant and practical use in this study. According to Geertsen (2003, p. 6), a positive attitude to thinking allows the use of current knowledge while leaving the mind open to new evidence and perspectives so that the individual is able to ‘remain sufficiently flexible to pursue new possibilities when confronted with unexpected outcomes’. As the CCTDI measures attitudes to critical thinking (Insight Assessment, 2014; Paans, Sermeus, Nieweg & Van der Schans, 2010), it was concluded that the resultant data would provide useful information about students’ tendency to apply clinical-reasoning skills within the context of nursing-care provision.

In addition, although a number of well-known instruments exist for measuring clinical reasoning (e.g. the California Critical Thinking Skills Test [CCTST] and the HSRT), they do not measure clinical reasoning from an applied perspective (e.g. the usage of clinical-reasoning skills by nurses in clinical practice) and were therefore considered to have limited relevance within the context of the present study (Brunt, 2005a; Follman, 2003; Murphy, 2004; Stone, Davidson, Evans & Hansen, 2001). Notably, several studies from the past 10 years have revealed a significant relationship between critical-thinking skills and critical-thinking disposition (Munix, 2012; Profetto-McGrath, 2003; Socherman, 2010; Stone et al., 2001; Walsh & Seldomridge, 2006; Yang & Chou, 2008).

Further, the CCTDI was available in the Indonesian language and, as contended by Facione, N and Facione, P (2007), the use of a language-adjusted measurement can minimise language-related misinterpretation of the measurement
statements and enable students to express beliefs, values, attitudes and intentions effectively. As such, this study concluded that the CCTDI was a relevant and feasible instrument for measuring the effect of the educational intervention on nursing students’ clinical reasoning within the context of this study.

5.1.2.4.2 Clinical vignette.

The clinical vignette that was developed for evaluating the educational intervention was a short, purpose-designed scenario describing a health situation related to high-risk pregnancy. Construction of the case scenarios were referred to the Nursing Diagnosis handbook by Ackley and Ladwig (2011) and the Maternal-newborn Nursing textbook by Chapman and Durham (2010). It contained relevant but insufficient information about a ‘problem’ being experienced by a woman receiving antenatal care. The clinical vignette also contained information that was irrelevant to the ‘problem’. Students were asked to respond to the five clinical reasoning questions provided, which accompanied the clinical vignette, and had the opportunity to request additional information as they worked through the clinical vignette. In addition, they were asked to rate their level of self-confidence in responding to every question, using five levels of self-confidence ranging from 1 (not confident at all) to 5 (extremely confident). The educational-intervention clinical vignette is presented in Appendix H.

5.1.2.5 Preparation of data for analysis.

5.1.2.5.1 Data management.

In the data management for the students’ responses to the CCTDI and the clinical vignettes, the following steps were performed to ensure integrity of the data:

- manual coding of students’ responses was developed
- before data entry was undertaken, any scoring inconsistencies were reviewed
• data were entered into an SPSS database, version 21. Ten per cent of students’ responses were entered a second time for double-entry verification
• a check for any duplication of student-identification numbers was undertaken for the completed database
• distribution of all variables was checked for invalid scoring codes, the frequency of missing data and normality
• any suspicious number about unusual scoring in the data were checked with the original student responses
• data were held in a locked and secured filing cabinet and in a password-protected computer or portable hard drive accessed by the researcher and supervisory team only.

5.1.2.5.2 Management of missing data.

Missing data in this study was at approximately 11 per cent (as stated in Table 6.2). Incomplete data might cause difficulty in conducting an analysis approach (Pallant, 2013) and might lead to a loss of statistical power (Howell, 2012). To treat missing data appropriately, it was crucial to determine the nature of missing data (Howell, 2012). This was achieved using the SPSS Missing Value Analysis (MVA), which can be used for testing the nature of missing data (Howell, 2012). A non-significant result from a chi-square test in MVA indicates the nature of missing data is missing completely at random (MCAR), which describes missing data that is occurring randomly or not systematically and unrelated to any value (Howell, 2012; Scheffer, 2002). In this study, MVA revealed non-significant results for the overall CCTDI scores for the responses to accuracy in clinical reasoning, inaccuracy in clinical reasoning, and self-confidence in clinical reasoning (p > 0.05) Therefore, missing data in these variable responses were considered MCAR. Several methods
are applicable for treating MCAR data. This study employed a linear-trend-at-point method. Using a regression substitution approach, the missing scores were predicted based on other variables present. The existing variables were used to make the prediction and then substitute for that predicted value as if it were an actual obtained value (Howell, 2012).

5.1.2.5.3 Checking of assumptions.

**CCTDI**

Students’ responses to the CCTDI were measured using a continuous-level scale. Although convenience sampling was used for this study, the independence assumption was maintained in that each participant’s responses were sampled independently from the other participants’ response. Importantly, to enhance equal probability and representativeness of the sample characteristics (Polit & Beck, 2012), participants were randomly allocated to the control or intervention groups. Further, the histogram generated from SPSS revealed that the overall mean scores and scale scores of the CCTDI responses were normally distributed around the mean, thus meeting the normality assumption (Pallant, 2013; Polit & Beck, 2012). Mauchly’s Test of Sphericity demonstrated that the observed covariance matrices of the dependent variables were equal across groups, and the homogeneity-of-variance test performed by Levene’s test revealed that the variability of scores for each of the groups was similar.

**Clinical vignette**

The overall scores of the variables of accuracy and inaccuracy in clinical reasoning and the self-confidence in clinical reasoning were measured using continuous-level scales. Mauchly’s Test of Sphericity indicated that the observed covariance matrices of these scores were equal across groups, and Levene’s
homogeneity-of-variance test revealed that the variability of scores for each of the groups was also similar. Thus, key assumptions for using parametric tests were also met.

For the results of the sub-variables of accuracy in clinical reasoning and inaccuracy in clinical reasoning, several assumptions for conducting parametric analysis were not met. For example, the dependent-variable results were at an ordinal level. Moreover, the normality check conducted for the four accuracy sub-variable results revealed that the number of responses was not normally distributed around the mean. Consequently, data collected from these variables were analysed using non-parametric tests.

5.1.2.6 Scoring.

Before conducting statistical analysis using SPSS 21.0, students’ responses to CCTDI and clinical vignette were scored. Detailed scoring of the overall scores and sub-variable results of the CCTDI and clinical vignette are described in the following subsections.

5.1.2.6.1 CCTDI.

Overall scores as described earlier (in the data-collection section) was the sum of the individual scale sores. The scale scores were the score of individual scales of the CCTDI. The scale scores ranged from 10 to 60. The overall scores therefore ranged from 70 from 420.

5.1.2.6.2 Clinical vignette.

Two components were measured using the clinical vignette: 1) students’ clinical reasoning; 2) students’ self-confidence in clinical reasoning. Students’ clinical reasoning was measured using two primary variables: accuracy and inaccuracy in clinical reasoning. The determination of accuracy and inaccuracy in
students’ responses to the clinical vignette was guided by Ackley and Ladwig’s (2011) *Nursing diagnosis handbook: An evidence-based guide to planning care* and Chapman and Durham’s (2010) *Maternal-newborn nursing: The critical components of nursing care*. The use of these texts is consistent with the key concepts presented in the lectures and the requirements of the national Indonesian nursing curriculum used by the CUDLSM. An answer guide for each of the four clinical-reasoning questions was constructed *a priori* using the content presented in these texts, and reviewed by the supervisory team (Appendix L). Scoring was initially performed by the researcher who read the response sheets to become familiarised with the data. Where the researcher was unclear about any words or phrases used by the students, consultation was undertaken with two nurse educators from the Faculty of Nursing at the CUDLSM. Students’ scores for accuracy and inaccuracy in clinical reasoning were obtained by comparing their responses to the predetermined answer guide and coding their responses as accurate or inaccurate as appropriate. The method for scoring was adapted from Botti and Reeve (2003): 0 response = 1; 1–2 responses = 2; 3–4 responses = 3; 5–6 responses = 4; >6 responses = 5. The detailed scoring method is presented in Appendix K. For each of the variables (accuracy and inaccuracy in clinical reasoning), an overall score and individual sub-variable scores were calculated. The overall score was calculated by summing the number of accurate/inaccurate responses to the five clinical-reasoning questions in the clinical vignette, and sub-variable scores were calculated by summing the number of accurate/inaccurate responses to each of the clinical-reasoning questions.

For the scale of self-confidence in clinical reasoning, the item scores ranged from 1 = strongly disagree to 5 = strongly agree. This scale was adapted from the Student Satisfaction and Self-Confidence in Learning published by National League...
for Nursing (NLN) (National League for Nursing, 2012). In order to enable others to interprete the score more readily and allow statistical analysis using parametric test, the mean confidence score for each student was multiplied by 20 to convert the 1–5 score range to a 0 = not confident at all to 100 = extremely confident (Leeper, 2007; O’Connor, 1995). As discussed, descriptive statistics (mean and standard deviation) were performed using SPSS 21.0.

5.1.2.7 Data analysis.

• Descriptive analysis was employed to report the characteristics of the participants in this study.

• Bivariate analysis chi-square/Fisher’s exact test were employed to compare the distribution of demographic factors between the intervention and control groups.

• Parametric tests (independent t-test and Mixed-Design Analysis of Variance [MD ANOVA]) were employed to compare the differences of the overall and scales scores of the CCTDI, the overall scores of accuracy/inaccuracy and the students’ self-confidence in clinical reasoning.

• Non-parametric tests (Mann–Whitney U-test was used to compare the differences between the intervention and control groups’ accuracy and inaccuracy sub-variable results to the clinical vignette.

• Frequency analysis was undertaken for the self-confidence sub-variable results.

• A significance level of \( p < 0.05 \) was employed.

• The use of Cohen’s effect size for parametric tests, eta squared \( (\eta^2) \) and partial eta squared \( (\eta_p^2) \) was 0.01 = small effect; 0.06 = medium effect; 0.14 = large effect was employed (Pallant, 2013).
• The use of Cohen’s effect size for non-parametric tests \((r)\) was 0.1 = small effect; 0.3 = medium effect; 0.5 = large effect was employed (Pallant, 2013). Data were analysed for both the overall scores and the overall scores for the four main variables: CCTDI, accuracy in clinical reasoning and inaccuracy in clinical reasoning were the combined sum of their sub-variables.

5.1.3 Qualitative component.

Following the educational intervention, focus-group discussions were undertaken to receive feedback from both the intervention and control groups that was crucial for understanding their perceptions of the learning experience provided by the educational intervention and the usual teaching (Liamputtong, 2011).

5.1.3.1 Participants.

Participants in the focus groups were drawn from both the intervention and control-group students \((n = 18)\). There were nine students for the intervention participants and nine students for the control participants who agreed and consented to participate in the focus-group discussions. Thus, the focus-group discussions had four to five student nurses in two focus-group discussions for each group. Richness or saturation of data was the focus of the data collection in this stage. Saturation according to Clark and Creswell (2008), occurs when the researchers are not obtaining new information.

5.1.3.2 Instrument

Data were collected using a focus-group guide to elicit students’ perceptions on the educational-intervention experience and factors that facilitated and/or hindered the development of clinical reasoning. As the discussions proceeded, probing questions were used to elicit in-depth responses about issues of interest that emerge. The discussion was audio recorded and notes were taken by the
moderator (research assistant) (Onwuegbuzie, Dickinson, Leech & Zoran, 2009).
The audio recordings of the group discussions were transcribed in the first language
of the participants, Bahasa Indonesia. Emerging issues were highlighted and
identified for further analysis (Cresswell, Fetters & Ivankova, 2004). The focus-
group guiding questions are presented in Appendix F.

5.1.3.3 Procedures

Before the completion of the intervention, an open invitation was extended to
both intervention and control groups’ students to participate in the focus-group
discussions. Students were provided with an explanation of the importance of their
perceptions for the development of the teaching and learning methods. Importantly,
the students were assured that their comments would remain confidential and not
influence any stage of their study progress. Similar to the quantitative element,
students were provided with an opportunity to ask questions and seek clarification
before consenting.

5.1.3.4 Data collection.

Data were collected using a focus-group guide to elicit students’ perceptions
on the educational-intervention experience and factors that facilitated and/or
hindered the development of clinical reasoning. The focus-group guiding questions
are presented in Appendix F. As the discussions proceeded, probing questions were
used to elicit in-depth responses about issues of interest that emerge. The discussion
was audio recorded and notes were taken by the moderator (research assistant)
(Onwuegbuzie, Dickinson, Leech & Zoran, 2009). To maintain participants’
anonymity, each participant was given a numeric code. Subsequently, participants’
comments were identified only by their code number. Richness or saturation of data
was the focus of the data collection in this stage. Saturation, according to Clark and
Creswell (2008) occurs when the researchers are not obtaining new information. This means that the information provided by the participants is similar and no new issues are raised. The focus group discussions lasted on average, 60 minutes.

5.1.3.5 Data analysis.

As in Phase 1 of the study, thematic analysis adapted from Braun and Clarke (2006) and Silverman (2009) were used. An inductive approach was used for identifying themes or patterns in students’ comments. This meant that the themes identified were strongly connected to the collected data (Braun & Clarke, 2006). Consequently, all focus-group data were treated comprehensively. Comprehensive data treatment allows the researcher to situate the students’ perspective in their broader contexts, rather than simply selecting particular data extracts (Silverman, 2010; Silverman & Ebooks, 2009). Therefore, the analysis was first conducted in the students’ native language (Bahasa Indonesia) to prevent alteration or loss of the broad meaning of the informal words or terms used by the students when translated into English.

The researcher ensured familiarisation with the data by reading and re-reading the transcripts, noting apparent trends to examine recurring patterns, or categories, extracted from the responses (Silverman, 2010). The transcripts were then examined in detail and initial codes were identified using similar words, phrases, examples and/or concepts. To prevent changes of meaning when translated into English, the coding process was performed in the Bahasa Indonesia. Moreover, there was a constant comparison of the data fragments within and between the discussion groups and simple tabulation was performed to identify several prevalent words or phrases (Braun & Clarke, 2006; Silverman, 2010). The generated codes and some extracted data were translated into English to allow further data validation by
the supervisory team and to ensure no preconceived assumptions were involved in any stage of the analysis process. The agreed codes were then placed into the categories to enable data to be further analysed as aggregate data. Themes were generated by grouping similar codes into conceptual clusters, and the resultant themes were again validated by the researcher and the supervisory team. In this validation phase, all transcripts were translated into English by a professional translator who is bilingual in English and Bahasa Indonesia. Prior to the translation process, agreement was reached between the researcher and the translator with regard to the maintenance of participant anonymity and confidentiality of the information.

5.2 Rigour of Study

Two activities were undertaken to enhance rigour in this study, particularly in managing the roles of the researcher and teacher in this study. These activities were as follows:

- First, it was ensured that the student participants and the researcher had no existing teaching and learning relationship before the implementation of the educational intervention or an academic relationship before the completion of students’ study programs.
- Second, to maintain impartiality of the comments in the focus-group discussions, there was involvement of an independent person to guide the group discussion. In addition, anonymity in reporting and recording the results was maintained.

5.3 Ethical Considerations

In this study, ethical approval for Phase 2 was formally obtained from the UHREC at QUT before conducting the expert-panel review of the intervention
package (Reference No. 1200000588). The project was reviewed as ‘Low Risk Human Research Ethics’ and confirmed as meeting the requirements of the National Statement on Research Involving Human Participation.

Specific ethical action was undertaken in this study to prevent any potential for the participants to be disadvantaged by not receiving the educational intervention. As such, the control group and any students who elected not to participate in the study were given the opportunity to undertake the educational intervention after the post-test (week 7–14 in the semester). Thus, before the final semester examination, all groups had benefited equally from the educational intervention. A copy of the ethics-approval document is provided in Appendix E.

5.4 Development and Review of Evaluation Instrument

This section will discuss the development and content-validation process for the clinical vignette. Using a valid instrument to measure study outcomes is an essential consideration in a research project (Polit & Beck, 2012). Therefore, an expert panel was utilised to review the clinical vignette that was used as an evaluation instrument in Phase 2. Figure 5.4 presents the steps that were used in instrument development and review.
5.4.1 Development of (post-test) clinical vignette.

Despite an exhaustive search of the literature, few tools were found for measuring the application of clinical-reasoning skills in the clinical-judgement context. Several studies have investigated clinical problem solving in the clinical-practice context (Agbedia et al., 2008; Cato, Lasater & Peeples, 2009; Davis & Kimble, 2011; Guhde, 2010; Huckabay, 2009; Lasater, 2007; Lechasseur, Lazure & Guilbert, 2011; Maskey, 2011; Vittrup & Davey, 2010); however, the measurement tools used were not relevant to the context of the present study. Hence, a purpose-built instrument (the clinical vignette) was constructed to allow the evaluation of clinical-reasoning skills in this study (Brunt, 2005a, 2005b; Walsh & Seldomridge, 2006).

5.4.1.1 Characteristics.

As described before, the educational-intervention clinical vignette was a short, purpose-designed scenario that described a health situation related to high-risk
pregnancy. The clinical vignette contained relevant, but insufficient information about an existing health problem. It also contained information that was irrelevant to the problem. If students wished, they were allowed to request additional information about the problem as they worked through the vignette. The undergraduate nursing curriculum and current maternity nursing texts (Ackley, 2011; Chapman, 2010) were used to construct the clinical problems so that the clinical scenarios would be consistent with students’ course experience.

5.4.1.2 Assessment indicators.

To measure the application of clinical-reasoning skills by the intervention and control groups, four main variables were determined as the assessment indicators. These are presented in Table 5.1, along with the particular clinical-reasoning skills that these indicators were designed to target (Facione, 2011).
Table 5.1

*Assessment Indicators of Clinical Vignette*

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicators</th>
<th>Critical-thinking Skills Targeted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Number of problems identified accurately/inaccurately</td>
<td>Analysis and inference</td>
</tr>
<tr>
<td>2</td>
<td>Number of relevant pieces of data used correctly and incorrectly</td>
<td>Interpretation and analysis</td>
</tr>
<tr>
<td>3</td>
<td>Number of accurate/inaccurate possible interventions identified</td>
<td>Analysis and evaluation</td>
</tr>
<tr>
<td>4</td>
<td>Number of accurate/inaccurate interventions chosen</td>
<td>Evaluation and inference</td>
</tr>
<tr>
<td>5</td>
<td>The level of self-confidence in the process of thinking</td>
<td>Evaluation and self-regulation</td>
</tr>
</tbody>
</table>

As previously explained in Section 5.1.2, students’ responses to each of the clinical-vignette questions for accuracy and inaccuracy in clinical reasoning were summed; the sub-variable results were scored using the scoring system as 1 = 0 response; 2 = 1–2 responses; 3 = 3–4 responses; 4 = 5–6 responses; 5 = >6 responses. As previously explained, the scoring system was adapted from the work of Botti and Reeve (2003). Table 5.2 summarises the scoring methods employed to measure students’ responses to the clinical vignette.
Table 5.2

Scoring Methods for Sub-variable Results

<table>
<thead>
<tr>
<th>Students’ responses to the clinical vignette</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of accurate/inaccurate problems</td>
<td>1</td>
</tr>
<tr>
<td>0 problem</td>
<td>2</td>
</tr>
<tr>
<td>1–2 problems</td>
<td>3</td>
</tr>
<tr>
<td>3–4 problems</td>
<td>4</td>
</tr>
<tr>
<td>4–5 problems</td>
<td>5</td>
</tr>
<tr>
<td>≥6 problems</td>
<td></td>
</tr>
<tr>
<td>Number of accurate/inaccurate data items</td>
<td>0</td>
</tr>
<tr>
<td>0 data</td>
<td>1–2</td>
</tr>
<tr>
<td>3–4 data items</td>
<td>4–5</td>
</tr>
<tr>
<td>≥6 data items</td>
<td></td>
</tr>
<tr>
<td>Number of accurate/inaccurate possible interventions</td>
<td>0</td>
</tr>
<tr>
<td>0 interventions</td>
<td>1–2</td>
</tr>
<tr>
<td>3–4 interventions</td>
<td>4–5</td>
</tr>
<tr>
<td>≥6 interventions</td>
<td></td>
</tr>
<tr>
<td>Number of accurate/inaccurate interventions chosen</td>
<td>0</td>
</tr>
<tr>
<td>0 interventions</td>
<td>1–2</td>
</tr>
<tr>
<td>3–4 interventions</td>
<td>4–5</td>
</tr>
<tr>
<td>≥6 interventions</td>
<td></td>
</tr>
<tr>
<td>Students’ self-confidence in clinical reasoning</td>
<td>Not confident at all</td>
</tr>
<tr>
<td>A bit confident</td>
<td>Fairly confident</td>
</tr>
<tr>
<td>Very confident</td>
<td>Extremely confident</td>
</tr>
</tbody>
</table>

5.4.2 Review of impact-evaluation instrument.

Similar to the development of the educational package, review of the impact-evaluation instrument (the educational-intervention clinical vignette) was undertaken. The review aimed to establish the validity of the instrument using content validity and face validity.

Content validity has been described as ‘the degree to which variance in obtained measures from an assessment instrument was consistent with prediction from the construct targeted by the instrument’ (Haynes et al., 1995, p. 239; Polit & Beck, 2012). To obtain content validation, this study employed an expert panel to
obtain expert-panel feedback on the draft impact-evaluation clinical vignette for Phase 2.

Face validity refers to whether the purpose of the test can be observed from the item-content instruments (Polit & Beck, 2012). To ensure this, the clinical vignette was also reviewed by a sample of Indonesian undergraduate nursing students. As with the expert-panel review, the students were asked to provide comments on the clinical vignette by reading the clinical-vignette instructions and providing responses to the clinical-reasoning questions in the clinical vignette. Having done this, the students were asked to provide numerical and written comments in the feedback instrument constructed for the purpose of this study (Appendix H). As such, two processes were employed to assess the content validity of the clinical vignette: 1) review by an expert panel and 2) review by a sample of undergraduate nursing students. The validation methods and procedures employed in this study are described in the following sections.

5.4.2.1 Expert-panel review.

The principal purpose of the expert-panel process was to attain expert judgement related to the content of a new instrument and its consistency with its targeted concepts (Polit & Beck, 2012; Polit et al., 2007; Ramsbotham, 2009). Thus, the review process was used to assess the relevance, clarity and feasibility of the educational-intervention clinical vignette. In this process, the expert panellists used their expertise to assess the case data and the application of the thinking-challenge questions to the clinical vignette, that is, whether the scenario adequately represented the characteristics of the targeted health problems. In addition, the experts assessed whether the questions used to stimulate students’ clinical reasoning were readable and could assist students to perform the tasks the questions asked of them.
Importantly, panellists reviewed the clinical vignette for its suitability to be used in an Indonesian nursing-education context. As before, both quantitative and qualitative data were obtained and analysed using the CVI technique and thematic analysis (qualitative data). A summary of the I-CVI and S-CVI results is presented in Tables 5.3 and 5.4 below.

5.4.2.1.1 Sample.

Five nursing teachers were invited to review the educational-intervention clinical scenario. This was the same expert panel that reviewed the educational-intervention package as described in Phase 1. Inclusion criteria of the panellists and their demographic characteristics have been presented in Chapter 4.

5.4.2.1.2 Instrument.

As in the review of educational-intervention package, the feedback instrument of the clinical vignette was constructed to assess the relevance, clarity and feasibility of the clinical vignette. The feedback instrument consisted of two items representing elements of the clinical vignette. Using the Likert scale, the relevance, clarity and applicability of the clinical scenario were rated as follows: 1 = strongly agree, 2 = agree, 3 = disagree, 4 = strongly disagree (Polit & Beck, 2012). The panellists were also asked to provide recommendations and further comments in the open-question section. Along with the review of the educational intervention, the feedback instrument for the clinical vignette was returned after one month.

5.4.2.1.3 Procedure.

To facilitate assessment of the content validity of the clinical scenario, the expert panellists were provided with an overview of the study explaining the pedagogical assumption underpinning the study, and an explanation on how to use
the feedback instrument. The panellists were asked to return the feedback instrument by email.

5.4.2.2 Data analysis.

The strategy used to compute the I-CVI was similar to that used for CVI calculation in the educational-intervention review. Feedback from the panellists was summarised and coded into a dichotomous Yes/No variable where Yes represented the Likert-scale response of 3 (agree) and 4 (strongly agree) and No indicated the Likert-scale response of 1 (strongly disagree) and 2 (disagree). As the calculation was focused on the agreement among experts that the items were relevant, clear and feasible, only I-CVI with response Yes (Likert scale of 3 or 4) would have an I-CVI of 1.00, and items with response No (Likert scale of 1 or 2) would not have any value, and were therefore excluded from the I-CVI calculation. The average I-CVI for each of the items and the expert-panel response as a whole was calculated by adding the I-CVI for each item and dividing the total by the number of the items (Grant & Davis, 1997; Haynes et al., 1995; Polit et al., 2007). The suggested evaluation criteria of excellent CVI values were ≥0.78 for I-CVI and ≥0.90 for S-CVI (Polit et al., 2007). Consistent with this standard, a benchmark of 0.78 or higher was applied to judge the adequacy of the I-CVI. As such, any components of the clinical scenario that had an I-CVI of less than 0.78 were considered to require improvement. Similar to the expert panel review process of developing educational intervention, recommendations and comments from panellists’ written comments regarding the relevance, clarity and the feasibility of the clinical scenario were translated into English. The comments were used to inform the refinement of the impact evaluation instrument.
5.4.2.2.1 Results.

Results from calculating the mean I-CVI revealed differences in the agreement levels for the first and the second items. Whereas the I-CVI for item 1 was 1.00 the I-CVI for item 2 was 0.75, which was below the recommended I-CVI value of 0.78, indicating improvement was needed in certain content. Computation of the educational-intervention clinical-vignette I-CVI by the expert panel is presented in Table 5.3 and the S-CVI computation of the clinical scenario is presented in Table 5.4.
Table 5.3

*Educational-intervention Clinical-vignette I-CVI*

<table>
<thead>
<tr>
<th>No.</th>
<th>Educational-intervention Clinical Vignette</th>
<th>Relevance</th>
<th>Clarity</th>
<th>Feasibility</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Experts in Agreement</td>
<td>I-CVI</td>
<td>Experts in Agreement</td>
<td>I-CVI</td>
</tr>
<tr>
<td>1</td>
<td>Case data</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Application of thinking-challenge questions to the post-measure clinical vignette</td>
<td>3</td>
<td>0.75</td>
<td>3</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Subscale I-CVI scores | 0.88 | 0.88 | 0.88 | 0.88 | Requires Refinement
The clinical-vignette S-CVI demonstrated that both relevance and feasibility subscale scores were 0.88, resulting in an overall S-CVI of 0.88 (< 0.90). This result was lower than the benchmark S-CVI value of 0.90 and consequently, it was determined that improvement or refinement was required. These findings were consistent with the qualitative data provided by the expert panellists. Feedback from the expert panel suggested refinement was needed in the clinical example provided in question 2 of the educational-intervention clinical vignette. The example provided related to a respiratory health problem, and it was suggested to use an example that related to antenatal care. Following the analysis processes, appropriate refinements were made. A detailed description of the content-validation process is presented in Appendix G.

5.4.2.3 Student review.

Face validity refers to whether the purpose of the test can be observed from the item-content instruments (Polit & Beck, 2012). To ensure this, the clinical vignette was also reviewed by a sample of Indonesian undergraduate nursing students. As with the expert-panel review, the students were asked to provide comments on the clinical vignette by reading the clinical-vignette instructions and providing responses to the clinical reasoning questions in the clinical vignette.
Having done this, the students were requested to provide numerical and written comments in the feedback instrument constructed for the purpose of this study.

5.4.2.3.1 Procedure.

Ten third-year nursing students were randomly chosen from the Faculty of Nursing CUDLSM database. They were provided with information about the study and invited to participate. Five from 10 students agreed to participate. The clinical scenario and the feedback instrument were sent to the students. They were asked to return the feedback assessment sheet within two weeks via email.

5.4.2.3.2 Sample.

A convenience sampling approach was used to recruit participants. As stated, five students agreed to participate in the student-review approach. Participants were third-year nursing students enrolled in a five-year Bachelor of Nursing programme at CUDLSM. The students were aged from 18 to 23 years and had completed an antenatal-nursing-care subject.

5.4.2.3.3 Data collection.

As with the expert-panel (clinical-vignette) review, both quantitative and qualitative data were obtained using a specifically designed feedback instrument. The feedback instrument consisted of 22 items aimed at assessing the relevance, clarity and feasibility of the clinical vignette. Using the Likert scale, the relevance, clarity and applicability of the clinical scenario was rated as follows: 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree. The students were also asked to provide comments in the open-question section. The feedback instrument and its instructions were sent to the students via email. They were then asked to return the completed feedback instrument to the researcher after two weeks.
5.4.2.3.4 Data analysis.

All five students (100 per cent) provided comments related to the clinical vignette using the feedback instrument. Quantitative data was analysed using the CVI technique.

The strategy for quantitative-data analysis used to compute I-CVI was similar to that used for the CVI calculation in the educational-intervention review where the I-CVI was computed as the proportion of students in agreement about relevance, which is the number of students who rate the items at either 3 or 4 (agree or strongly agree), divided by the number of the student sample. The S-CVI was computed by calculating the total I-CVI divided by the number of items being assessed. The benchmark values for ‘excellent’ clinical vignette are similar to those of the educational package: ≥0.78 for I-CVI and ≥ 0.90 for S-CVI (Polit & Beck, 2012). Consistent with this standard, a benchmark of 0.78 or higher was applied to judge adequacy of the I-CVI. Accordingly, any components of the clinical vignette that received an I-CVI score of less than 0.78 were considered to require improvement. Student feedback was also used to guide the refinement of the impact evaluation instrument.

5.4.2.3.5 Results.

The quantitative data indicated that 21 of the 22 items were rated as agree or strongly agree by the student sample. As explained, all items that were in agreement were scored as 1.00; this provided I-CVI scores of 21.00. Item 19 was rated as agree by four students, providing a score of 0.80. To calculate the S-CVI, the total number of the I-CVI (21.80) was divided by the number of items (22 items). The resultant S-CVI was 0.99. As this result is higher than the benchmark value of 0.90, the clinical vignette was demonstrated to have excellent agreement (from the student sample) for
use as a post-measure clinical vignette. Detailed computation of the quantitative data is presented in Table 5.5.

Table 5.5

*Student Review: CVI Computation*

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>Students in Agreement</th>
<th>I-CVI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The instructions for the clinical-scenario activity were clear</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>The key elements of the clinical scenario were clear:</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>· Introduction</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>· Clinical data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>The clinical scenario relates to undergraduate nursing studies</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>The clinical situation in the clinical scenario reflects most of the situations I have faced in my clinical practice</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>It was easy to understand the clinical-scenario questions:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>· Question 1</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>· Question 2</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>· Question 3</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>· Question 4</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>· Question 5</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

(continued)
The clinical-scenario questions relate to undergraduate nursing studies:

<table>
<thead>
<tr>
<th>No.</th>
<th>Items</th>
<th>Students in Agreement</th>
<th>I-CVI</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>· Question 1</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>· Question 2</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>· Question 3</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>· Question 4</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>· Question 5</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>The order of the clinical-scenario questions help me to think systematically</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>The examples provided (questions 1 and 2) were easy to understand</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>The examples provided (questions 1 and 2) helped me to know what the questions were asking me to do</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td>The instructions for completing the confidence self-rating scale were clear</td>
<td>4</td>
<td>0.8</td>
</tr>
<tr>
<td>20</td>
<td>I can easily understand what the clinical-scenario questions are asking me to do</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>21</td>
<td>The clinical-scenario questions relate to what undergraduate nursing students are expected to learn in relation to providing nursing care</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>22</td>
<td>Overall, the clinical scenario is able to be easily understood</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

Total score: 21.8

S-CVI score = Total I-CVI : the number of item
21.80 : 22 = 0.99

Consistent with the S-CVI, the qualitative data from the student sample revealed positive comments on the clinical vignette’s relevance, clarity and feasibility. Suggestions were also made by the students to improve aspects such as relevance. Evaluation criteria and example comments are presented in Table 5.6.
Table 5.6

Key Evaluation Criteria and Representative Comments from Student Review

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Example Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevance</td>
<td>‘A case study like this is really good for facilitating students’ learning, as this can assist students in mastering the subject being learnt and to think critically in identifying health problems’</td>
</tr>
<tr>
<td></td>
<td>‘Add more data so clearer nursing problems can be generated’. ‘Need more history of pregnancy of the patient so that diagnosing and prioritising the problems can be achieved easily’</td>
</tr>
<tr>
<td>Clarity</td>
<td>‘In general, the scenario can be easily understood’</td>
</tr>
<tr>
<td>Feasibility</td>
<td>‘This case is very good for us for learning, especially for the development of the nursing profession in Indonesia’</td>
</tr>
</tbody>
</table>

5.4.3 Refinement of impact evaluation instrument.

As reported, results from the expert-panel review suggested a need for minor refinements of the instruments. The expert panellists believed that examples provided in the case scenario, which were in the clinical context of respiratory system, should be amended so that they were in the same context as the nursing students’ subject (high-risk pregnancy) to prevent confusion in the study participants. The instrument was accordingly refined. Results from student review did not indicate a need for refinement of the impact-evaluation instrument. The revised impact-evaluation instrument is presented in Appendix H.
Chapter 6: Results

The following chapter presents the results from Phase 2 of this study. As indicated in Chapter 5, this study aimed to evaluate the effect of the educational intervention designed by this study on nursing students’ clinical-reasoning skills and their perception regarding the learning experience. The first section of Chapter 6 presents the results from the CCTDI and the students’ responses to the clinical vignette. This is followed by the presentation of the results from the focus-group discussions with students in the intervention and control groups. The procedures for data collection and data analysis were described in Chapter 5. Chapter 6 concludes with a summary of the quantitative and qualitative results.

6.1 Quantitative Results

As detailed in Chapter 5, students in the third year of a five-year nursing undergraduate degree were invited to participate in the study. The participants who agreed and consented completed a case-based (clinical) vignette and survey questionnaire (CCTDI) before and after the educational intervention.

The CCTDI consisted of 75 forced-choice items (Likert scale 1–6) measuring attitudes and values that influence critical thinking (Facione, N. & Facione, P., 2007). Following the educational intervention, the CCTDI was re-administered to participants. The clinical vignette comprised a short, purpose-designed scenario that described a health situation related to high-risk pregnancy. The students were asked to respond to five clinical-reasoning questions provided in the clinical vignette. In addition, they were asked to rate their level of self-confidence in responding to every question using a Likert scale ranging from 1 (not confident at all) to 5 (extremely confident). The main purpose of the pre-test was to establish comparative baseline data for the intervention and control groups and a point of comparison for the post-
test results (Dimitrov & Rumrill, 2003). Importantly, the intervention-group and control-group students had completed a normal pregnancy prerequisite subject before participating in the study. For reasons outlined previously, the pre-test clinical vignette presented a normal-pregnancy scenario whereas the post-test clinical vignette presents a high-risk-pregnancy scenario. However, it is important to note that at both points, the focus of the clinical vignette was on students’ clinical-reasoning skills, rather than on specific knowledge related to pregnancy conditions. The following section presents the results of the students’ responses to the CCTDI questionnaire and the clinical vignettes.

6.1.1 Demographic characteristics.

From the 85 students who completed the pre-test phase in the study, 76 participants continued until the completion of the intervention, and completed the post-tests. Table 6.1 presents the proportion of demographic data by the baseline, discontinuing and completing sample.
Table 6.1

Proportions of Demographic Data at Pre-test Baseline for Completing and Discontinuing Sample

<table>
<thead>
<tr>
<th>Variables</th>
<th>Pre-tested(N = 85)</th>
<th>Discontinuing(N = 9)</th>
<th>Completing(N = 76)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(%)</td>
<td>(%)</td>
<td>(%)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19–21</td>
<td>71 (83.5)</td>
<td>7 (77.7)</td>
<td>64 (84.2)</td>
</tr>
<tr>
<td>22–24</td>
<td>12 (14.1)</td>
<td>2 (22.3)</td>
<td>10 (13.1)</td>
</tr>
<tr>
<td>≥25</td>
<td>2 (2.3)</td>
<td>–</td>
<td>2 (2.6)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>74 (87.1)</td>
<td>8 (88.8)</td>
<td>66 (86.8)</td>
</tr>
<tr>
<td>Male</td>
<td>11 (12.9)</td>
<td>1 (11.2)</td>
<td>10 (13.1)</td>
</tr>
<tr>
<td>GPA (1–4 scale)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;3.00</td>
<td>1 (1.17)</td>
<td>1 (11.2)</td>
<td>–</td>
</tr>
<tr>
<td>3.00–3.50</td>
<td>71 (83.5)</td>
<td>8 (88.8)</td>
<td>63 (82.8)</td>
</tr>
<tr>
<td>3.51–4.00</td>
<td>13 (15.3)</td>
<td>–</td>
<td>13 (17.1)</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manado</td>
<td>22 (25.9)</td>
<td>2 (22.3)</td>
<td>20 (26.3)</td>
</tr>
<tr>
<td>Minahasa</td>
<td>29 (34.1)</td>
<td>5 (55.4)</td>
<td>24 (31.5)</td>
</tr>
<tr>
<td>Bitung</td>
<td>2 (2.3)</td>
<td>–</td>
<td>2 (2.6)</td>
</tr>
<tr>
<td>Satal</td>
<td>8 (9.4)</td>
<td>–</td>
<td>8 (10.5)</td>
</tr>
<tr>
<td>Bolmong</td>
<td>4 (4.6)</td>
<td>–</td>
<td>4 (5.2)</td>
</tr>
<tr>
<td>Other</td>
<td>20 (23.5)</td>
<td>2 (22.3)</td>
<td>18 (23.6)</td>
</tr>
</tbody>
</table>
6.1.2 Homogeneity of sample.

The age ranges of the intervention and control groups were slightly different (20–39 and 20–40, respectively); however, this difference was not statistically significant \((p = 0.47)\). Consistent with student enrolment in the CUDLSM Bachelor of Nursing course, the sample was primarily female (87.1 per cent). Further analysis revealed no significant difference between the intervention and control groups according to gender \((p = 0.56)\). The range of the grade point average (GPA) for the intervention and control groups was slightly different (2.68–3.77 and 2.80–3.86, respectively); however, the difference was not significant \((p = 0.40)\). Equally, there were no significant differences \((p = 1.00)\) in participants’ region of origin. The participants came from five major regions in the North Sulawesi Province and some other regions in Indonesia, including the regions of Palembang, Donggala, Sorong, Jayapura and Ternate. Approximately 35 per cent \((n = 15)\) of participants in the intervention and control groups were from the Minahasa region. Table 6.2 reports the frequency, percentage, Fisher’s exact test and significance values of sample characteristics.
### Table 6.2

**Comparison between Intervention and Control Group by Demographics**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Intervention $(n = 42)$ (%)</th>
<th>Control $(n = 43)$ (%)</th>
<th>Chi-square/Fisher’s Exact Test</th>
<th>$X^2$</th>
<th>$p (&lt;0.05)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19–21</td>
<td>35 (83.3)</td>
<td>36 (83.7)</td>
<td>14.6</td>
<td>0.47</td>
<td></td>
</tr>
<tr>
<td>22–24</td>
<td>6 (14.3)</td>
<td>6 (14)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥25</td>
<td>1 (2.4)</td>
<td>1 (2.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>36 (85.7)</td>
<td>38 (88.4)</td>
<td>0.00</td>
<td>0.56</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>6 (14.3)</td>
<td>5 (11.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPA (1–4 scale)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;3.00</td>
<td>–</td>
<td>5 (1.6)</td>
<td>2.18</td>
<td>0.40</td>
<td></td>
</tr>
<tr>
<td>3.01–3.50</td>
<td>36 (86)</td>
<td>28 (65.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.51–4.00</td>
<td>6 (14)</td>
<td>10 (23.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manado</td>
<td>11 (26.2)</td>
<td>11 (25.6)</td>
<td>29.92</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Minahasa</td>
<td>14 (33.3)</td>
<td>15 (34.9)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bitung</td>
<td>1 (2.4)</td>
<td>1 (2.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satal</td>
<td>4 (9.5)</td>
<td>4 (9.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bolmong</td>
<td>2 (4.8)</td>
<td>2 (4.7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>10 (23.8)</td>
<td>10 (23.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 6.1.3 Student responses to CCTDI.

This section addresses research question 3: Is there a significant difference (at Time 1/Time 2) in CCTDI scores (as measured by overall CCTDI scores and scale scores) for students who received the educational intervention compared to students who received usual teaching?
To examine the differences in student responses to CCTDI, t-tests and MD ANOVA were conducted. Student responses to CCTDI were measured using continuous-level scales. Although convenience sampling was used for this study, the independence assumption was maintained in that each participant’s responses were sampled independently from the other participants’ responses.

As described in Chapter 5, analysis of the CCTDI data was undertaken on two levels. The first level involved analysis of the overall CCTDI scores, which were the combined sum of the seven scale scores. The second level involved the analysis of students’ responses on each of the individual scales of CCTDI. The overall and scale scores of students’ responses to the CCTDI are presented below.

6.1.3.1 Student responses to CCTDI: overall scores.

As described in Chapter 5, the scores on each of the seven CCTDI scales range between 10 and 60. Scores below 20 indicate negative habits of mind (Insight Assessment, 2014; Paans et al., 2010), and scores between 30 and 40 indicate ambivalence of the attitude being measured. Scores are considered positive if they fall into the 40–60 range of the subscales, allowing for some variance due to the differing number of items in each subscale. Consequently, for the seven scales of CCTDI, responses are considered to reflect positive habits of mind when the total questionnaire score falls between 280 and 420 (Insight Assessment, 2014). Mean overall scores for the intervention and control group were greater than 280 at Time 1 and Time 2, indicating the students’ responses was in the positive range. As presented in Table 6.3, the control-group students demonstrated a higher overall mean score than the intervention-group students at Time 1 and Time 2. The difference between the overall CCTDI mean scores for the control and intervention groups at Time 1 was found to be statistically significant: $t (83) = 3.15, p = 0.00$, but
the difference was not significant at Time 2: \( t (83) = 0.84, p = 0.40 \). Analysis of Covariance (ANCOVA) to adjust the pre-test scores was not performed, as the ANCOVA assumptions of linearity and homogeneity of regression slopes of the covariate (Time 1 CCTDI overall scores) were violated.

Table 6.3

**Mean CCTDI Overall Scores for Intervention and Control Groups at Time 1 and Time 2**

<table>
<thead>
<tr>
<th>Time</th>
<th>Control Group ((n = 43))</th>
<th>Intervention Group ((n = 42))</th>
<th>M difference</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Overall Scores</td>
<td>1</td>
<td>301.93</td>
<td>24.61</td>
<td>286.1</td>
<td>21.54</td>
</tr>
<tr>
<td>Overall Scores</td>
<td>2</td>
<td>294.3</td>
<td>31.82</td>
<td>288.86</td>
<td>27.57</td>
</tr>
</tbody>
</table>

\*\(p < 0.05\)

To assess the effect of the two educational strategies (the educational intervention and usual teaching) on students’ CCTDI overall scores at Time 1 and Time 2, an MD ANOVA was performed. There was no significant interaction between Group (control group or intervention group) and Time (Time 1/Time2): Wilks’ Lambda = 0.97, \( F (1, 83) = 2.89, p = 0.10 \), \( \eta^2 = 0.032 \) (small effect size).

Further, there was no statistically significant main effect for Time: Wilks’ Lambda = 0.99, \( F (1, 83) = 0.63, p = 0.36 \), \( \eta^2 = 0.01 \) (small effect size) suggesting that there was no difference in the change in scores over time for the two groups (see Table 6.13). The main effect comparing the two groups was significant: \( F (1, 83) = 4.82, p = 0.031^* \), \( \eta^2 = 0.055 \) (medium effect size) indicating that there was a difference in the overall CCTDI scores for the two groups. Figure 6.1 presents the interaction plot of Group and Time for the overall CCTDI scores in clinical reasoning.
Figure 6.1. Interaction plot of Group and Time for overall CCTDI scores in clinical reasoning.

6.1.3.2 Student responses to CCTDI: scale scores.

As noted, the CCTDI comprises seven scales: truth-seeking, open-mindedness, inquisitiveness, analyticity, systematicity, confidence in reasoning and maturity of judgement. In this study, the mean scale scores for the intervention and control groups were largely comparable for all scales. For each scale, a score range of 40 to 60 indicates a positive habit of mind (Insight Assessment, 2014). From this perspective, the intervention and control groups demonstrated positive ‘habits of mind’ at Time 1 and Time 2 with respect to inquisitiveness, analyticity and confidence in reasoning. At Time 1, the control group’s mean scores on the analyticity and systematicity scales were significantly higher than those of the intervention-group students ($p < 0.05$). At Time 2, the control group’s mean scores on the systematicity scale were again significantly higher than those of the intervention-group students ($p < 0.05$). There were no other significant differences.
Table 6.4

Mean CCTDI Scale Scores for Intervention and Control Groups at Time 1 and Time 2

<table>
<thead>
<tr>
<th>Scale Name</th>
<th>Time</th>
<th>Control Group (n = 43)</th>
<th>Intervention Group (n = 42)</th>
<th>M Difference</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Open-mindedness</td>
<td>1</td>
<td>38.23</td>
<td>6.67</td>
<td>36.4</td>
<td>5.04</td>
<td>1.83</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>38.18</td>
<td>5.34</td>
<td>37.35</td>
<td>3.97</td>
<td>0.83</td>
</tr>
<tr>
<td>Analyticity</td>
<td>1</td>
<td>48.65</td>
<td>4.68</td>
<td>45.6</td>
<td>5.13</td>
<td>3.05</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>45.59</td>
<td>7.27</td>
<td>45.51</td>
<td>7.24</td>
<td>0.08</td>
</tr>
<tr>
<td>Confidence in Reasoning</td>
<td>1</td>
<td>47.95</td>
<td>6.33</td>
<td>44.93</td>
<td>7.89</td>
<td>3.02</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>45.05</td>
<td>7.71</td>
<td>45.14</td>
<td>8.7</td>
<td>–0.08</td>
</tr>
<tr>
<td>Maturity of Judgement</td>
<td>1</td>
<td>40.9</td>
<td>7.15</td>
<td>38.6</td>
<td>6.39</td>
<td>2.31</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>39.59</td>
<td>7.36</td>
<td>38.89</td>
<td>7.58</td>
<td>0.69</td>
</tr>
<tr>
<td>Truth-seeking</td>
<td>1</td>
<td>28.3</td>
<td>6.52</td>
<td>27.52</td>
<td>6.89</td>
<td>0.78</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>31.44</td>
<td>7.92</td>
<td>31.14</td>
<td>8.26</td>
<td>0.3</td>
</tr>
<tr>
<td>Inquisitiveness</td>
<td>1</td>
<td>54.14</td>
<td>4.31</td>
<td>52.2</td>
<td>5.9</td>
<td>1.95</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>50.59</td>
<td>8.46</td>
<td>51.4</td>
<td>7.81</td>
<td>–0.82</td>
</tr>
<tr>
<td>Systematicity</td>
<td>1</td>
<td>44.12</td>
<td>5.65</td>
<td>40.9</td>
<td>5.79</td>
<td>3.21</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>43.87</td>
<td>6.85</td>
<td>39.73</td>
<td>6.61</td>
<td>4.14</td>
</tr>
</tbody>
</table>

Time: 1 = pre-test; 2 = post-test; *p < 0.05.

Table 6.5 reports changes at Time 1/Time 2 in the CCTDI scale scores for the two educational strategies (educational intervention and usual teaching). Results from MD ANOVA revealed no significant interaction effects (p > 0.05) between Group and Time across the seven scales (p > 0.05), partial eta squared ranged from 0.00 to 0.04.

There were significant main effects for Time (p < 0.05) for the scales truth-seeking and inquisitiveness, partial eta squared were 0.00 and 0.04 respectively, with both groups demonstrating an increase in truth-seeking mean scores and a reduction
in inquisitiveness-scale scores at Time 2 (see Table 6.14). There were no other significant main effects for time in the other scales. The main effect comparing the two groups was significant for the systematicity scale: $F(1, 83) = 11.36, p = 0.001$, $\eta^2_p = 0.12$ (large effect size), suggesting a difference in the systematicity scale scores between the two groups across the two times (Pallant, 2013). There were no significant main effects for other scales. Table 6.5 presents the results from MD ANOVA at Time 1 and Time 2 in the CCTDI scale scores for the intervention and control groups.

The results from the analysis of the overall CCTDI scores and individual scale scores showed no differences (Time 1/Time 2) for students who received the educational intervention compared to the students who received the usual teaching. These findings indicated no difference in effectiveness between the educational intervention and usual teaching on the students’ critical-thinking dispositions.
<table>
<thead>
<tr>
<th>Scale Name</th>
<th>Effect (F)</th>
<th>Value</th>
<th>F</th>
<th>Sig.</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open-mindedness</td>
<td>Interaction effect</td>
<td>0.99</td>
<td>0.06</td>
<td>0.81</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Within subject</td>
<td>0.99</td>
<td>0.44</td>
<td>0.51</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Between subject</td>
<td>–</td>
<td>1.96</td>
<td>0.16</td>
<td>0.02</td>
</tr>
<tr>
<td>Analyticity</td>
<td>Interaction effect</td>
<td>0.97</td>
<td>3.03</td>
<td>0.06</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>Within subject</td>
<td>0.96</td>
<td>3.37</td>
<td>0.07</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>Between subject</td>
<td>–</td>
<td>2.32</td>
<td>0.13</td>
<td>0.03</td>
</tr>
<tr>
<td>Confidence in Reasoning</td>
<td>Interaction effect</td>
<td>0.97</td>
<td>2.59</td>
<td>0.11</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>Within subject</td>
<td>0.98</td>
<td>1.95</td>
<td>0.16</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>Between subject</td>
<td>–</td>
<td>1.17</td>
<td>0.28</td>
<td>0.14</td>
</tr>
<tr>
<td>Maturity of Judgement</td>
<td>Interaction effect</td>
<td>0.99</td>
<td>0.01</td>
<td>0.34</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Within subject</td>
<td>0.99</td>
<td>0.36</td>
<td>0.55</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Between subject</td>
<td>–</td>
<td>1.36</td>
<td>0.24</td>
<td>0.16</td>
</tr>
<tr>
<td>Truth-seeking</td>
<td>Interaction effect</td>
<td>0.99</td>
<td>0.06</td>
<td>0.81</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Within subject</td>
<td>0.87</td>
<td>12.06</td>
<td>0.00*</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Between subject</td>
<td>–</td>
<td>0.18</td>
<td>0.68</td>
<td>0.00</td>
</tr>
<tr>
<td>Inquisitiveness</td>
<td>Interaction effect</td>
<td>0.98</td>
<td>1.72</td>
<td>0.19</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>Within subject</td>
<td>0.95</td>
<td>4.22</td>
<td>0.04*</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>Between subject</td>
<td>–</td>
<td>0.30</td>
<td>0.58</td>
<td>0.00</td>
</tr>
<tr>
<td>Systematicity</td>
<td>Interaction effect</td>
<td>1</td>
<td>3.03</td>
<td>0.06</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>Within subject</td>
<td>0.99</td>
<td>0.78</td>
<td>0.38</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Between subject</td>
<td>–</td>
<td>11.36</td>
<td>0.006*</td>
<td>0.12</td>
</tr>
</tbody>
</table>

*p < 0.05
6.1.4 Student responses to clinical vignette.

In this study, the students’ responses to the clinical vignette were measured using three major outcome variables: accuracy in clinical reasoning, inaccuracy in clinical reasoning and self-confidence in clinical reasoning. Accuracy in clinical reasoning comprised four sub-variables: 1) number of relevant problems identified; 2) number of relevant pieces of data identified; 3) number of relevant possible interventions identified; 4) number of accurate interventions selected. Inaccuracy in clinical reasoning comprised four sub-variables: 1) number of inaccurate problems identified; 2) number of inaccurate pieces of data identified; 3) number of inaccurate possible interventions identified; 4) number of inaccurate interventions chosen. This section reports the results for accuracy and inaccuracy in clinical reasoning. Section 6.2.4 reports the results for students’ perceived level of self-confidence in responding to the clinical-vignette questions.

Similar to the analysis of the CCTDI scores, analysis of the accuracy and inaccuracy outcome variables was performed at two levels. The first level involved analysis of the overall accuracy and inaccuracy scores, which were derived from the sum of the sub-variable results. The second level involved the analysis of students’ responses on each of the individual sub-variables. Students’ t-test and MD ANOVA procedures were used to examine differences in the overall accuracy and inaccuracy scores for the two groups. Key assumptions for using these tests were met. Missing data were treated in the same manner as described in Chapter 5.

Non-parametric tests were applied to examine differences in the accuracy and inaccuracy sub-variables. Several assumptions for conducting parametric analysis were not met. For example, the dependent-variable results were at an ordinal level. Moreover, the normality check conducted for the four accuracy sub-variable results
revealed that the number of responses was not normally distributed around the mean. Therefore, the Mann–Whitney $U$-test was used to compare the accuracy and inaccuracy sub-variable results of the intervention and control groups (independent test), and the Wilcoxon signed rank test was used to compare responses within the groups (paired test).

**6.1.4.1 Accuracy in clinical reasoning.**

This section addresses research question 4: Is there a significant difference (at Time 1/Time2) in students’ accuracy in clinical reasoning (as measured by overall accuracy score, number of accurately identified problems, data items, possible accurate interventions and accurate interventions chosen) for students who received the educational intervention compared to students who received usual teaching?

**6.1.4.1.1 Accuracy in clinical reasoning: overall scores.**

As demonstrated in Table 6.6, there was an increase in the mean Time 1/Time 2 accuracy scores for the intervention-group students, while the scores of the control-group students demonstrated a slight decrease. At Time 1, there was no significant difference ($p > 0.05$) in the mean accuracy scores for the intervention and control groups. However, at Time 2, there was a statistically significant difference in the accuracy scores for the intervention and control groups ($t (85) = -12.65, p = 0.00$), representing a higher mean number of accurate responses to the clinical vignette by intervention-group students ($M = 9.74, SD = 1.40$) compared to the control group ($M = 6.12, SD = 1.24$). The magnitude of the differences in overall accuracy in clinical reasoning mean scores was $-3.62$, 95% CI: $-7.24$ to $-3.05$ with a very large effect size ($\eta^2 = 0.66$) (Pallant, 2013).
Table 6.6
Clinical Reasoning Accuracy Scores at Time 1 and Time 2 for Intervention and Control Groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>Time 1</th>
<th>Time 2</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control Group</td>
<td>Intervention Group</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(n=43)</td>
<td>(n=42)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy Overall Scores</td>
<td>1</td>
<td>6.86</td>
<td>1.35</td>
<td>6.67</td>
<td>1.30</td>
<td>0.19</td>
<td>0.67</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>6.12</td>
<td>1.24</td>
<td>9.74</td>
<td>1.4</td>
<td>-3.62</td>
<td>-12.65</td>
<td>0.00*</td>
</tr>
</tbody>
</table>

*p < 0.05; equal variances assumed.

An MD ANOVA was conducted to assess the effect of the educational strategies (educational intervention and the usual teaching). The MD ANOVA analysis revealed a significant interaction effect between Group and Time, Wilks’ Lambda = 0.35, \( F(1, 83) = 155.6, p = 0.000 \), with a very large effect size \( \eta^2 = 0.65 \). Similarly, there was a significant main effect for Time, Wilks’ Lambda = 0.59, \( F(1, 83) = 57.90, p = 0.000, \eta^2 = 0.41 \) (very large effect size) with intervention-group students revealing an increase in the overall accuracy mean scores. A significant main effect was also found for Group, \( F(1, 83) = 49.68, p = 0.000 \), with partial eta square showing a very large effect size \( \eta^2 = 0.37 \) (Pallant, 2013), suggesting a difference in the effectiveness between the educational intervention and the usual teaching on students’ overall accuracy in clinical reasoning. Figure 6.2 presents the interaction plot of Group and Time for accuracy in clinical reasoning.
As presented in Table 6.7, the results for the accuracy sub-variables suggest that at Time 2, there was a general trend towards improvement in accuracy in clinical reasoning by both groups, although the improvement appeared to be more evident in the results for the intervention-group students. For example, 66 per cent \((n = 28)\) of intervention-group students reported ‘1–2 accurate problems’ compared to 25 per cent \((n = 11)\) in the control group. More detailed analysis of the differences between the intervention and control groups in relation to the accuracy sub-variable results are reported in the following section.

Figure 6.2. Interaction plot of Group and Time for accuracy in clinical reasoning.
Table 6.7

*Accuracy in Clinical Reasoning Sub-variable Results at Time 1 and Time 2 for Intervention and Control Groups: Descriptive Statistics*

<table>
<thead>
<tr>
<th>Sub-variable Items</th>
<th>Time 1</th>
<th>Time 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Intervention</td>
</tr>
<tr>
<td></td>
<td>f (%)</td>
<td>f (%)</td>
</tr>
<tr>
<td><strong>Accurate Problems</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 Problems</td>
<td>39 (90.7)</td>
<td>34 (81.0)</td>
</tr>
<tr>
<td>1–2 Problems</td>
<td>4 (9.3)</td>
<td>8 (19.0)</td>
</tr>
<tr>
<td><strong>Accurate Data Items</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 Data Items</td>
<td>27 (62.8)</td>
<td>25 (59.5)</td>
</tr>
<tr>
<td>1–2 Data Items</td>
<td>15 (34.9)</td>
<td>16 (38.1)</td>
</tr>
<tr>
<td>≥3 Data Items</td>
<td>1 (2.3)</td>
<td>1 (2.4)</td>
</tr>
<tr>
<td><strong>Accurate Possible Interventions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 Intervention</td>
<td>3 (7.0)</td>
<td>4 (9.5)</td>
</tr>
<tr>
<td>1–2 Interventions</td>
<td>25 (58.1)</td>
<td>25 (59.5)</td>
</tr>
<tr>
<td>≥3 Interventions</td>
<td>15 (34.9)</td>
<td>13 (31.0)</td>
</tr>
<tr>
<td><strong>Accurate Interventions Chosen</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 Intervention</td>
<td>7 (16.3)</td>
<td>10 (23.8)</td>
</tr>
<tr>
<td>1–2 Interventions</td>
<td>28 (65.1)</td>
<td>30 (71.4)</td>
</tr>
<tr>
<td>≥3 Interventions</td>
<td>8 (18.6)</td>
<td>2 (4.8)</td>
</tr>
</tbody>
</table>
Table 6.8 reports the differences between the median results of the intervention and control groups on the four sub-variables of accuracies in clinical reasoning at Time 1 and Time 2. As described earlier (Section 6.2.2), the Mann–Whitney $U$ non-parametric test was used, as the sub-variable results were measured on ordinal scales involving two groups. Independence of observation assumption was maintained. The results from these analyses were generally consistent with the overall score results of accuracies in clinical reasoning described earlier. At Time 1, there were no statistically significant differences ($p > 0.05$) between the intervention and control groups in any of the four sub-variables of accuracy in clinical reasoning. However, at Time 2, there were statistically significant differences for each of the four sub-variable results ($p < 0.001$), with the magnitude of effects ranging from medium to large effect sizes ($r = 0.3–0.8$) in the intervention-group students.

Table 6.8

Accuracy in Clinical Reasoning Sub-variable Results at Time 1 and Time 2 for Intervention and Control Groups: Mann–Whitney U-test Results

<table>
<thead>
<tr>
<th>Sub-variable Items</th>
<th>Time</th>
<th>Control Group (n = 43)</th>
<th>Intervention Group (n = 42)</th>
<th>$z$</th>
<th>$p$</th>
<th>$r$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Median (min, max)</td>
<td>Median (min, max)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accurate Problems</td>
<td>1</td>
<td>1.0 (1–2)</td>
<td>1.0 (1–2)</td>
<td>−1.28</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1.0 (1–2)</td>
<td>2.0 (1–2)</td>
<td>−3.78</td>
<td>0.00*</td>
<td>0.41</td>
</tr>
<tr>
<td>Accurate Data Items</td>
<td>1</td>
<td>1.0 (1–3)</td>
<td>1.0 (1–3)</td>
<td>−0.30</td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1.0 (1–2)</td>
<td>3.0 (1–4)</td>
<td>−7.63</td>
<td>0.00*</td>
<td>0.83</td>
</tr>
<tr>
<td>Possible Accurate Intervention</td>
<td>1</td>
<td>2.0 (1–4)</td>
<td>2.0 (1–3)</td>
<td>−0.71</td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2.0 (1–3)</td>
<td>3.0 (2–5)</td>
<td>−6.82</td>
<td>0.00*</td>
<td>0.74</td>
</tr>
<tr>
<td>Accurate Interventions Chosen</td>
<td>1</td>
<td>2.0 (1–3)</td>
<td>2.0 (1–3)</td>
<td>−1.72</td>
<td>0.09</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2.0 (1–3)</td>
<td>2.0 (2–4)</td>
<td>−2.92</td>
<td>0.00*</td>
<td>0.32</td>
</tr>
</tbody>
</table>

Time: 1 = pre-test; 2 = post-test; *the median difference is significant at the 0.05 level.
The results from the analysis of the overall scores for accuracy in clinical reasoning and the sub-variable scores demonstrated significant Time 1/Time 2 differences for students who received the educational intervention compared to students who received usual teaching. These findings suggest that at post-test, there was a higher number of accurate responses to the clinical-vignette questions from students in the intervention group compared to students in the control group.

6.1.4.2 Inaccuracy in clinical reasoning.

This section addresses research question 5: Is there a significant difference (at Time 1/Time2) in students’ inaccuracy in clinical reasoning (as measured by overall inaccuracy score, number of inaccurately identified problems, data items, possible interventions and interventions chosen) for students who received the educational intervention compared to students who received usual teaching?

The analysis of inaccuracy in clinical reasoning was also undertaken at two levels. The first level involved analysis of the overall inaccuracy in clinical reasoning, which was the combined sum of the four sub-variable results for inaccuracy in clinical reasoning. The second level involved the analysis of students’ responses for each of the individual sub-variables of inaccuracy in clinical reasoning. Therefore, the results of the variable inaccuracy in clinical reasoning are reported as ‘overall scores’ and ‘sub-variable results’; these results are reported in the following section.

6.1.4.2.1 Inaccuracy in clinical reasoning: overall scores.

Descriptive-analysis results of the overall scores for inaccuracy in clinical reasoning are presented in Table 6.10. The results suggest that there was a decrease in the mean Time1/Time2 scores for inaccuracy in clinical reasoning for the intervention and control groups. At Time 1, there was no significant difference in the
mean scores for inaccuracy in clinical reasoning between both groups. However, at 
Time 2, there was a statistically significant difference in the overall scores for 
inaccuracy in clinical reasoning between the intervention and control groups ($t(83)$ 
$= 3.06, p = 0.003$), representing a lower mean number of inaccurate responses to the 
clinical vignette by intervention-group students ($M = 7.48, SD = 1.58$) compared to 
the control-group students ($M = 8.44, SD = 1.39$). The magnitude of the differences 
in overall mean scores for inaccuracy in clinical reasoning ($M$ difference $= 0.97$, 
95% CI: 1.15–1.59) was large (eta squared $= 0.10$) (Pallant, 2013).

Table 6.9

*Inaccuracy in Clinical-reasoning Scores at Time 1 and Time 2 for Intervention and 
Control Groups*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Time</th>
<th>Control Group ($n = 43$)</th>
<th>Intervention Group ($n = 42$)</th>
<th>$M$ Difference</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Inaccuracy</td>
<td>1</td>
<td>8.65, 1.65</td>
<td>8.74, 1.86</td>
<td>−0.09</td>
<td>−0.23</td>
<td>0.82</td>
</tr>
<tr>
<td>Scores</td>
<td>2</td>
<td>8.44, 1.39</td>
<td>7.48, 1.58</td>
<td>0.97</td>
<td>3.06</td>
<td>0.003*</td>
</tr>
</tbody>
</table>

*p < 0.05; equal variances assumed.

An MD ANOVA was conducted to assess the effect of educational strategies 
(the educational intervention and usual teaching) on students’ inaccurate responses to 
the clinical vignette, before and after the educational intervention. The results 
reported that there was a significant interaction effect between Group and Time, 
Wilks’ Lambda $= 0.94, F(1, 83) = 5.09, p = 0.027, \eta^2 = 0.06$ (medium effect size) 
(Pallant, 2013). There was also a significant main effect found for Time, Wilks’ 
Lambda $= 0.89, F(1, 83) = 9.96, p = 0.002, \eta^2 = 0.11$ (large effect size), with 
intervention-group students demonstrating a marked reduction in the overall scores.
for inaccuracy in clinical reasoning across the two times. However, the main effect for Group was not significantly different, $F(1, 83) = 2.84, p = 0.095, \eta^2_p = 0.033$ (small effect size). This suggests no difference in the overall scores for inaccuracy in clinical reasoning for students who received the educational intervention compared to students who received usual teaching across the two times (Pallant, 2013). The interaction plot of Group and Time for scores for inaccuracy in clinical reasoning is presented in Figure 6.3.

![Inaccuracy Interaction Plot: overall scores](image)

**Figure 6.3.** Interaction plot of Group and Time for the overall scores for inaccuracy in clinical reasoning.

Although results from the t-test reported a significant difference between the intervention and control groups’ overall mean scores at Time 2, MD ANOVA analysis results demonstrated no significant difference between the intervention and control groups’ overall inaccuracy scores. As multiple comparisons in MD ANOVA employ the Bonferroni correction to prevent Type I error, a more stringent alpha level is used. As a result, a significant difference reported by the t-test analysis might not be detected by the MD ANOVA analysis. Therefore, for the overall inaccuracy
scores, it was concluded that there was no significant difference between the intervention and control groups’ overall inaccuracy scores.

6.1.4.2.2 Inaccuracy in clinical reasoning: sub-variable results

Table 6.10 reports the results for the sub-variable inaccuracy in clinical reasoning for the intervention and control groups at Time 1 and Time 2. The mixed pattern of the results does not indicate any clear trends in inaccuracy in clinical reasoning for either group. More detailed analysis of the differences between the intervention and control groups in relation to the sub-variable of inaccuracy in clinical reasoning is presented in Table 6.10.
Table 6.10

Inaccuracy in Clinical Reasoning Sub-variable Results at Time 1 and Time 2 for Intervention and Control Groups: Descriptive Statistics

<table>
<thead>
<tr>
<th>Sub-variable Items</th>
<th>Time 1</th>
<th></th>
<th>Time 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control Group</td>
<td>Intervention Group</td>
<td>Control Group</td>
<td>Intervention Group</td>
</tr>
<tr>
<td></td>
<td>f (%)</td>
<td></td>
<td>f (%)</td>
<td></td>
</tr>
<tr>
<td>Inaccurate Problems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 Problem</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1–2 Problems</td>
<td>18 (41.9)</td>
<td>23 (54.8)</td>
<td>35 (81.4)</td>
<td>42 (100)</td>
</tr>
<tr>
<td>≥3 Problems</td>
<td>25 (58.1)</td>
<td>19 (45.2)</td>
<td>8 (18.6)</td>
<td>0</td>
</tr>
<tr>
<td>Inaccurate Data Items</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 Data Items</td>
<td>4 (9.3)</td>
<td>8 (19.0)</td>
<td>4 (9.3)</td>
<td>11 (26.2)</td>
</tr>
<tr>
<td>1–2 Data Items</td>
<td>22 (51.2)</td>
<td>18 (42.9)</td>
<td>35 (81.4)</td>
<td>15 (35.7)</td>
</tr>
<tr>
<td>≥3 Data Items</td>
<td>17 (39.5)</td>
<td>16 (38.1)</td>
<td>4 (9.3)</td>
<td>16 (38.1)</td>
</tr>
<tr>
<td>Possible Inaccurate Intervention</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 Intervention</td>
<td>5 (11.6)</td>
<td>3 (7.1)</td>
<td>1 (2.3)</td>
<td>1 (2.4)</td>
</tr>
<tr>
<td>1–2 Interventions</td>
<td>28 (65.1)</td>
<td>24 (57.1)</td>
<td>28 (65.1)</td>
<td>32 (76.2)</td>
</tr>
<tr>
<td>≥3 Interventions</td>
<td>10 (23.3)</td>
<td>15 (35.7)</td>
<td>14 (32.6)</td>
<td>9 (21.4)</td>
</tr>
<tr>
<td>Inaccurate Interventions Chosen</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 Intervention</td>
<td>20 (46.5)</td>
<td>17 (40.5)</td>
<td>9 (20.9)</td>
<td>7 (16.7)</td>
</tr>
<tr>
<td>1–2 Interventions</td>
<td>20 (46.5)</td>
<td>22 (52.4)</td>
<td>32 (74.4)</td>
<td>31 (73.8)</td>
</tr>
<tr>
<td>≥3 Interventions</td>
<td>3 (7.0)</td>
<td>3 (7.1)</td>
<td>2 (4.7)</td>
<td>4 (9.5)</td>
</tr>
</tbody>
</table>
Table 6.11 reports differences between the median results of the intervention and control groups on the four sub-variables of inaccuracy in clinical reasoning at Time 1 and Time 2. As described earlier, the Mann–Whitney non-parametric test was employed because the data were measured on categorical scales involving two groups. Independence of observation assumption was maintained. The general assumptions of using this test were met. Overall, the results from this analysis were consistent with the overall results of inaccuracy in clinical reasoning reported earlier.

At Time 1, there were no statistically significant differences ($p > 0.05$) between the intervention and control groups for any of the four sub-variables of inaccuracy in clinical reasoning. However, at Time 2, there was a statistically significant difference on the sub-variable of identification of inaccurate problems ($z = 2.92$, $p = 0.005$, $r = 0.32$).

Table 6.11

| Inaccuracy in Clinical Reasoning Sub-variable Results at Time 1 and Time 2 for Intervention and Control Groups: Mann–Whitney U-test Results |
|---|---|---|---|---|---|
| Sub-variable Items | Time | Control Group ($n = 43$) Median (min, max) | Intervention Group ($n = 42$) Median (min, max) | $z$ | $p$ | $r$ |
| Inaccurate Problems | 1 | 3.0 (2–4) | 2.0 (2–4) | −1.01 | 0.31 | 0.11 |
| | 2 | 2.0 (2–3) | 2.0 (2–2) | −2.92 | 0.00* | 0.32 |
| Inaccurate Data Items | 1 | 2.0 (1–3) | 2.0 (1–4) | −0.54 | 0.59 | 0.06 |
| | 2 | 2.0 (1–4) | 2.0 (1–3) | −0.89 | 0.36 | 0.10 |
| Possible Inaccurate Intervention | 1 | 2.0 (1–4) | 2.0 (1–4) | −1.27 | 0.20 | 0.14 |
| | 2 | 2.0 (1–5) | 2.0 (1–4) | −0.99 | 0.34 | 0.10 |
| Inaccurate Interventions Chosen | 1 | 2.0 (1–3) | 2.0 (1–5) | −0.52 | 0.60 | 0.06 |
| | 2 | 2.0 (1–3) | 2.0 (1–3) | −0.8 | 0.49 | 0.08 |

Time: 1 = pre-test; 2 = post-test; *the median difference is significant at the 0.05 level.
Despite a decrease in the overall mean score for inaccuracy in clinical reasoning in the intervention group, the differences found between the intervention and the control groups were not significant. Similarly, the results indicated no significant difference in the results for the inaccurate-problems sub-variable between the intervention and control groups. Therefore, it can be concluded that there was no significant difference (p > 0.05) at Time 1 or Time 2 between the educational intervention and usual teaching in reducing students’ inaccuracy in clinical reasoning.

6.1.5 Students’ self-confidence in clinical reasoning.

This section addresses research questions 6: Is there a significant difference (at Time 1/Time 2) in the perceived level of self-confidence in responding to the clinical-vignette questions for students who received the educational intervention as compared to students who received the usual teaching?

As for the two previous counterpart variables (accuracy and inaccuracy in clinical reasoning), the analysis was undertaken at two levels. The first level involved analysis of the overall scores of students’ responses relating to self-confidence in clinical reasoning. These scores were derived from the sum of the six students’ self-confidence items. The six items consisted of the following: 1) self-confidence in problem identification; 2) self-confidence in data sufficiency; 3) self-confidence in correctness of the problems identified; 4) self-confidence in the identification of possible interventions; 5) self-confidence in the chosen interventions; 6) self-confidence in the thoroughness of thinking. The second level involved the frequency analysis of students’ responses to each of the six individual items of students’ self-confidence accuracy in clinical reasoning. A t-test and MD
ANOVA were conducted to compare the overall scores of students’ perceived level of self-confidence in responding to the clinical-vignette questions. Key assumptions underpinning the use of MD ANOVA were met. Missing data were treated in the same manner as described in Chapter 5.

6.1.5.1 Students’ self-confidence in clinical reasoning: overall scores.

In general, the overall scores of students’ self-confidence in clinical reasoning for the intervention and control groups were comparable. As reported in Table 6.12, the mean of the overall scores for students’ self-confidence in clinical reasoning at Time 1 were higher in the control group ($M = 86.63, SD = 20.56$) than the intervention group ($M = 70.60, SD = 14.81$). At Time 2, there was a small trend towards the intervention-group students having improvement in the overall scores of their self-confidence in clinical reasoning, while the control group demonstrated a slight decrease. However, the difference in the overall mean scores between the intervention and control group at Time 2 was relatively small (intervention group: $M = 72.84, SD = 11.28$) and (control group: $M = 72.83, SD = 14.03$), and was not statistically significant, $t(83) = –0.001, p = 0.99$. 
Table 6.12

*Mean Self-confidence Scores for Intervention and Control Groups at Time 1 and Time 2*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Time</th>
<th>Control Group</th>
<th>Intervention Group</th>
<th>M Difference</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(n = 43)</td>
<td>(n = 42)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD</td>
<td>SD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall Scores</td>
<td>1</td>
<td>86.63</td>
<td>70.60</td>
<td>16.03</td>
<td>4.11</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>72.84</td>
<td>72.83</td>
<td>0.004</td>
<td>0.001</td>
<td>0.99</td>
</tr>
</tbody>
</table>

*p < 0.05; equal variances assumed.*

MD ANOVA results demonstrated that there was no significant interaction effect between Group and Time: Wilks’ Lambda = 0.97, $F(1, 83) = 2.35, p = 0.13$, $\eta^2 = 0.028$ (small effect size). Further, there was no significant main effect for Time: Wilks’ Lambda = 1.00, $F(1, 83) = 0.002, p = 0.96, \eta^2 = 0.00$ (very small effect size), suggesting no differences in students’ self-confidence in clinical reasoning before and after the intervention. Equally, the main effect comparing the two groups was not significantly different: $F(1, 83) = 1.29, p = 0.26, \eta^2 = 0.015$ (small effect size) (Pallant, 2013), indicating no difference between of the two educational strategies—the educational intervention and the usual teaching on students’ self-confidence in clinical reasoning. The interaction plot of Group and Time for students’ overall scores for perceived level of self-confidence in clinical reasoning for both groups is presented in Figure 6.4.
6.1.5.2 Students’ perceived level of self-confidence in clinical reasoning: individual items.

To examine the pattern of the intervention-group students’ responses to self-confidence in clinical reasoning, and how this compared with the control-group students’ responses at Time 1/Time 2, frequency analysis was conducted on their responses to individual items. The results for both groups are presented in Table 6.13.
Table 6.13

_Intervention-group and Control-group Responses to the Individual Items for Self-confidence in Clinical Reasoning at Time 1 and Time 2_

<table>
<thead>
<tr>
<th>Items</th>
<th>Time</th>
<th>Group</th>
<th>Not Confident At All</th>
<th>Extremely Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1. Confident that you have identified all possible health problems</td>
<td>C</td>
<td>–</td>
<td>9.3</td>
<td>23.3</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>I</td>
<td>–</td>
<td>16.7</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>–</td>
<td>7.0</td>
<td>34.9</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>I</td>
<td>–</td>
<td>9.5</td>
</tr>
<tr>
<td>2. Confident that you have sufficient information to identify the patient’s health problem</td>
<td>C</td>
<td>–</td>
<td>27.9</td>
<td>18.6</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>I</td>
<td>–</td>
<td>23.8</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>–</td>
<td>7.0</td>
<td>30.2</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>I</td>
<td>–</td>
<td>9.5</td>
</tr>
<tr>
<td>3. Confident that you have correctly identified the patient’s health problem</td>
<td>C</td>
<td>–</td>
<td>11.6</td>
<td>14.0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>I</td>
<td>2.4</td>
<td>19.0</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>–</td>
<td>11.6</td>
<td>14.0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>I</td>
<td>2.4</td>
<td>19.0</td>
</tr>
<tr>
<td>4. Confident that you have identified the possible intervention/s for this patient</td>
<td>C</td>
<td>–</td>
<td>7.0</td>
<td>11.6</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>I</td>
<td>2.4</td>
<td>11.9</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>I</td>
<td>–</td>
<td>11.9</td>
</tr>
<tr>
<td>5. Confident about your choice of intervention/s for this patient</td>
<td>C</td>
<td>2.3</td>
<td>9.3</td>
<td>11.6</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>I</td>
<td>2.4</td>
<td>11.9</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>–</td>
<td>2.3</td>
<td>39.5</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>I</td>
<td>–</td>
<td>16.7</td>
</tr>
<tr>
<td>6. Confident that you have made good decisions about the nursing care for this patient</td>
<td>C</td>
<td>–</td>
<td>4.7</td>
<td>11.6</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>I</td>
<td>2.4</td>
<td>16.7</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>–</td>
<td>2.3</td>
<td>34.9</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>I</td>
<td>–</td>
<td>11.9</td>
</tr>
</tbody>
</table>
At Time 1 and Time 2, the intervention-group students’ responses to the items for self-confidence in clinical reasoning were generally comparable with the control-group students’ responses; however, for some items, differences between their responses were apparent. For example, at Time 2, three of the items demonstrated an increase in the proportion of the intervention group compared to the proportion of control group that rated their perceptions as confident/extremely confident. The three items were self-confidence in possible-interventions identification (item 4), self-confidence in chosen interventions (item 5), and self-confidence in thoroughness of thinking (item 6). In fact, control group’s responses at Time 2 went backward, demonstrating a decrease in the proportion of confident/extremely confident for the three aforementioned items. The proportion of confident/extremely confident for item 1 (self-confidence in problem identification), item 2 (self-confidence in data sufficiency), and item 3 (self-confidence in correctness of problems identified) was virtually the same at Time 1 and Time 2 for both groups.

Considered together, the results from students’ responses to the clinical vignette suggest that the educational intervention employed in this study demonstrated a positive effect on facilitating students’ accuracy in clinical reasoning. Although there were some positive changes in students’ inaccuracy in clinical reasoning and self-confidence in clinical reasoning found in intervention-group students, the results did not reach significance.

6.2 Qualitative Results

This section presents the analysis of the data from the focus-group discussions conducted with the students after the educational intervention in Phase 2 of the study. Presentation of the findings is supported by the categories and themes
generated from the open coding and verbatim quotation from the transcripts followed by an example from the transcripts. The data from the students who were in the intervention group and the data from the students who are in the control group were analysed separately. Interestingly, although there were differences in the details of what had been said by the students in the both groups, there were similarities in the categories and themes that emerged from the analysis. Accordingly, the data are presented as a comprehensive integration of the findings, including quotations from both the intervention and control groups to indicate similarities and/or differences in their comments.

Research question 7: What are the perceptions of students who received the educational intervention of the learning experience compared to those who received usual teaching?

Eighteen \( (n = 18) \) students participated in the focus-group discussions. Approximately 70 per cent of the students were aged 19–21 years and 90 per cent were female; approximately 70 per cent of the students’ GPA ranged between 3.00 and 3.50; and 20–30 per cent students in the focus group were from the Manado and Minahasa regions. Details of the characteristics of the focus-group participants are presented in Table 6.14.
Table 6.14

*Focus-group Participant Characteristics*

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Intervention Group (n = 9)</th>
<th>Control Group (n = 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19–21</td>
<td>6 (66.7)</td>
<td>7 (77.8)</td>
</tr>
<tr>
<td>22–24</td>
<td>2 (22.2)</td>
<td>2 (22.3)</td>
</tr>
<tr>
<td>≥25</td>
<td>1 (11.1)</td>
<td>–</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>9 (100)</td>
<td>7 (77.8)</td>
</tr>
<tr>
<td>Male</td>
<td>–</td>
<td>2 (22.2)</td>
</tr>
<tr>
<td>GPA (1–4 scale)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;3.00</td>
<td>–</td>
<td>1 (11.1)</td>
</tr>
<tr>
<td>3.00–3.50</td>
<td>7 (77.8)</td>
<td>6 (66.7)</td>
</tr>
<tr>
<td>3.51–4.00</td>
<td>2 (22.2)</td>
<td>2 (22.2)</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manado</td>
<td>2 (22.2)</td>
<td>3 (33.3)</td>
</tr>
<tr>
<td>Minahasa</td>
<td>2 (22.2)</td>
<td>2 (22.2)</td>
</tr>
<tr>
<td>Bitung</td>
<td>–</td>
<td>1 (11.1)</td>
</tr>
<tr>
<td>Satal</td>
<td>1 (11.1)</td>
<td>2 (22.2)</td>
</tr>
<tr>
<td>Bolmong</td>
<td>1 (11.1)</td>
<td>1 (11.1)</td>
</tr>
<tr>
<td>Other</td>
<td>3 (33.3)</td>
<td>–</td>
</tr>
</tbody>
</table>

Table 6.15 demonstrates that three overall themes emerged from the analysis of students’ comments about the learning experience. These themes are elaborated in the section below, incorporating examples from the data that illustrate the dimensions of each category.
Table 6.15

*Themes and Categories from Focus-group Discussions*

<table>
<thead>
<tr>
<th>No.</th>
<th>Themes</th>
<th>Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Developing knowledge and skills</td>
<td>• My understanding</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Retaining what I learn</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reasoning-skills development</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Being self-directed in my learning</td>
</tr>
<tr>
<td>2</td>
<td>Connecting knowledge to practice</td>
<td>• Ways of knowing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Context of learning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Confidence for practice</td>
</tr>
<tr>
<td>3</td>
<td>Enjoying learning</td>
<td>• My learning experience</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Provision of support</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Collaborating with others</td>
</tr>
</tbody>
</table>

6.2.1 Developing knowledge and skills.

During the focus-group discussions, both groups of students made a number of comments that emphasised how their learning experiences had supported them in making sense of the new high-risk-pregnancy topic. Four categories were particularly evident in students’ comments: 1) my understanding; 2) retaining what I
learn; 3) reasoning-skills development; 4) being self-directed learning in my learning.

6.2.1.1 My understanding.

For the category of ‘my understanding’, students from the intervention and control groups commented about how their learning experiences had developed their understanding of the learnt topic. Both groups of students perceived that their involvement in the learning activities of high-risk-pregnancy topic enabled them to be more informed in this area of practice. However, there were subtle (but important) differences in the emphasis placed by each of the study groups on the quality of their learning experience. For example, students from the control group described their learning experience as being more focused on knowledge acquisition. For example:

*We had opportunities to ask questions (to get the answer) to the teacher when we found it unclear (12).*

*We are satisfied with the answer, as we know that the teacher is the one who is more knowledgeable in that field (11).*

*We asked the lecturer directly when we handed in the assignment; if we did not understand anything, we did ask them (15).*

Importantly, control-group students made further comments stating that although they think they gained understanding from the teachers, they remained concerned about their lack of understanding of the high-risk-pregnancy context and as such, they felt frustrated. For example:

*I do not know about the terms we found it difficult to understand, as we know little about these. We feel our knowledge is not sufficient (12).*

*We do not know many important things about maternity care (14).*
The problem is the teachers know a lot but they do not explain things thoroughly (17).

The problem is that we do not understand the difficult terms used in the clinical setting. The terms are in the books but we do not know the difficult terminologies. Sometimes the handwriting was unclear (18).

Consistent with these comments, intervention-group students noted that learning was usually achieved by gaining information from the textbooks, for example, ‘in the past, we just copy and pasted the answer from the textbook’ [7]. However, when compared to their learning experience gained through the educational intervention, intervention-group students highlighted a deeper understanding of the topics addressed as one of the positive effects the intervention had on their learning:

I think the topic could be understood better despite the fact we think we have learnt the topic (1).

Using this approach [the educational intervention] means we have come to understand the lessons from the very basics [...] I mean that the knowledge is deeply explored (3).

Although the time [spent on the topic] is limited, it has been explored thoroughly. I am confident I could explain it to other peers (5).

Now, I do not rely on the textbook, I know what I need to do. I do not need to copy and paste the information anymore (6).

6.2.1.2 Retaining what I learn.

Throughout the focus-group discussions, students from the intervention and control groups made a number of comments that highlighted their use of memorisation for learning, including issues related to the storage and retrieval of
learnt concepts. Intervention-group and control-group students commented on their capacity to retain and recall the information gained from the high-risk-pregnancy learning experience. However, the nature of the comments from both groups was very different. Students from the control group spoke about simply memorising the information gained and found the information was easily forgotten. For example:

*We understand the lessons but we forget them easily (13).*

*We just presented what we remembered, so when we were asked later, we had forgotten (16).*

*We are used to memorising things; so far, we are not sure if we can remember patients’ symptoms (11).*

Some similar comments about memorisation and learning were made by intervention-group students:

*Previously, we learnt by memorising the given lessons and this is not an effective way of learning. It is easy to forget (2).*

*We think that the [previous] method is ineffective because it made us memorise most things rather than understanding what we had learnt (5).*

*With this approach [the educational intervention], we are learning to understand, not just memorising (7).*

However, in contrast, intervention-group students noted that participation in the educational intervention had enhanced their retention of information. For example:

*[We are] not just memorising, but we comprehend and understand the topic that we have studied (1).*

*Many things stayed in the mind after the learning activities; they were easy to use, hard to forget (6).*
With this approach, I could easily remember and understood more. With the other teacher, I easily forgot [the lessons] (3).

It also made me confident in explaining the materials to others while helping them with the knowledge (2).

[...] now, even if I am not looking in the books for answers, but because the teacher already taught us, we can still remember (4).

6.2.1.3 Reasoning-skills development.

‘Reasoning-skills development’ was the third category of this theme. Reflecting on their learning experiences, both groups provided similar comments about the significance of using specific thinking skills when delivering care to patients. Again, both groups raised the same issues but also expressed some different perceptions. Students from the control group made comments about the importance of thoughtful thinking in delivering care to patients, for example, ‘thinking critically is important in providing good care to patients’. However, the concept of ‘thinking critically’ seemed to be understood by this group as ‘knowing’, which (for them) denoted the recall of learning concepts. For example:

We found that [thinking critically] difficult because we think we didn’t know much. If we have enough knowledge, we need to be more confident. But we aren’t (17).

We know that thinking critically is very important in nursing, but in practice, we have concerns that the intervention will be inconsistent with the prescribed medical treatment (18).

Conversely, intervention-group students expressed the view that participation in the educational intervention had enhanced their reasoning skills. In particular, they
emphasised their development of skills in identifying important clinical information and relevant problems. For example:

- We are taught how to identify and group the data critically (5).
- Now, I can recognise one case from other cases, although the signs and symptoms given are quite similar (2).
- I can differentiate whether this case has ‘these’ [characteristics] and that case has ‘those’ [characteristics] (3).
- Previously, we only wanted to include data that supported our opinion; that just because these data were present, the other data should be there too (6).
- I think the approach used was very helpful in solving clinical problems (7).
- Our curiosity to find out how problems are solved is greater than before (4).

Notably, intervention-group students made additional comments highlighting the importance of introducing the teaching and learning approach earlier in the curriculum. For example:

- This is much better; if we had learnt this since the beginning, we may have a more grounded knowledge in maternity (2).
- Unfortunately, this approach is not used in the first maternity nursing subject, and we are close to the end of semester (5).
- I suggest that all learning strategies used in this campus should be the same as this approach, as this can make learning interesting and so we are not bored (6).

### 6.2.1.4 Being self-directed in my learning.

The final category of the theme of developing knowledge and skills relates to being self-directed in the learning process. Both group of students perceived themselves as capable of finding out more information about the topic they were
addressing. However, there was different emphasis on the meaning of ‘self-directed’ in the two groups. Control-group students described their learning experience as a task-related activity that was directed by the teacher. For example:

*From the given tasks, we could learn, although in all learning processes, we need to do it by ourselves (15).*

*The tasks given are useful, as we should learn by ourselves so we understand (12).*

*I think the process was quite good because we needed to learn by ourselves; the teacher gave us tasks, so we knew it but what we thought was difficult was that teachers gave us too many tasks (11).*

*Basically, after saying something, they [the teachers] will say ‘you will have to find this out by yourself’. That’s it (17).*

Conversely, intervention-group students indicated that involvement in the learning activity had motivated them to enquire more broadly about the topic. For example:

*Now, we use our own thinking and it is a helpful learning approach (2)*

*[The] teacher always teaches and shows me how to be an active and independent learner, not just waiting to be fed (6).*

*For sure it makes me more curious and really affects the learning of the other materials as well (5)*

*[If] other lecturers ask me questions I cannot answer, I become ashamed and that encourages me to study more (3).*

6.2.2 Connecting knowledge to practice.

A second theme in students’ comments was related to what could be seen as a ‘key strategy’ to being better prepared for clinical practice. Both groups of students
described how their learning experiences had supported their ‘real-world’ practice.

Three categories were particularly evident in students’ comments about this theme: 1) ways of knowing; 2) context of learning; 3) developing confidence for practice.

6.2.2.1 Ways of knowing.

For the category ‘ways of knowing’, students from the intervention and control groups highlighted the use of several teaching and learning strategies that promoted knowledge construction and practice of the high-risk-pregnancy topic. Both groups of students perceived that teachers used effective strategies to facilitate their application of knowledge to practice. However, what they perceived as effective ways of doing this was conceptually different. For example, the comments of the control-group students highlighted written concepts presentation and obtaining correct answers from peers and teachers as the usual ways of learning in the class. For example:

There were questions and answers [among students] during our presentation in the class (12).

We provided answers for some questions asked by some peers who did not understand our presentation (17)

In the discussion, the teacher only provided answers if we [the presenters] could not provide answers for the questions from our peers (16).

We could recognise whether our answers were correct or not by seeing the teacher’s expression. If the teacher laughed at us that was a sign the answer was wrong (13).

Control-group students also highlighted knowledge recall and technical-skills acquisition gained through demonstration and repetition as the primary ways of knowing in the nursing laboratory. For example:
The good things: the teacher could help our prac as we had practice in the nursing lab before doing the prac (13).

The part of learning that we think is useful is in the nursing lab, the teacher explains until we know (17).

But only some students had opportunities to practice [under the teachers’ guidance], as the time was so limited (18).

We prefer practical experience. For example, practice of IUD [intrauterine device] insertion. We could see it directly. By seeing the procedure taking place, we retain the information more than just reading the information (14).

The teacher said this [equipment] should be prepared in advance, that’s all we could understand (15).

The strategies used by the teachers have helped us to decide what to do by sharing their experiences from the clinical setting (12).

The teacher shared their experience; the teacher said that we could follow what they did. So we remember what teacher told us to do (13).

So we need to remember the lesson more so that we know when the medical doctor asks us about the equipment, we know that, though some were not (16).

When there was a mother giving birth, we could remember what had been explained in the nursing lab, we could explain the equipment needed (15).

We found a patient with retained placenta, which had been explained by the teacher, so when we saw the case, we remembered what the teacher told us to do (11).

However, intervention-group students demonstrated a stronger sense of learning as a process that occurs within them. They perceived that hints used in the
educational intervention were useful, as they provided ‘keys’ or clues that helped them connect to what they had learnt or developed as a new understanding in the high-risk-pregnancy topic, and expressed that this was important for solving problems that would be found in clinical practice. For example:

The teacher already gave us the keys on how to make [clinical] decisions critically; we can determine the steps [strategies] to take [in making decisions] (4).

The teacher gave us the techniques so we didn’t have to learn every detail [of the concepts] but there were some specific points [information] to be focused on (8).

The teacher showed us the way to solve a [clinical] problem, we got the hints. So we could solve the problem effectively (4).

The teacher gave us keywords that agreed with my understanding of the topic [high-risk pregnancy], and so these are deeply rooted in our minds (6).

From this strategy, we learnt how to relate to clinical situations [patients’ data] and group [the data] according to what we have learnt (7).

6.2.2.2 Context of learning.

The second category in the theme of connecting knowledge to practice was termed ‘context of learning’. The two groups expressed alternative views on this category. Control-group students perceived the context of their learning as completing the task they were given, which was a group discussion of a given topic and presentation of the results to the other groups. For example:

We were first informed of the learning syllabus, then we got a topic from it to be presented (11).
However, since we did these just to fulfil the task, we just presented, that’s it (18).

We only presented the given topic, for example, I did a presentation to the class about abortion, so I only know a lot about abortion, not for the other topics (14).

Maybe because when we presented our tasks, we thought this is just to fulfil the task, we do not want to learn more. The important thing is to accomplish the tasks. When we pass the lesson, that means it’s done. If other groups’ presentations are interesting, we pay more attention (15).

The intervention-group students provided similar comments. For example:

Previously, the teachers always required us to do a presentation and memorise all of the topic (3).

We used to have group discussions but we did it unthoughtfully. We just did it to fulfil the task. If we want to know more, we think we will find out later via the internet, but in fact, we didn’t (8).

However, intervention-group students also perceived the learning context as a case-based or problem-related learning experience that had facilitated their thinking skills. For example:

The teacher used case studies so I think this does encourage us to think critically in a way that we did not before (9).

We learnt some cases through this approach (2).

I think, through this approach, I feel confident, as I learnt not only the theoretical concepts but also the real-life daily situation of patients. Our thinking now is directed to a real problem (7).
This [case] is certainly more useful because before we only used written data and composed reports based on that data without thinking more about it; as long as the report was done, we did not care about it (3).

The teacher teaches us how to think critically when facing clinical problems; how to determine a relevant client diagnosis and practice some skills in antenatal care (5).

I think the teacher teaching us using examples of cases made it easier to understand; her way requires us to think critically, but before, we never thought of it that way (2).

Importantly, intervention-group students also highlighted the advantages of the thinking skills employed for solving problems in the high-risk-pregnancy context, and the potential use of the strategy for other learning contexts. For example:

The new approach has enhanced my curiosity and this has positively influenced my ways of learning about other topics (4).

I am motivated to learn other topics using this approach. I think this has influenced my learning strategy in other topics (9).

I could widely implement this [thinking skills] to other topics (3).

6.2.2.3 Developing confidence for practice.

The third category in this theme was ‘developing confidence for practice’. Both groups of students highlighted the importance of good preparation in the provision of better performance in the clinical setting. However, students’ perceptions about what constitutes ‘good preparation’ differed between the two groups. Students in the control group were concerned about their knowledge and skills preparation and commented that ‘practice in the new environment makes us so
worried’. They expressed a lack of confidence in what they know and what to do.

For example:

I think we were able […] but did not feel confident for what we see. What if our interpretation is wrong, we will be blamed. If we know, we should be confident. But we are not (19).

We do not know much [about the learnt topic]. If we think our knowledge is adequate, then we will be confident in what we are doing, if we have seen [from the teacher] how things [intervention/s] are done, we will be more sure in solving the problems (16).

We only memorise the symptoms, so I am not sure if we could identify a patient’s problem (15).

In contrast, intervention-group students expressed perceptions such as ‘we think we are ready to face practice; we are familiar with the situations, so we feel ready to be in clinical practice’. Key reasons for their comments appeared to relate to a perceived sense of familiarity with the practice context and an enhanced capacity to know what to do. For example:

We feel confident to make a decision when caring for a patient (3).

I think I could make a decision about what to do (4).

We think we could apply this knowledge to real patients in clinical practice (6).

The following comment summarises the views of intervention group students:

This makes us ready to go to the hospital. Because we felt that before, the teacher only gave us the basics of this material and we thought we would not
be ready to go to practice in the hospital; I think the others felt the same as well (5).

6.2.3 Enjoying learning.

The final theme that emerged from the focus-group discussions with the intervention and control groups related to their perceptions about what they had enjoyed about the high-risk-pregnancy learning activities and, to some extent, the degree to which this influenced their motivation to learn the high-risk-pregnancy topic. Three categories were particularly evident in the students’ comments on this theme: 1) my learning experience; 2) provision of support; 3) collaborating with others.

6.2.3.1 My learning experience.

For the ‘my learning experience’ category, intervention-group and control-group students made comments that highlighted the issue of engagement in the learning activities. Again, both groups of students made different comments about how they perceived learning facilitation should/should not be. Describing their perceptions of the teaching method/strategy, the control-group students made the following comments:

*Regarding the method, it is still lacking. It is not good because we know less about important things in maternity (17).*

*I think the teaching strategies were not good because we were mostly confused and so we felt unhappy (11).*

*There were too many tasks given; we were tired and bored (18).*

In support to the above comments, intervention group students also commented:
I think the teaching methods used by the previous teachers were not good, as they only handed out some tasks and asked us to present them (9).

However, when commenting on their learning experiences that had been facilitated through the educational-intervention package, intervention group students highlighted the effect of ‘not bored’ or ‘feeling interested’ in the learnt topic. For example:

I think with this way of learning, all the material can be covered. Also, when the teacher taught us, it was not boring at all; even though the class duration is pretty long, every word she said can still be understood, even in drowsy hours, it’s kind of waking us up and we wanted to listen, even now, we still remember that (2).

I think this way of teaching is fun and easy to understand; it is easier to understand and relax (2 and 5).

[So] it made it easy for us to absorb the topic in our minds, and it is not easy to forget either (5).

This approach is enjoyable and easy to understand compared to the previous [approach]. Last time, we felt bored (3).

Learning a method like this attracts our attention so we do not get bored easily in class because it was fun when each person in the group got the opportunity to talk (8).

Additional issue raised in the category of ‘my learning experience’ was related to the students’ engagement in group learning. Intervention-group and control-group students perceived that the number of students in the group learning activity played an important role in facilitating learning engagement; however, different perspectives were evident in the comments of the two groups. Control-
group students were concerned that not being engaged in learning was the limitation of group learning with a large number of students. However, these students considered not being engaged in learning from the perspective of the physical aspects of engagement, rather than from the perspective of cognitive engagement. For example:

*I think this method was not effective because the number of students in the group was too many (14).*

*I think the method is already effective but the problem lies in the number of the people in the group; where there are too many people in the group, it becomes ineffective, thus the others were not working (18).*

*The size [of the group] is too big, so most of the students were taking advantage of others’ work and very dependent on others, so not all students learnt effectively (15).*

*It is better to have a smaller group so everybody in the group works (13).*

Intervention-group students also highlighted the effect of the size of the group, particularly from the perspective of their previous experiences. These students felt that small-group discussion (such as they had experienced during the educational intervention) was better, as it could enhance learning motivation on the learnt topic. For example:

*We are motivated, as the groups are small (6).*

*In this method [group discussion], each person got the chance to say something. It enabled the person to share even if they were shy. They did not feel pressured or afraid (9).*
Normally in class [in usual teaching], we had to raise our hand, but because some others are very shy, there is no chance for them to convey what they think (7).

Last time [in the larger group discussions], the active students dominated the process of learning (5).

6.2.3.2 Provision of support.

For the category of ‘provision of support’, intervention-group and control-group students commented on the support provided by the teacher in facilitating their learning. Both groups of students perceived that gaining support and respect from teachers plays an important role in enhancing learning motivation. Gaps between students’ expectations and what they had actually experienced were evident in their comments. Comments made by control-group students about support for learning seemed contrary to the comments made by intervention-group students. Control-group students raised concerns about the lack of guidance, and expressed strong needs for more guidance in task completion. For example:

For the theory, I think the teachers should teach us before giving us the assignment. I mean that not all the learning contents were presented by the students (15).

We want enough explanation, and when we think there is enough, then they can give us tasks (17).

The point is the lecturer only tells us to find this and that without clear instructions (13).

In contrast, intervention-group students commented that they gained support through the teacher’s presence and guidance during class-learning activities. For example:
The teacher is very helpful; we discuss the things that were not so clear for us before. We don’t worry if the answer might be wrong (7).

The support is so good and useful because the teacher was really supportive, so we felt more confident in answering questions (5).

The teacher is on our side to help us. When our thinking is not quite right, the teacher will help us to identify why that is not relevant and show us some alternative ways to find [solutions] (4).

The support from the teacher was so good. In fact, this is the first kind of guidance I ever experienced during my study in this university (8).

The teacher directs and teaches us from the basics, so we really understand (1).

In addition, intervention-group and control-group students perceived that being valued by the teachers was an important learning support. Control-group students were concerned about being undervalued by teachers when offering an incorrect opinion during the learning process because they were concerned they might be perceived by the teachers as unknowledgeable students. Therefore, these students were reluctant to make ‘mistakes’. For example:

*Usually the lecturers equate us with nursing-diploma students, comparing us with them, I mean, because we really have no idea that we do not know, that is why we remain silent (18).*

*We feel discouraged and then reluctant to talk, as we worry if we make a mistake again. So in order to prevent us from making mistakes, when the teacher asks us, we say ‘I do not know’ (16).*
I mean we were quiet [didn’t give answers] because we hadn’t learnt, so we didn’t know about it, we do not know many important things in maternity care (12).

Intervention-group students commented further on the effect of the teacher valuing their opinions. For example:

In this approach, the teacher positively values our opinion and when it is not relevant, the teacher ‘sets it straight’ [explains], so we do understand (8).

We don’t have any worries with the teacher (6).

The teacher’s approach is good; this made us confident in answering her questions without fearing that it’s a wrong or right answer (4).

Before this, the teacher would say, ‘How do you not know the answer? This is easy’ (3).

6.2.3.3 Collaborating with others.

The final category in this theme was ‘collaborating with others’.

Intervention-group students perceived that learning will occur when students ‘engage’ with others. Therefore, engaging with other students was an important learning strategy. These students highlighted that gaining confidence in justifying opinions and having the opportunity to share knowledge were the positive effects of collaborating with others. For example:

I feel confident to answer questions (4).

I can explain it to other peers and by doing this we can help others to learn as well (2).

That was the time for us to exchange knowledge and experience (1).

Being open-minded and reaching a conclusion were the other benefits of the group discussion that intervention-group students noted. For example:
The discussions method used recently is really helpful because then we learn to tolerate others’ way of thinking and combine it with what we have, and we also learn how to appreciate the opinions of others; by looking for a rational decision, we are exchanging thoughts with others and understanding the reasons behind their way of thinking and based on the books that we read (1).

There were also times when we shared the knowledge we had and experiences to and from others, so we got the solutions for the problems we had (2).

We learn how to value other’s comments and seek a logical solution so we exchange ideas (5).

We learn how to understand and value others’ perspectives (7).

Although control group students commented on their group tasks, they did not have any comments related to this theme.

6.3 Summary

This chapter has presented the results from Phase 2 of this study: the evaluation of the educational-intervention package. The results consist of quantitative and qualitative components. The quantitative component results were derived from the students’ responses to the CCTDI and the clinical vignettes. The results of the qualitative component were drawn from the focus-group data. Overall, the quantitative data indicate positive outcomes in accuracy in clinical reasoning for the intervention-group students. The results from the students’ inaccuracy in clinical reasoning, the students’ responses to the CCTDI, and the students’ self-confidence in responding to the clinical questions did not reach significance. As with the results of the variable of accuracy in clinical reasoning, the intervention-group demonstrated
more positive perceptions in the variable of inaccuracy in clinical reasoning regarding their learning experience than did the control group. Overall, the qualitative data indicated that intervention-group students had more positive perceptions about their learning experience than did control group students. This was demonstrated in the comments from the focus-group discussions with the both groups. While there were differences in the specifics of participants’ comments, similarities in the themes that emerged from the focus-group discussions were identified, with both groups highlighting issues related to ‘developing knowledge and skills’, ‘connecting knowledge to practice’ and ‘enjoying learning’.
Chapter 7: Discussion

As described in Chapter 1 (Section 1.3), the present study was undertaken in two phases: Phase 1—expert panel review and Phase 2—evaluation of the educational intervention. The details of Phase 1, including the findings in relation to research questions 1 and 2, are discussed in Chapter 4. Chapter 7 discusses the major findings in relation to the five research questions that guided Phase 2 of this study. The goal of Phase 2 was to evaluate the effect of the educational intervention on students’ learning outcomes and the perception of the students of their learning experience. Chapter 7 begins with an overview of this study and continues with a discussion of the quantitative and qualitative evidence found in Phase 2. The first section of each component provides a summary of the results. The section that follows collates the results and discusses them according to the research questions. This chapter concludes with a summary of the discussion of Phase 2.

7.1 Overview of Study

The quality of nursing care strongly depends on the clinical judgement made by nurses. Thompson and Stapley (2011) argue that this involves an interpretation of client cues in the provision of care through a process of clinical reasoning. Thus, developing nurses’ ability to apply clinical-reasoning skills in practice is likely to contribute positively to the quality of nursing-care provision (Banning, 2007; Chabeli, 2006; Kuiper et al., 2009; Redding, 2001; Tanner, 2009; Thompson & Stapley, 2011). However, clinical reasoning is a complex, multifaceted process that involves the utilisation of domain-specific knowledge, and cognitive and metacognitive skills to identify problems, enumerate possible actions, weigh them appropriately and justify chosen actions (Facione & Facione, 2008; Facione, 2010; Simmons, 2010) across the diverse range of clinical settings in which nurses
practice. Accordingly, curricula and teaching approaches that support student nurses’
development of clinical-reasoning skills are of prime importance in enabling nursing
graduates to provide effective care (Brunt, 2005a; Simpson & Courtney, 2002, 2009;
Vittrup & Davey, 2010). However, despite the body of work that has been
undertaken in this area, questions remain about the degree to which nursing
graduates are prepared to meet the challenges of contemporary practice (Benner et
al., 2010; Gillund et al., 2012; Henessy et al., 2006b; Tanner, 2010). Tanner (2010)
believes that nurses entering the field are not equipped with the essential knowledge
and clinical-reasoning skills for current practice, nor are they prepared to continue
learning to meet the challenges of professional nursing in the future. Further, Tanner
notes that teaching strategies used by teachers do not support the development of
habits of enquiry that equip graduates to make the required decisions. This is also
believed to be the case in Indonesia, where developing clinical judgement is one of
top three training needs identified for nurses, particularly in East Kalimantan and
North Sulawesi (Henessy et al., 2006b).

The educational intervention implemented in this study offered an innovative
approach to the improvement of nursing students’ development of clinical-reasoning
skills. The intervention drew upon the pedagogical concepts of cognitive
apprenticeship and key concepts from the IDEAS model (Facione, 2011) to develop
an interactive, guided learning experience for undergraduate nursing students that
would improve their application of clinical-reasoning skills to clinical problems.
Importantly, in the Indonesian context, the intervention design represented a
significant shift away from traditional learning and teaching approaches to
incorporate a contemporary perspective for facilitating quality learning outcomes.
This study’s Phase 2 results suggest that the teaching strategies used in the educational intervention appear to have had some positive effects on students’ clinical-reasoning skills. These results are indicated by the effect of the intervention on the accuracy dimension of students’ clinical reasoning and were supported by their comments about the quality of their learning experiences.

7.2 Evaluation of Educational Intervention

The purpose of Phase 2 was to evaluate the effect of the educational intervention on students’ learning outcomes, and their perceptions of the learning experience. As outlined in Chapter 4, quantitative and qualitative data were obtained. The following section begins with a discussion of the results obtained in relation to critical-thinking disposition, clinical reasoning and perceived level of confidence in responding to the clinical vignette. This is followed by a discussion of students’ perceptions of their learning experiences.

7.2.1 Critical-thinking disposition.

Research question 3: Is there a significant difference (at Time 1/Time 2) in CCTDI scores (as measured by overall CCTDI scores and the scale scores) for students who received the educational intervention compared to students who received usual teaching?

In this study, the overall CCTDI scores for the intervention and control groups were above 280, indicating that all students had what is considered a ‘positive’ disposition to critical thinking (Insight Assessment, 2014). The overall scores obtained in this study are similar to those obtained in previous studies involving Korean students (Shin, Lee, Ha & Kim, 2006), Chinese students (Tiwari et al., 2006) and Dutch students (Paans et al., 2010). However, it contrasts with work conducted by Ip et al. (2000) and Yang and Jung (2004), which reported overall
CCTDI scores below 280 for participants in their studies. In the present study, the intervention and control groups scored lowest on the truth-seeking scale and highest on the inquisitiveness scale. Low scores in the truth-seeking scale are consistent with Ip et al. (2000) and Yang and Jung (2004) (who conducted research with Chinese students) and Yu, Zhang, Xu, Wu & Wang (2013) and Shin et al. (2006) (who conducted research with Korean students).

It is possible that students’ cultural background will be a contributing factor to the low truth-seeking scores in these studies. Some studies conducted in Asian countries have found that compliance with parents and teachers is one of the basic norms taught to children (Ip et al., 2000; Shin et al., 2006; Yu et al., 2013). Consequently, expressing conflicting views or asking ‘critical questions’ to parents or teachers can be negatively sanctioned (Ip et al., 2000; Shin et al., 2006). As a result, students are more likely to develop passive attitudes and not be motivated to find the truth, as they are likely to be more concerned with ‘the authoritative right answer’ provided by teachers or parents (Ip et al., 2000, p.88; Shin et al., 2006). However, the high score on the inquisitiveness scale found in the present study highlights the potential to develop expert knowledge and skills (Ip et al., 2000).

At Time 2, there were no significant differences in the overall CCTDI scores or CCTDI scale scores for the intervention or control group. This contrasts with Yuan et al. (2008) and Tiwari et al. (2006). However, the interventions in their studies were of 18 and 28 weeks’ duration respectively, whereas the intervention in the present study was of six weeks’ duration. While it might be possible to influence students’ critical-thinking disposition using well-designed learning instruction, students need time to incorporate such ‘habits of mind’ into their professional judgement. Thus, intervention dosage might have been a key factor in the results of
the present study. In addition, work by Abrami et al. (2008) suggests that a ‘whole-of-course’ approach is needed to facilitate the development of positive habits of mind.

In addition, it is possible that the CCTDI was not sensitive to the applied nature of the clinical-reasoning skills that were the focus of the present study. The CCTDI aims to assess disposition to engage with problems and make decisions using critical-thinking skills within the context of general daily life. While it might be expected that there is a similarity between ‘daily life disposition’ and the underlying disposition to apply clinical-reasoning skills within the context of patient care, the contexts are quite different. Thus, it is possible that insignificant results in the between and within tests might have been influenced by a lack of sensitivity of the CCTDI for the purpose of this study.

The language expression used in the CCTDI also appeared to influence students’ perception of the items. This might be related to translation issues in the Indonesian version of the CCTDI. Anecdotal evidence revealed that language used in the CCTDI was not easily understood by the students. All student participants spoke the formal Indonesian language; however, the language used by the students were differs between the Indonesian regions. The Indonesian translation of CCTDI was in a very formal Indonesian language that some students might rarely use in their daily communication. Thus, using the Indonesian-translation version of the CCTDI in one location in Indonesia appeared to be feasible (Soeherman, 2010) but it might not be the case in other Indonesian regions such as the one in which this study was conducted. Importantly, a very limited number of studies have used the CCTDI in the Indonesian context. This means there is a lack of information about the appropriateness of the Indonesian translation.
In summary, the present study found no significant differences in critical-thinking dispositions between the intervention and control groups at post-test. These findings might indicate three important factors. First, the length of the educational intervention in this study might not have been sufficient to provide an observable effect on students’ critical-thinking disposition. As argued, if students’ disposition to critical thinking is to be improved, the educational intervention requires sufficient time for the thinking disposition to become a habit of mind. Second, the CCTDI might not be an appropriate instrument for measuring attitudinal components of clinical-reasoning skills. The CCTDI measures critical-thinking disposition rather than clinical-reasoning attitudes. As described, there is likely to be a divergence between the ‘willingness’ to think critically (Insight Assessment, 2014) and the cultural beliefs, feelings and behavioural tendencies students have towards clinical reasoning, particularly for students who are from cultural backgrounds where independent reasoning is not a highly valued attribute (Ip et al., 2000; Shin et al., 2006; Yu et al., 2013). Third, the language expression used in the Indonesian version of the CCTDI seemed to be not sensitive to the Indonesian language used by the participants in this study.

7.2.2 Clinical reasoning.

Research question 4: Is there a significant difference (at Time 1/Time2) in students’ accuracy in clinical reasoning responses to the clinical vignette (as measured by overall accuracy score, number of accurately identified problems, data items, possible interventions and interventions chosen) for students who received the educational intervention compared to students who received usual teaching?

Research question 5: Is there a significant difference (at Time 1/Time2) in students’ inaccuracy in clinical reasoning responses to the clinical vignette (as
measured by overall inaccuracy score, the number of inaccurately identified problems, data items, possible interventions and interventions chosen) for students who received the educational intervention compared to students who received usual teaching?

For accuracy in clinical reasoning, there were no significant differences between the intervention and control groups at Time 1 for the overall scores or sub-variable results from the high-risk-pregnancy clinical vignette. However, at Time 2, there were significantly more accurate responses \( F(1, 83) = 49.68, p = 0.000 \) made by the intervention-group students, with partial eta square showing a very large effect size \( \eta^2 = 0.37 \) compared to the control group. There was a similar pattern in the accuracy results for each of the four clinical-reasoning sub-variables. The intervention group scored significantly higher than the control group on each of the four elements of accuracy in clinical reasoning. With inaccuracy in clinical reasoning, there were no significant differences \( p > 0.05 \) found between the two groups at Time 1 or Time 2 for the overall scores or sub-variable results from the high-risk-pregnancy clinical vignette, indicating that although there had been an effect of the educational intervention on the accuracy of students’ clinical reasoning, there was no effect on students’ identification of inaccurate responses.

The accuracy results are consistent with a quasi-experimental study by Tesoro (2012), which investigated the effect of a two-week educational intervention using the Developing Nurses’ Thinking model (DNT model) in facilitating student nurses \( (N = 99) \) to interpret data accurately by measuring nursing diagnostic accuracy. The educational intervention was in a post-conference format after each of the clinical assignments during the two weeks. The control group was given the usual post-conference format that was to assist students to think critically when
interpreting data, and developing care plans. There was discussion about the patient’s condition and learnt concepts between the teacher and students. The intervention group was guided in making diagnostic reasoning using the DNT worksheet, short case studies and student clinical data. This group was given a North American Nursing Diagnosis Association (NANDA) international nursing diagnosis book as the standard for generating nursing diagnosis. Students were coached to use their cognitive and metacognitive skills such as interpretation, analysis, evaluation and reflection skills on the provided case studies. At the end of each assignment, the post-conference students were assigned to a small group, employing their diagnostic-reasoning knowledge to the current clinical data using the DNT worksheet. Data were collected before and after the educational intervention on students’ scores for accuracy in nursing diagnosis in a case scenario using the Lunney scoring method, number of the post-conferences and evaluation of the post-conferences process. The post-test scores of students from the intervention group demonstrated a statistically significant improvement in accuracy. Therefore, Tesoro concluded that the DNT post-conference model improved accuracy of nursing diagnosis. However, this study focused on measuring nursing diagnosis accuracy, while the present study examines specific aspects of the clinical-reasoning process. Nonetheless, Tesoro’s study highlights the importance of actively involving students in the development of their diagnostic skills.

Similarly, a randomised factorial study conducted by Paans et al. (2010) explored the effect of knowledge sources (knowledge about patient’s history and about how to interpret relevant patient information), disposition towards critical thinking and reasoning skills on nursing diagnosis accuracy among clinical nurses ($N = 249$). The results indicated a significant effect for the use of knowledge sources,
particularly the ‘problem, etiology, signs and symptoms’ (PES) format, and reasoning skills on nursing diagnosis accuracy. The author proposed that these findings indicate a strong relationship between a nurse’s knowledge source and diagnosis accuracy.

Botti and Reeve (2003) investigated the effect of academic ability and experience on nursing students’ diagnostic accuracy. Within the context of low complexity problems, academic ability was found to have a significant effect on diagnostic accuracy. However, for difficult clinical problems, there were no significant differences in students’ diagnostic accuracy according to academic ability or experience. The authors concluded that academic ability affects decision making in low complexity tasks but as case complexity increases, domain-specific knowledge and experience determine decision-making skills. Taken together, the findings from Paans et al. (2010) and Botti and Reeve (2003) highlight the importance of diagnostic skills and acquisition of relevant knowledge for clinical diagnostic accuracy.

The present study found significant differences in the accuracy of students’ clinical reasoning for those who received the educational intervention compared to those who received usual teaching. However, the results for inaccuracy in clinical reasoning were insignificant between the two teaching approaches. Students participating in the study were in the third year of a five-year Bachelor of Nursing programme and were not experienced in domain-specific knowledge. Perhaps, similar to Botti and Reeve’s (2003) study, the lack of significance seen in the inaccuracy results of the present study might be related to the students’ lack of experience with the subject content and the fact that higher level ability is required to make precise discriminations between what may be unfamiliar data—as opposed to
the recognition of more familiar data—and hence, the differential effects on accuracy and inaccuracy seen in the intervention group’s clinical reasoning.

7.2.3 Confidence with clinical reasoning.

Research question 6: Is there a significant difference (at Time 1/Time 2) in the perceived level of self-confidence in responding to the clinical-vignette questions for students who received the educational intervention compared to students who received usual teaching?

Results from the intervention and control groups’ responses to self-confidence in clinical reasoning revealed no significant differences between the intervention and control groups’ perceived self-confidence at either Time 1 or Time 2. However, there were trends in the data that suggested that at Time 2, the intervention-group students perceived a high level of self-confidence in identifying possible interventions, selecting the most appropriate interventions, and in their decision-making process compared to the control-group students. This result differs to findings from a longitudinal study by Patterson (2006), who assessed in veterinary students ($N = 50$) the three clinical-reasoning skills: making problem lists, making rule-out skills and selecting relevant diagnostic test. Data were collected on students’ self-confidence to examine whether students’ self-confidence increased after a 15-week clinical-reasoning-skills intervention (making problem lists, making rule-out lists and selecting relevant diagnostic tests). Data were collected on the three clinical-reasoning indicators before and after the educational intervention. The results suggested that students’ self-confidence was significantly increased. The differences between Patterson’s study and the present study suggest that the shorter length of the current study might have influenced the results. This highlights the
possible influence of time and practice in developing student self-confidence in clinical-reasoning skills.

It is possible that the lack of statistical significance in the results for students’ self-confidence reflected an overconfidence factor that has been reported by Berner and Graber (2008). According to these authors, people are more likely to rate their confidence beyond the accuracy of those judgements and notably, overconfidence seems to disappear in easy tasks but intensify with difficult tasks. The intervention and control groups in the present study might have responded overconfidently to the clinical-reasoning questions at Time 1 by choosing ‘confident’ or ‘extremely confident’. Consequently, the levels of self-confidence after the educational intervention were perceived to be similar to the self-confidence levels expressed at Time 1. As a result, a significant difference between Time 1 and Time 2 was not detected. Despite insignificant results, the intervention group demonstrated a positive direction in changes in self-confidence, while the control group revealed a negative trend in self-confidence in clinical reasoning.

In summary, the present study found no significant differences in students’ perceived level of self-confidence in responding to the clinical-vignette questions for students who received the educational intervention compared to students who received usual teaching at pre-test or post-test. However, the positive trends that were observed suggest that the intervention might have played a role in influencing students’ self-confidence in clinical reasoning.

**7.2.4 Students’ perceptions of their learning experiences.**

*Research question 7:* What are the perceptions of students who received the educational intervention of the learning experience compared to those who received usual teaching?
Overall, the results from the quantitative data were consistent with the findings from the focus-group data, in that intervention group students had generally more positive perceptions of their learning experience and development of clinical-reasoning skills. Three common themes emerged from the analysis of students’ perceptions of their learning experience: developing knowledge and skills, connecting knowledge to practice and enjoying learning. Detailed discussion of the findings is presented in the following sections.

7.2.4.1 Developing knowledge and skills.

The theme ‘developing knowledge and skills’ indicates students’ perceptions of how their learning experience had supported them in understanding the new high-risk-pregnancy topic. While participants from both groups felt that their learning experiences had enabled them to become ‘more informed’ about the high-risk-pregnancy topic, intervention-group students believed that they had ‘deeply explored’ the topic and as a result, were ‘confident’ that they could explain it to their peers and were better able to retain their new knowledge. They also felt that the educational intervention had enabled them to think critically about clinical data and work through the process of solving clinical problems. In contrast, control-group students saw their experience as more about getting ‘the answers’ from the teachers who had ‘more knowledge’ in the relevant field. They also commented that, although they had gained some knowledge, they found the topic difficult to understand and were still concerned about their perceived lack of understanding. Additionally, they perceived that ‘learning by memorising’ is not an effective way to learn as it is ‘easy to forget’ what has been learnt. These concerns extended to the development of clinical-reasoning skills because these students expressed that they saw their lack of understanding as a barrier to thinking critically in practice situations.
Findings from this theme suggest that the educational intervention might have assisted students to develop clinical-reasoning skills through two interdependent processes: facilitation of deep learning and structuring of knowledge. Karagiorgi and Symeou (2005) argue that deep learning occurs when students actively use their knowledge to resolve complex situations, for example, by applying, relating and theorising. In contrast, students with a surface approach to learning have a less meaningful understanding of the learnt subject as they are primarily focused on memorising information or procedures of performance (Bay, Bägöcci & Cetin, 2012; Biggs, 1996). A case study by Anderson (2006) explored factors affecting the development of clinical reasoning in medical students ($N = 130$). The findings indicated that clinical reasoning does not develop in isolation but is positively affected by the approach to learning used by the individual. Anderson further argues that ability to structure and integrate knowledge from different disciplines plays an imperative role in developing students’ knowledge bases, retaining knowledge for a longer period, and retrieving and utilising the knowledge in new cases. Therefore, it is possible that the deeper thinking described by the intervention-group students played a role in assisting those students to develop their clinical-reasoning skills.

The focus-group comments suggest that the educational intervention enabled students to structure their knowledge in manners that facilitated clearer conceptual connections. The ability to structure knowledge provides three benefits: enhanced meaningful understanding and retention of knowledge, and developed reasoning skills. As discussed by Biggs (1999), structuring knowledge is essential for promoting retention of knowledge. In addition, well-structured knowledge not only enhances retention but also facilitates recall of the existing knowledge and
understanding related information (Biggs, 1999; Gazzaniaga, Heatherton & Halpern, 2010; Karagiorgi & Symeou, 2005; Pritchard & Woollard, 2010).

Consistent with principles of CALM, the learning activities in the educational intervention were designed to facilitate students’ active engagement in their learning and were purposefully sequenced from simple to complex problems to enable students to incorporate the interrelated sets of knowledge and skills and assist them to practice what they were learning (Collins et al., 1991). From these findings, it is suggested that these design features played a role in facilitating students’ development of cognitive and metacognitive skills by fostering a deep approach to learning and enabling the construction of a deep level knowledge.

7.2.4.2 Connecting knowledge to practice.

For the theme of connecting knowledge to practice, both groups of students perceived that teachers used strategies to facilitate their application of knowledge to practice. Nonetheless, what they perceived as effective manners of achieving this was conceptually divergent. Control-group students perceived that learning occurred by asking questions and obtaining answers from peers or teachers. They also perceived that memorising particular skills as demonstrated by the teacher would assist them to employ their knowledge in the clinical setting. In contrast, intervention-group students perceived that learning is an active process enacted by individuals to construct conceptual and practical knowledge facilitated by the teachers; a process through which they can observe the teacher’s process of thinking in solving a complex problem, as well as attain direct support through the practice expertise of their teacher. Intervention-group students also perceived that the case-based approach of the intervention had facilitated their development of thinking skills and enhanced their curiosity to explore more about the subject. Notably, these
students believed that they could employ thinking skills across different subjects. Enhanced self-confidence caused by familiarity to the practice context also resulted in a perceived readiness of these students to face clinical practice.

These findings are consistent with the research of several authors. Control group experienced a traditional-teaching approach in which topics are typically presented in a linear manner through weekly lectures that are focused on the presentation of decontextualised theoretical knowledge (Benner et al., 2010; Biggs, 1999; Gagne et al., 2005; Herrington & Herrington, 2006; Tanner, 2010). Students are required to memorise the content and present it in an exam that is designed to test the recall of memorised material. Consistent with these notions, the control-group students were found not to be able to see the connections between knowledge and practice. Conversely, the case-based approach of the educational intervention facilitated the development of knowledge and skills that these students felt they could apply in different practice contexts.

7.2.4.3 Enjoying learning.

For the theme of enjoying learning, both groups highlighted the issue of engagement in the learning activities. However, as noted previously, different perspectives emerged from the comments of the two groups. Control-group students described their learning experience as a ‘not good’ experience in which ‘There were too many tasks given; we were tired and bored’ (18) and ‘we were mostly confused and so we felt unhappy’ (11). This group also highlighted that they were not engaged by the big-group learning despite expressing that being able to share work during group activities was important. Control-group students also perceived a lack of guidance, particularly in relation to task completion, and expressed the view that being undervalued by the teacher had negatively influenced their learning. In
contrast, intervention-group students perceived that participating in the educational intervention was enjoyable, and it was easy to comprehend the concepts. They commented that learning through the educational intervention had enhanced their engagement with other students through opportunities to share and justify their opinions, and that it had helped them to be open-minded in their learning. Being valued by teacher was another positive perception related to learning support of intervention-group students.

Consistent with the sociology dimension of CALM (Collins et al., 1991), these comments highlight the importance of collaborative environments for optimising students’ learning experiences. According to Dewey (Schiefele, 1991, p. 300), ‘external attempts to make something interesting lead to only temporary effort and do not result in identification with the material’. This is consistent with comments from control group students, for example, ‘we thought this is just to fulfil the task; we do not want to learn more. The important thing is to accomplish the tasks. When we pass the lesson, that means it’s done’ (15). Conversely, feeling interested promotes students’ intrinsic motivation for learning. Working with peers in a collaborative environment can facilitate a social context for learning that stimulates a level of interest that promotes intrinsic motivation for learning (Collins et al., 1991; Schiefele, 1991). This enables students ‘opportunities to experience the pleasure and satisfaction inherent in problem solving’ (Karagiorgi & Symeou, 2005, p. 19).

In summary, the findings from the focus-group data suggest that learning facilitated by the educational intervention had a positive influence on knowledge and skills that are important for the development of clinical reasoning. This effect was fostered by the change from teacher-centred learning to student-centred learning.
Importantly, enjoyment of learning is also evident from the intervention-focus-group data. Learning enjoyment can be promoted by experiencing collaborative learning activities and learning support obtained from the teacher and peers.

**7.3 Factors Influencing Educational Intervention Outcomes**

Reflecting on the overall findings of this study, and the main propositions of CALM, it is proposed that three key factors were instrumental in achieving the partially positive outcomes:

1. situating the knowledge through case-based learning
2. making clinical reasoning visible using a ‘think-aloud’ approach with students
3. enhancing collaboration through small peer-group discussion.

Conceptualisation of factors affecting students’ clinical-reasoning learning in this study is presented in Figure 7.1
7.3.1 Situating knowledge through case-based learning.

Situating knowledge through case-based learning was a key element of the design and implementation of the educational intervention. According to Brown et al. (1989), situating learning in an authentic context (i.e. situations that would usually involve the relevant knowledge and skills) assists students to develop the cognitive and metacognitive skills important to solving real-life problems. Contextualising learning according to culture and the environment where the knowledge is constructed and employed enables students to develop conceptual models of the targeted tasks or procedures before practicing the knowledge and skills in the real environment (Brown et al., 1989; Brown et al., 1987). Thus, contextualising learning facilitates the development of expertise in a specific area (Brown et al., 1987; Collins et al., 1991; Darabi, 2005), which includes disciplinary
knowledge (e.g. key concepts, principles and demonstration of procedures), techniques or approaches for making judgements, and self-regulation (e.g. ability to identify, select appropriate strategies and re-evaluate decisions made if needed).

For the purpose of the present study, the learning activities were contextualised within case scenarios that were drawn from examples of high-risk-pregnancy situations that students are likely to encounter in their everyday practice. This differs from the usual teaching methods used within the Bachelor of Nursing at CUDLSM, which generally involve more traditional didactic approaches. Studies support the use of case-based learning to develop students’ cognitive and metacognitive skills (Karagiorgi & Symeou, 2005; Mayo, 2004; Ozturk, Muslu & Dicle, 2008; Pedersen & Liu, 2003). Importantly, case-based learning facilitates learning real-life task complexities, as it effectively depicts a real-world problem and occurs in the domain-specific context (Karagiorgi and Symeou, 2005; Stone, Alfeld, Pearson, Lewis & Jensen, 2006). Thus, compared to didactic instruction, the use of a case-scenario approach offers a potentially more effective manner in which to assist students to connect what they are learning to the knowledge and skills required in real-life situations.

More specifically, learning through case scenarios can facilitate the development of higher order cognitive skills that are essential for the development of clinical-reasoning skills (Ozturk et al., 2008; Pedersen & Liu, 2003). For example, students need to identify the problem and ensure they have relevant and sufficient clinical information to infer the health problem. Students are also required to prioritise the identified problems and their possible interventions before selecting the most relevant and feasible intervention/s. During the process of problem solving, students need to recursively monitor and correct their decisions in previous steps or
Findings from the focus-group data suggest that the intervention-group students perceived that contextualisation of the learning activity had assisted their development of clinical reasoning and had improved their feelings of confidence in applying their learning in practice situations. In particular, the intervention-group students perceived that they had developed an improved ability for analysing similarities and differences between the problems presented in the case scenarios (i.e. bleeding caused by placenta praevia or abruptio placentae). Notably, the capability to determine when and where to apply previously learnt knowledge and skills reflects the use of metacognitive skills that novices might lack (Nash-Ditzel, 2010; Perin, 2011). Importantly, this capability might also promote retention of learning (Perin, 2011) and transfer of learning (Collins et al., 1991; Giamellaro, 2014; Karagiorgi & Symeou, 2005; Perin, 2011). In addition, the intervention-group students perceived that they were able to identify supporting signs and symptoms, and evaluate the most accurate data to support the clinical problems, for example, I can differentiate whether this case has “these” [characteristics] and that case has “those” [characteristics] (3). The intervention-group students also commented on their improved ability to make decisions about interventions for clinical problems. Further, the gained feeling of familiarity with the context of practice enhanced their confidence and made them feel ‘ready to go to the hospital’. These findings highlighted the influence of a contextualised learning approach on students’ readiness for clinical reasoning.
The importance of contextualising learning has been highlighted in several studies. For example, Beech and Domer (2002) describe a pre-post-design study to explore whether the effect of formalising instruction using a case discussion that involved the integration of basic science concepts enhanced students’ incorporation of their learning into practice. In their study, baseline knowledge related to the case presented was pre-tested on third-year surgical-clerkship students. The case was developed by a group of experts in the study domain. Consensus was reached on the appropriate utilisation of the basic science and clinical information in patient management after two 90-minute, student-driven sessions and student review of bibliographic resources, the appropriate utilisation of the basic science and clinical information in patient management. The pre-test and post-test results found improvements in the participants’ performances by the seminars. The study concluded that the case method enabled instructors to assess specific areas of increased knowledge and adjust subsequent teaching to improve students’ learning. The enhanced learning reported by Beech and Domer was consistent with the results from the present study and highlights the important of contextualising learning in promoting effective learning outcomes.

Improved knowledge and skills were also reported by Drakeford, Davis and van Asperen (2007), who conducted an intervention study involving medical students and junior house staff in a paediatric hospital ($N = 40$). This prospective cohort study aimed to examine the effect of an evidence-based paediatric-asthma-management educational package on students’ formulation of written asthma action plans and inhalation-device technique. The educational package involved two 1.5-hour sessions. PowerPoint presentations of the three cases and activities were focused on the importance of asthma management, incorporating the formulation of
accurate actions plans and inhalation-device technique. The paediatric hospital junior house staff were given a compact disc read only memory (CD-ROM) and asked to solve the problem by themselves; for the medical students, learning was conducted in a small-group session and guided by an expert facilitator. The medical students were asked to write asthma action plans from the case scenario provided before attending the educational intervention. This was similar to the second and third case scenarios. In addition to this, the medical students were also required to complete a Confidence Questionnaire (CQ) that uses a five-point Likert scale to indicate their level of confidence in using and teaching common asthma devices as well as their confidence in asthma management in general. Data were collected from the three case studies on the students’ ability to write an accurate asthma action plan, competence in using and teaching the use of asthma devices, and knowledge and confidence about knowledge of asthma. Drakeford, Davis and van Asperen concluded that the package was effective in improving students’ formulation of written asthma action plans and inhalation-device technique. Findings from their study suggested that learning with different cases allows students to practice solving problems in multiple real-life problems in the domain. However, the findings from their study also provided evidence that contextualising learning in case-based learning without proper guidance will not provide maximum learning outcomes. However, their study did not specify the complexity of the case studies. Reasonably, sequencing cases complexity and diversity (i.e. from simple to complex problems or from similar to wider variety) assists students to integrate the interrelated sets of skills and organise the activities, as well as allows the practice of a variety of strategies (Collins et al., 1991).
Kopp, Stark and Fischer (2008) investigated the effect of a computer case-based learning environment on medical students’ diagnostic knowledge by randomising 153 medical students into four groups, a two x two factor design (errors versus no errors, elaborated feedback versus knowledge of correct result [KCR]). To verify the sustainability of the effects, a subgroup of subjects (n = 52) was compared with a control group of students who did not participate in the experiment (n = 145) through completion of a regular multiple-choice question (MCQ) test. Results indicated that in the post-intervention knowledge test (post-test), greater improvement in diagnostic reasoning was demonstrated by the groups where errors were made and corrected by elaborate feedback. The group where errors were made but minimal feedback was given scored the worst on the post-test. Further, the authors concluded that effects of the case-based learning environment proved sustainable. These findings again indicate the positive effect of case-based approach and adequate learning guidance in improving students’ clinical reasoning. Similar to the findings from Drakeford et al. (2007), Kopp, Stark and Fischer sound that students gain more benefits from case-based learning if there is appropriate guidance.

Moreover, similar to comments made by intervention group students in the present study, a systemic review by Thistlethwaite et al. (2012) found that case-based learning was also enjoyable and able to promote both student and teacher motivation. In summary, consistent with the general thrust of the studies described above, it is argued that the case-based scenario nature of the educational intervention had a positive influence on the learning experience for intervention group students and promoted their development of clinical reasoning skills.
7.3.2 Making clinical reasoning visible using ‘think aloud’ with students.

As discussed by Brown et al. (1987), a key element of cognitive apprenticeship is to make the process of thinking used by experts visible to students to enable their development of the cognitive and metacognitive skills needed to solve complex problems. In a cognitive-apprenticeship approach, expert thinking is made transparent through community-of-practice interactions between students and teachers. To learn expert thinking, students are required to participate actively in the activities and observe how experts use their thinking to solve the complex problems in real-life situations.

To facilitate visible expert thinking, the present study employed a ‘think-aloud’ approach in which teacher verbalised their thinking; this included discussion of the assumptions, clinical-reasoning logic and usage of relevant evidence in relation to the case scenarios (Calleja et al., 2011; Lundgrén-Laine & Salanterä, 2010). This is different from the usual teaching method employed in the Bachelor of Nursing course at CUDLSM, in which the expert thinking is generally hidden, as teachers do not verbalise their process of thinking. The focus in this course is on traditional learning through the information-dissemination approach that requires students to memorise content (Collins et al., 1991; Dennen & Burner, 2008).

The think-aloud approach can be beneficial for both teachers and students. Using this approach, students can observe the thinking processes employed by the teacher to solve complex problems and, consequently, they can observe how knowledge and skills are employed. When the think-aloud approach is used interactively with students participating in the exchange, they are able to make linkages between the current information being provided and knowledge from their long-term memory (Gazzaniaga et al., 2010). Facilitating the articulation of their
thinking processes enables students to self-assess their thinking and subsequently self-correct their thinking and, thus, their metacognitive skills development.

For teachers, thinking aloud interactively with students can also act as an formative assessment strategy. It allows teachers access to students’ cognitive and metacognitive processes and thus provides formative information on the level of support needed by the students. For these reasons, scholars argue that the think-aloud approach is an effective strategy for enhancing students’ clinical reasoning (Banning, 2008; Calleja et al., 2011; Forsberg, Ziegert, Hult & Fors, 2013; Lundgrén-Laine & Salanterä, 2010; Pinnock & Welch, 2014).

Findings from the focus-group data in the present study suggested that learning was perceived as external process to the control group. The control-group students learnt by asking questions and obtaining answers from peers or teachers, as well as by memorising particular skills demonstrated by the teacher. These students also commented that the information they gained could be easily forgotten. Memorising particular information without constructing understanding from this information might lead to the information being stored temporarily (Gazzaniaga et al., 2010). This might result in insufficient knowledge in the particular context. Importantly, the absence of a visible reasoning process used by the teacher to solve clinical problems also contributed to learning difficulties experienced by the control group. Conversely, the intervention-group students perceived learning as an internal process. The learning activities using thinking aloud assisted them to gain a conceptual model of how clinical reasoning is employed in real nursing practice. As a result, the intervention-group students were able to make connections between what is learnt and the utility of the knowledge in the real-world context.
The role of verbalising thinking is reported in several studies. A study by McAllister, Billett, Moyle & Zimmer-Gembeck (2009) explored the effect of the think-aloud approach on nurses’ knowledge, professional identity and clinical reasoning in self-harm and suicide nursing care. The study employed pre-test and post-test design involving 28 emergency nurses. Participants completed the educational-intervention activity in two sessions of two hours of interactive lectures and discussions related to the clinical context. The participants were provided with four case scenarios: two scenarios before the intervention and two scenarios approximately two weeks after the intervention. Participants were given a digital voice recorder to record their responses to the given questions about the plans and decisions they intended to use. Data were audio recorded, transcribed and analysed. Both quantitative and qualitative data were collected. The results indicated that significant improvements were noted in the nurses’ ability to consider the patients’ psychosocial needs following the intervention. The authors argued that interactive education not only improves attitude and confidence but enhance nurses’ reasoning skills to include psychosocial needs. Comments from the focus groups in the present study suggest that the effect of the teacher’s thinking aloud with students on their development of clinical reasoning was somewhat similar to McAllister et al.’s (2009) findings.

Forsberg, Ziegert, Hult and Fors (2013) conducted a qualitative descriptive design to investigate how experienced paediatric nurses reason for complex virtual-patient cases and how they make clinical decisions. Forsberg et al.’s study also aimed to explore possible issues that should be assessed in clinical-reasoning exams for postgraduate students in diplomas for specialist paediatric nursing education. Thirty registered nurses working in Swedish paediatric departments, and child or
school healthcare centres volunteered to participate in the study, they were from three neonatal intensive-care wards \( (n = 10) \), two emergency departments \( (n = 4) \), four paediatric wards \( (n = 8) \), three child healthcare centres \( (n = 6) \) and two school healthcare centres \( (n = 2) \). The educational intervention consisted of interactive computer simulations of real-life clinical scenarios using virtual patients. In the data-collection phase, nurses were invited to solve (in pairs) two to three virtual-patient cases in a maximum of 1.5 hours, including an introduction to Web-SP and a demonstration of one standard patient case scenario. They were asked to think aloud during the problem-solving process and act as though they had encountered a real patient. The thinking aloud session and the follow-up interview were audio recorded. Content analysis was used to analyse the data. A central theme emerged: an innovative and interactive assessment focusing on clinical reasoning and clinical decision making. The results suggested that experienced nurses use a pattern in judging the value of signs, symptoms, physical examinations, laboratory tests and radiology to make their hypotheses. Results indicated the importance of this intervention on assessing clinical reasoning and clinical decision making. The participants also perceived that the think-aloud approach was an enjoyable approach to learning.

Another qualitative study conducted by Funkesson, Anbäcken & Ek (2007) on clinical reasoning in the context of pressure ulcers explored the process and the content of nurses’ reasoning during care planning at different nursing homes; the study used pressure-ulcer prevention as an example. Seven registered nurses, including nurses involved in direct nursing care and consultant nurses participated in the study. Client simulation illustrating transition from hospital to three weeks after transfer to a nursing home was used. Data were collected using interviews. The
methods used were the think-aloud approach, protocol analysis and qualitative content analysis. The findings indicated that most nurses involved in the study conducted direct and indirect reasoning in a wide range of areas in relation to pressure-ulcer prevention. The clinical reasoning focused on different parts of the nursing process, depending on part of the case. Findings also indicated that nurses involved in direct nursing care demonstrated application of a more complex clinical reasoning than consultant nurses. The authors concluded that the nurses’ experience and knowledge, together with how close to the elderly the nurses’ work was, appeared to be important factors affecting the content of clinical reasoning. The findings from Forsberg et al.’s study revealed the utility of thinking aloud in developing clinical-reasoning skills.

Reflecting on the themes emerging from these studies, and the focus group comments of intervention group students in the present study, it is postulated that the ‘thinking aloud’ approach employed in the educational intervention facilitated students’ observation of expert clinical reasoning utility and their development of useful mental model of clinical reasoning process in solving complex problems.

7.3.3 Enhancing collaboration through small peer-group discussion.

Collaboration through a small-group discussion was another key element of the design and implementation of the educational intervention employed in the present study. Learning through collaboration is consistent with the community-of-practice concept, which emphasises the social dimension of learning and knowing. In a community of practice the sharing of perspective, expertise, experiences, activities, information and knowledge promote the active participation of the community members (Collins et al., 1991; Collins et al., 1989; Karagiorgi & Symeou, 2005), which allows the creation of collaborative learning environments that engage
students and teachers (Collins et al., 1991). Learners become involved in a community of practice, which can transform passive ways of learning to active participation in the learning experience.

As discussed by Karagiorgi and Symeou (2005), collaborative learning environments enable students to develop, compare and understand multiple perspectives of an issue, as well as develop a meaningful understanding through developing and evaluating the opinions of others. This is consistent with Collins et al.’s (1991) views on the sociology aspect of the learning environment, which emphasises the importance of the social process in providing opportunities for students to observe procedures and attitudes demonstrated by the expert, as well as the values, judgement processes and cultural elements that inform the thinking process and decisions made.

Karagiorgi and Symeou (2005) believe that students can experience pleasure and satisfaction when they solve a problem. According to Gazzaniaga et al. (2010) and Rogoff (1990), positive learning experiences are more likely to be repeated. Arguably, experiencing pleasure and self-satisfaction in learning is an effective precursor to enhance self-confidence and continual use of problem solving as the students’ manner of learning. It is important that communication between teachers and students facilitate students to share their thinking in a non-threatening environment (Laal & Ghodsi, 2012).

In the present study, collaboration was facilitated in the small peer-group discussions of case scenarios in the context of high-risk pregnancy. The group discussions were designed to provide opportunities for students to develop, compare and understand multiple perspectives through meaningful activity and social interaction. Learning was guided by the teacher using relevant strategies such as
thinking aloud and providing hints. This differs from the usual teaching methods used in the Bachelor of Nursing course at CUDLSM, which generally involve teacher-centred learning and are focused on individual activities and learning achievement. Studies support the use of a collaborative learning approach to develop students’ clinical-reasoning skills.

The focus-group data revealed the students experienced an enjoyable and conducive learning atmosphere in the intervention group. Feeling interested or ‘not bored’ according to Collins et al. (1991, p. 22) reflects students ‘intrinsic motivation’, as students are intrinsically involved in coherent learning goals. Collins et al. believes that having intrinsic motivation fosters students’ self-directed performance in task completion. In addition, Collins et al. (1991) believe that learning through cooperative problem solving also enhances motivation. The control group perceived that learning activities are not interesting, for example, ‘there were too many tasks given; we were tired and bored’ (18).

Moreover, the students in the intervention group perceived that in the small peer-group discussion, students had opportunities to share their thinking without a feeling of being pressured. Importantly, this approach not only reduces anxiety but also enhance students’ self-confidence, as they feel valued and supported, for example, ‘this made us confident in answering her questions without fearing that it’s a wrong or right answer’ (4). The results also revealed that confidence in justifying opinions was an important finding in the small peer-group discussion involving the intervention group. The intervention group perceived that being able to share thinking with other participants enabled them to support the learning of other participants in the group, for example, ‘I can explain it to other peers and by doing
this we can help others to learn as well (2)’. Thus, learning is seen as a group process and improved learning is seen as a communal achievement.

The focus-group data also revealed that the small-group discussion during the educational intervention led to being open-minded and collaboratively seeking the solution to the problems being discussed. A positive attitude to the other group members was also evident in their comments, as was acknowledging diversity of understanding. Collaboratively finding solutions to tasks was found to be considered another benefit of a collaborative learning environment (Laal & Ghodsi, 2012), for example, ‘There were also times when we shared the knowledge we have and experiences to and from others so we got the solutions for the problems we had’ (2).

This finding is similar to a case study conducted by Cliff (2006), which found that a learning strategy in which students actively confronted their faulty notions about respiratory physiology was useful in helping the students to overcome their misconceptions of the learnt knowledge. A positive attitude as a result of learning collaboratively was also found by Vittrup and Davy (2010), who conducted a case study to investigate the effect of a structured group problem-based learning activity on graduate nurse’s skills of inquiry, problem solving and clinical reasoning.

Graduate nurses were divided into groups of six to eight. The interventions were arranged approximately every six weeks throughout the programme, allocating nine sessions (nine hours) to each group. The intervention consisted of one introduction session and six sessions of a case study. The evaluation of the case study found that the incorporation of group problem-based learning promoted the achievement of the stated educational outcomes, with graduate nurses displaying improvement in skills of inquiry, problem solving and clinical reasoning. An unexpected finding from this
activity was the enhancement of clinical-practice behaviours such as communication and interactive skills.

Bowe (2009) examined the feasibility of case-method teaching (CMT) in pre-clinical curricula to integrate basic science concepts in the management of clinical problems. CMT sessions were conducted with students during the first year and second year of a hybrid curriculum at two medical schools in the United States of America. The results indicated that first-year and second-year medical classes of 40 to 95 students prepared for, and actively engaged in, single-session case discussions, and were able to apply productively basic science principles in clinical problem solving. Bowe concluded that CMT represents a feasible pedagogical format for promoting cognitive skills and integrating basic science principles into the pre-clinical curriculum. The findings in Bowe of enhanced clinical-reasoning skills and a positive attitude were similar to the findings of the present study and a study by Cliff (2006) that emphasises the potentially important role of small peer-group discussion in promoting construction of knowledge that supports clinical-reasoning development.

Considering all the results of this study, it is argued that the interplay between authentic contextualisation of learning, the use of a ‘think-aloud’ approach to model expert clinical reasoning, and the promotion of peer collaboration through small peer-group discussions conducted in an informal environment facilitated more effective learning outcomes for students in the intervention group (compared to the students in the control group). The contextualisation of learning provided by the educational intervention gave this group a clear and relevant learning context and activities that fostered a meaningful learning experience for students. This was scaffolded by the deliberate use of the think-aloud approach by the teacher and
supported by the small-group discussion, which promoted students’ active participation in the learning activities.

7.4 Summary

This study found that the educational intervention implemented in this study demonstrated some positive effects on students’ development of clinical-reasoning skills. The key findings highlight important issues in understanding educational strategies that effectively facilitate development of clinical-reasoning skills by undergraduate student nurses in Indonesia. These findings highlight the benefit of a contextualised learning experience, collaborative construction of knowledge and the role of thinking aloud in achieving positive outcomes for students’ clinical-reasoning skills; these are the key of the positive outcomes of this study. In particular, the educational intervention was identified as able to enhance accuracy in clinical reasoning in the intervention-group students and provide a more enjoyable learning experience for the students.

Having a clear educational model will enable teachers to reflect critically on the construction of learning experiences that facilitate students’ development of habits of inquiry and complex thinking skills (Benner, 2004; Benner et al., 2008; Standing, 2010). This will better enable students to develop the clinical-reasoning skills that are needed for making sound clinical judgements in the practice context.
Chapter 8: Conclusion

This final chapter outlines the strengths and limitations of the study. It also discusses the implications arising from the findings of this study and proposes recommendations for future research.

8.1 Strengths and Limitations

8.1.1 Strengths of study.

There are a number of strengths in the present study. First, to the knowledge of the author, this thesis provides a distinctive contribution to the existing knowledge on nursing education. It is the first study conducted in Indonesia to examine the effect of an educational strategy on student nurses’ clinical-reasoning skills. To enhance the validity of the educational-intervention package, it was reviewed by five experts from several Indonesian regions (eastern and western regions of Indonesia) to determine its relevance, clarity and feasibility. In addition, the educational-intervention package was reviewed by five undergraduate nursing students to assess its readability and clarity. Importantly, using a quasi-experimental design, the educational-intervention package was implemented and tested. The results provided useful data that raise important questions for further research.

Second, this study makes a significant contribution to the literature through the utilisation of CALM in the context of the development of student nurses’ clinical-reasoning skills. This study found that CALM provides a relevant and useful theoretical and practical framework for facilitating the development of clinical-reasoning skills in the nursing context. Most importantly, this study contributes to the body of literature through its capacity to connect the key concepts of CALM to the most effective practical concepts of learning approaches that facilitate student
nurses’ clinical-reasoning skills (i.e. case-based learning, small peer-group discussion and the think-aloud approach).

Third, the participants were randomly allocated to the intervention or control groups. As such, it was ensured that the differences found between the intervention and control groups in this study were due to the implemented intervention and not to bias or self-selection. In fact, examination of the distribution of demographic characteristics demonstrated homogeneity.

In addition, this study employed quantitative and qualitative data collected from the intervention and control groups. Having these aspects provided the study with richer data and meaningful outcomes.

8.1.2 Limitations of study.

There were several limitations associated with the instruments and design of the study.

8.1.2.1 Instruments.

The impact-evaluation instruments employed in this study included the clinical vignette, which contained the five clinical-reasoning questions and the students’ self-appraisal of their self-confidence in clinical reasoning. As no suitable, validated instruments were found by the author, these tools were developed specifically for the purpose of this study. Their psychometric properties are untested and, hence, their reliability and validity (other than content validity) is unknown. Despite the construction of a response guide to code students’ responses to the clinical-vignette questions. It is also possible that an experimenter effect in scoring their answers occurred.

Further, the self-confidence survey instrument used a five-point Likert-scale rating system, which might have had a ceiling effect on students’ responses. A study
by Kleitman and Stankov (2007) found that participants are more likely to overconfidently rate their accuracy of knowledge and judgement. Hence, the capacity for students to report enhanced self-confidence at Time 2 would have been constrained if their confidence ratings were at the highest rating point (i.e. 5 or ‘extremely confident’) at Time 1 (Ramsbotham, 2009). Notably, despite the clinical vignette having content validity (established through a process of review by academic and student group), it is acknowledged that the reliability and validity of this instrument has not been fully developed. Therefore, the responsiveness and sensitivity of this impact-evaluation instrument might constitute a source of systemic errors in this study.

8.1.2.2 Study timeframe.

Another limitation was related to the study timeframe. The timeframe of the study was estimated based on the availability of the students’, the researcher’s available time, and the budget of a doctorate student project. Therefore, the entire Phase 2 of the study was undertaken in eight weeks, six of which were employed to implement the educational intervention and two of which were used to conduct the focus-group discussions. Considering the amount of time that is sufficient for developing students’ cognitive skills and attitudes, a more appropriate time for a maximum intervention would be more than 10 weeks (Shen, Edwards, Courtney, McDowell & Wu, 2012; Tiwari et al., 2006; Yuan, Williams & Fan, 2008).

8.1.2.3 Generalisability.

Several factors might have affected the generalisability of results. Given that a convenience sample was used, a selection bias might have occurred. Participants in this study were drawn from one university only; therefore, the results do not necessarily reflect the development of the clinical-reasoning skills of student nurses.
in the other faculties of nursing in the North Sulawesi Province. Further, the sample size of this study was based on the number of students available at the time the study was conducted. Therefore, the characteristics of the sample may not represent the characteristics of the student population in the North Sulawesi Province. In addition, the use of non-parametric tests for the analysis of sub-variable data limits the generalisability of the results (Pallant, 2013).

8.2 Implications

The educational intervention implemented in this study offered an innovative approach to the improvement of nursing students’ development of clinical-reasoning skills. The intervention combined the pedagogical concepts of cognitive apprenticeship with Facione’s IDEAS model in an interactive, guided learning experience for students. Importantly, in the Indonesian context, the intervention design represented a significant shift away from traditional learning and teaching approaches to incorporate a contemporary perspective for facilitating quality learning outcomes. The broad aim of the intervention was to assist students to develop ‘habits of mind’ that would promote consistent and systematic application of clinical-reasoning skills to clinical problems. From the overall results of the study, it is argued that the model that was developed to underpin the educational intervention had a number of positive effects in relation to facilitating students’ clinical-reasoning skills. It is also argued that the combination of case-based learning, small peer-group discussion and the think-aloud approach provides a systematic and inclusive practical teaching model to facilitate high-quality learning experiences for students. However, there are several challenges to sustaining these outcomes in the long term.
8.2.1 Teachers’ capability and availability to implement approach.

Teachers’ capability and availability are two critical factors related to the feasibility of the teaching model in the long term. In fact, teacher insufficiency in theoretical and practical knowledge is not only a national issue in Indonesia but also an international issue. As stated in Chapter 1, the majority of nursing teachers in Indonesia are newly graduated from nursing schools, which contributes to a lack of a conceptual and practical approach to nursing education (Gillund et al., 2012; Henessy et al., 2006b). The issue of educators’ capability to facilitate the development of students’ clinical-reasoning skills is supported by Tanner (2010), who argues that teaching strategies used by teachers do not support the development of habits of inquiry that equip graduates to make required decisions. The World Health Organization (2013) also reported that there is a need for training for nursing educators.

In-depth knowledge and skills about factors facilitating students learning clinical reasoning is urgently needed. Further development of the awareness of the role that factors such as authentic learning, social collaboration and expert guidance can play in promoting high-quality learning outcomes is essential.

Another issue involved with implementing the educational approach developed by this study in Indonesia is the increased need for nurse educators. Facilitating students to learn collaboratively and providing adequate scaffolding during the learning activities were two important approaches in the educational intervention that required small-group activity. To implement such approaches on a broader scale, more educators are needed. Therefore, it is clear that strategies to enhance the quality and quantity of nurse educators and educational strategies must be undertaken.
8.2.2 Need for new instructional-design framework.

Inconsistency in the conceptual and practical framework of traditional-instruction approaches with the nature of the innovative learning facilitation proposed in this study is a key issue. Herrington and Herrington (2006) argue that the authenticity of courses is frequently ignored by separating the learning content from the real-life practice of the knowledge. For example, students are taught principles and procedures, and they try to remember all the concepts and imitate the procedures in every given context. This manner of learning is characterised by a division of subject matters into weekly sections in one semester (Herrington & Herrington, 2006; Seel, 2001; Woolley & Jarvis, 2007). In contrast, employing the innovative facilitation approach designed by this study will require students to solve complex clinical problems collaboratively and the teacher to provide adequate learning guidance. This teaching and learning approach allows connection between the learnt content and the real life practice of the knowledge. In addition, this study found that the current instructional-design framework of the current nursing curriculum of Indonesia does not support the application of the innovative learning strategy used in this study. Therefore, it is believed that revisiting and reforming the current nursing curriculum of Indonesia to adapt the new instructional framework will support the implementation of this innovative approach to learning and teaching.

8.3 Recommendations

In light of the findings of this study, several recommendations for future research are proposed:

1. revisit the national nursing curriculum of Indonesia to enable evaluation of its appropriateness in terms of the development of skills, such as clinical reasoning, that are needed for contemporary practice
2. further longitudinal research to investigate students’ application of clinical reasoning in the clinical setting and the transfer of gained clinical-reasoning skills to other learning contexts

3. further research to investigate educators’ understanding and application of the learning model proposed in this study and any practical challenges that might arise from this model

4. further research to investigate the effectiveness of the educational intervention with a larger sample size across nursing faculties in Indonesia.

8.4 Conclusion

Clinical-reasoning skills are complex, and present significant learning and teaching challenges, especially within the undergraduate context. Studies have indicated that sound clinical reasoning requires well-grounded scientific and technological research-based knowledge about general cases in particular contexts (Anderson, 2006; Benner et al., 2008; Benner et al., 2010; Standing, 2010; Tanner, 2006). Therefore, there is a need for reforms in nursing pre-registration programmes through better design of curricula that can effectively connect knowledge to practice (Benner et al., 2008; Benner et al., 2010).

The results of this study indicate that the educational intervention developed for this study had positive effects on nursing students’ development of clinical-reasoning skills. Three key factors that appear to be important in achieving this outcome were situating knowledge through case-based learning, making thinking visible through thinking aloud with students and facilitating collaboration through small peer-group discussions. These factors worked interdependently in achieving the positive outcomes of this study. This study makes an important contribution to
nursing education by providing evidence of how best to facilitate students’ development of clinical reasoning skills.
References


Benner, P. (2004). Using the Dreyfus Model of Skills Acquisition to describe and interpret skills acquisition and clinical judgement in nursing practice and


Catholic University of De La Salle Manado. (2012). Faculty of Nursing Report

Manado: CUDLSM.


Yuan, H. B., Williams, B. A., & Fang, J. B. (2012). The contribution of high-fidelity simulation to nursing students' confidence and competence: a systematic


Appendices

Appendix A: The Educational-intervention Package

The Educational Intervention Overview

The Teacher’s Guide

The Students’ Guide
The Educational Intervention

Overview

Semester 2, 2013
1. Overview

The educational intervention for this study represents a shift away from a more traditional model of learning and teaching to one that provides a contextualised, guided learning experience for students. Clinical reasoning is a complex cognitive activity, and the development and application of clinical reasoning is not an intuitive process for many people. Hence, consistent with the work of Facione and Facione (2008) and Lai (2011), the Educational Intervention is designed to provide explicit, well-designed educational support to assist learners with the development of these capabilities and their application in clinical practice situations.

2. Design of the Intervention

The overall design of this educational intervention is underpinned by principles of constructivist theory. Constructivism, as a paradigm, posits that learning is an active, constructive process in which people construct their own understanding and knowledge of the world, through experiencing things and reflecting on those experiences. The work of Dewey, Montessori, Piaget, Bruner, and Vygotsky among others provides historical precedents for constructivist learning theory. The key element in constructivism is that the learner is an active contributor to the learning process, and that teaching methods should focus on what the student can bring to the learning situation as much as on what is received from the environment. To be active creators of their knowledge however, they must be able to ask questions, explore and assess what they know. In the classroom, the constructivist view of learning means encouraging students to use active techniques such as experiments and real-world problem solving using authentic data if possible, and to create knowledge and reflect on their understanding. Hence, the role of the teacher is to be a facilitator of learning, and to provide opportunities for learners to acquire knowledge and construct a meaning through discussion, sharing of ideas with other learners, reflection etc. Based on these perspectives, the Educational Intervention will engage students in collaborative learning activities that are facilitated by their teachers or instructors.
2.1. Learning Objectives

Learning objectives can be described as more specific statements of desirable outcomes of a learning instruction (Gagne et al., 2005). Thus, at the end of the learning facilitation, students are expected to show specific achievement that can be observed by teacher or instructor (McInerney & McInerney, 2010). The overall aim of the Educational Intervention is to facilitate the application of clinical reasoning skills by undergraduate nursing students in clinical situations where judgment is required.

The specific objectives of the Educational Intervention learning experience are to enable students to:

1. Recognize key clinic characteristics that suggest high-risk pregnancy (Abortion, Ectopic Pregnancy, Placenta Previa, Hyperemesis Gravidarum, and Gestational Hypertension).
2. Determine whether high-risk pregnancy problems exist.
3. Prioritize identified problems and their possible interventions.
4. Chose the most relevant and feasible intervention/s and justify decisions made.
5. Reflect on the effectiveness of decision made and the thinking process which was undertaken.
2.2. The Educational Intervention Model

To achieve the overall aim and learning objectives, the model for the Educational Intervention focuses on four key teaching/learning strategies—Critical questioning, Expert modelling, Peer discussion and Reflective thinking—which are underpinned by Facione’s work on critical thinking (2011) and theoretical perspectives of cognitive apprenticeship (Collins et al., 1991). The four teaching/learning strategies are complemented by four learning enhancement processes which provide a practical framework for the structure and delivery of the learning activities. The learning enhancement processes are contextualisation, sequencing, scaffolding and articulation, and they are designed to facilitate the four Educational Intervention strategies in making the learning become visible and doable to the teacher and the students. The model is shown diagrammatically in Figure 1 and the key elements are briefly described below.

Figure 1: Clinical Reasoning: A contextualised, guided learning experience model
2.2.1. 'Key teaching/learning' strategies

The key teaching/learning strategies, as described above, are the core instruction strategies used to achieve the learning objectives. The first strategy is **critical questioning**. These questions facilitate students to identify key clinical characteristics that suggest the existence of the high-risk pregnancy; identify the need to collect further data to determine whether high-risk pregnancy problems exist; prioritize identified problems, choose the most relevant and feasible intervention/s and reason the decisions made and reflect on the effectiveness of decisions made and the thinking process which was undertaken. The second strategy used in this intervention is **expert modelling**. Expert modelling will be acted in the educational intervention using the ‘Think-aloud’ approach. Thinking aloud is a process which involves the teacher verbalises his/her thinking including making assumption, the use of relevant evidence and the logic of the thinking when solving problems (Lundgrén-Laine & Salanterä, 2010). By doing this, the students will be able to access expert thinking in solving problems performed by the teacher. **Peer discussion** is one of the key strategies which aim to facilitate collaboration among students in the process of learning. Using this strategy, the students can get multiple perspectives to solve problems. Indeed, peer discussion can also support students’ knowledge construction and reflection (J. Herrington et al., 2010). The last but not the least of the key teaching/learning strategy is **reflective thinking**. This strategy aims to assist student to reflect or think back on their thinking in the judgment processes.

The visualisation of the teaching/learning strategies is presented in the Table 1.
<table>
<thead>
<tr>
<th>Key elements of teaching/learning strategies</th>
<th>Definitions</th>
<th>Characteristics</th>
</tr>
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</table>
| Critical Questioning                        | Purposeful questions that focus on development of clinical reasoning skills used by the students in the clinical judgment process. | • Five clinical reasoning questions will be used:  
Q1: What are the relevant facts about your patient?  
Q2: What is/are the key problems to be addressed, and why?  
Q3: What intervention/s might be used?  
Q4: Which intervention/s is/are most appropriate, and why?  
Q5: Has all the important information been taken into account? How confident am I about this decision? Thinking back, is there anything that should have been done differently? What have I learned, and how will I use this learning in the future? |
| Expert Modelling                            | Demonstration of clinical reasoning skills utilization in the clinical judgment processes performed by the teacher using ‘thinking aloud’ approach (McInerney & McInerney, 2010) | • A clear demonstration of expert thinking in relation to the process of clinical decision making/judgement. |
| Peer Discussion                             | A learning facilitation in which provides group problem solving and social support (J. Herrington et al., 2010). | • Discussion on the clinical vignettes in the group of 5-6 students.  
• Coaching by the teacher if needed by the students.  
• Group presentation of argument to allows sharing of knowledge and experiences among students and defence of learning. |
| Reflective Thinking                         | A deliberate monitoring and correction of the cognitive strategies used by the students in developing their clinical reasoning skills within the clinical judgment process (P. Facione, 2011) | • The use of reflective thinking questions:  
  _ Has all the important information been taken into account?  
  _ How confident am I about this decision?  
  _ Thinking back, is there anything that should have been done differently?  
  _ What have I learned, and how will I use this learning in the future? |
In order to enhance the function of the key teaching/learning strategies, this learning instruction is complemented by another four strategies which provide a practical support for the structure and delivery of the learning activities. The first strategy is to **contextualize** the learning experience. This strategy will frame the learning activities based on the intended learning objectives. As the result, both teachers and students are able to plan and implement the teaching/learning activities efficient and effectively. The second enhancement approach is to **sequence** the learning experience. Sequencing teaching/learning activities will enable students to learn from utilizing clinical reasoning in the normal/physiological context to the clinical context as well as from the simple clinical problems to the more complex problems. By sequencing the learning, the process of learning can be dependent on adaptability of the student’s need (Durabi, 2005). Importantly, using this strategy, the teacher can anticipate, identify learning difficulties and then take supporting strategies in each sequence of learning. The third strategy is **scaffolding** of the learning experience. This strategy aims to assist students achieve their learning objectives and later is removed when the students are no longer need the support. Thus, the teacher plays more supportive roles than didactic roles (J. Herrington et al., 2010). Finally, the key teaching/learning strategies are accompanied by **articulation** strategy. Using this enhancement strategy, the students are given opportunities to verbalize and write about their thinking process or growing understanding (J. Herrington et al., 2010). In this strategy, students are prompted by some questions that allow them discuss contradictions, inconsistencies, strong/weak points in students’ thinking or indeed challenge each other’s reasoning. The manifestation of the enhancement strategies in the educational intervention can be revealed in the Table 2.
Table 2. ‘Learning enhancement’ strategies

<table>
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<tr>
<th>Enhancement strategies</th>
<th>Manifestation in the educational intervention</th>
</tr>
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</table>
| **Contextualization of the learning experience** | • Clinical Reasoning as part of nursing care/a nursing competency  
• Clinical reasoning within the context of high-risk pregnancy.  
• The use of the five clinical reasoning questions as the guiding questions in the all clinical vignettes.  
• Checking students’ understanding of relevant information learnt in the other subjects that essential for addressing the clinical vignette questions. |
| **Sequencing** | • Assisting students to work through three clinical vignettes that are structured with incremental levels of complexity. The characteristics of the clinical vignettes are follows.  
- **Vignette level 1**: is categorised as a simple clinical vignette which contains sufficient, relevant information to determine the key problem and the appropriate intervention.  
- **Vignette level 2**: is a more complex vignette which contains relevant, but insufficient information which suggests the existence of a problem. Additional information to determine the key problem and appropriate intervention will be available to students.  
- **Vignette level 3**: is a complex clinical vignette which contains relevant, but insufficient, and irrelevant information which suggests the existence of more than 1 problem. Additional information to determine the key problems and appropriate interventions will be available to students. |
| **Scaffolding of the learning experience** | • Teacher is in the environment and actively listens to the peer discussion.  
• Giving students hints to think about what to do by:  
  - Prompt students to think about factors that are missing or have not been fully considered by the students, e.g. medical history etc.  
  - Gives students example how to think and do e.g. “if I were you, I would do this and this”. |
• Performing some alternative ways of doing things e.g. “alternatively, you could possibly do “a” or “b”, let us think about its implication and consequences”, before choosing the most relevant and feasible intervention/s.

**Articulating**

Students will be prompted/facilitated to express their ideas in the open through:

- discussing contradictions, inconsistencies, strong/weak points in students’ thinking
- questioning their assumptions
- explaining the reason/s behind their thinking
- challenging each other’s reasoning
- presenting their arguments to the group as a whole
Overview

This teacher guide is a set of strategies for facilitating students’ application of clinical Reasoning skills within the context of high risk pregnancy. Using the clinical reasoning strategies in this package will enable you to assist students to:

1. Recognize key clinical characteristics that suggest high-risk pregnancy (Abortion, Ectopic Pregnancy, Placenta Previa, Hyperemesis gravidarum, Gestational Hypertension).
2. Collect relevant information to determine whether high-risk pregnancy problems exist.
3. Prioritize identified problems and their possible interventions.
4. Choose the most relevant and feasible intervention/s and justify the decisions made.
5. Reflect on the effectiveness of decisions made and the thinking process which was undertaken.

What are clinical reasoning skills?

Clinical reasoning can be described as a process of thinking that is underpinned by thoughtful reasoning and reflective-based decision making. In nursing, clinical reasoning can be explained as “the process we use to make a judgment about what to believe and what to do about the symptoms our patient is presenting for diagnosis and treatment” (N. Facione & Facione, 2008, p.2).

Facione and Facione (2008) describe six skills that underpin clinical reasoning: interpretation, analysis, evaluation, and inference, explanation and self-regulation. Nurses who have these skills will be better able to identify the signs and symptoms of patient health from physical, psychological and social cultural contexts, apply acquired nursing knowledge and skills, anticipate the potential effect of the chosen interventions, monitor the outcomes of the delivered care and make necessary corrections (N. Facione & Facione, 2008). Thus, skills such as these are regarded as essential for making complex decisions that allow nurses to recognize a patient’s health problems, select a course of action and monitor outcomes effectively.
As mentioned above, the use of clinical reasoning skills will enable students to be systematic in their thinking about patient care. Thus, developing student nurses’ clinical reasoning skills is likely to positively contribute to the quality of clinical judgment in clinical practice (Banning, 2007; Chabeli, 2006; Kuiper et al., 2009; Redding, 2001; C. A. Tanner, 2009; Thompson & Stapley, 2011) and this will subsequently increase the quality of nursing care.

Clinical judgment is “an interpretation or conclusion about a patient’s needs, concerns, health problems, and/or decision to take action (or not), use or modify standard approaches or improvise new ones as deemed appropriate by the patient’s response” (Davis & Kimble, 2011). The application of clinical reasoning skills within clinical judgment by nurses can be effectively facilitated by habitually and systematically asking five key questions:

| 1. What are the important facts about my patient? Is any additional data needed – if so, what would this be? | This question (and the follow-up question) assists students to interpret the available information, identify data which suggests the existence of a problem/s, identify gaps in the data and any additional pieces of information that are needed. |
| 2. What is/are the key problems to be addressed, and why? | This question assists students to identify key health problem/s and set priorities. The key problem/s to be addressed, and their reasons, are analyzed from the patient’s signs and symptoms, data from family members and nursing observation records and nursing knowledge that are relevant to the patient’s situation. |
| 3. What possible intervention/s might be appropriate in this situation? | This question assists students to identify possible options and anticipate any likely consequences. Utilizing clinical reasoning skills, e.g. inference, assists students to identify possible actions, reasons and evidence for their proposed actions. |
4. Which intervention/s would you choose, and why?

This question assists students to evaluate their proposed actions, choose the most appropriate intervention/s to use in a particular situation by weighing the impacts and consequences of each action, and explain the reasons for their choice/s.

5. How good was my thinking in this situation?

This question assists students to reflect on their clinical reasoning process, identify any weaknesses, correct errors and so learn from the experience to make better clinical judgments in the future.

How do I facilitate students' clinical reasoning within the context of clinical judgment?

Using the five questions explained above will enable you to help students apply their clinical reasoning skills. As teachers, however, the teaching/learning strategies that you use are also important as they play a central role in scaffolding the learning process. Therefore, several learning facilitation strategies are provided below for you to assist students’ development of clinical reasoning within the high-risk pregnancy context.

1. Making clear the learning objectives in relation to high risk pregnancy (particularly abortion, ectopic pregnancy, placenta previa, hyperemesis gravidarum, gestational hypertension) so that students know what they will learn, why they need to learn these skills and how they can involve in the learning process.

2. Always using the following five questions to provoke clinical reasoning skills application:
   
   **Q1:** What are the important facts about my patient? Is any additional information needed – if so, what would this be?
   
   **Q2:** What is/are the key problems to be addressed, and why?
   
   **Q3:** What possible intervention/s might be appropriate in this situation?
   
   **Q4:** Which intervention/s would you choose, and why?
Q5: How good was my thinking in this situation?

3. Demonstrating clinical reasoning skills utilization in the clinical judgment processes using a ‘think aloud’ approach (See the Glossary for more information).

4. Facilitating peer discussion in the group of 5-6 students, and group presentation of argument on each of the clinical vignettes. During the discussion on the clinical vignettes, you are asked to coach students in their thinking (See the Glossary for more information). During the discussion, students are also facilitated to express their ideas in the open through discussing contradictions, inconsistencies, strong/weak points in their thinking, questioning their assumptions, explaining the reason/s behind their thinking, challenging each other’s reasoning, and presenting their arguments to the group as a whole.

5. Providing relevant time allocation within the learning session for students to observe and practice the knowledge and skills, and suggesting useful learning materials or resources, e.g. web address, text books.

6. Allowing 10-15 minutes towards the end of the learning session for debriefing to give general feedback to the students and emphasize main ideas about applying clinical reasoning to clinical practice.

7. Using the fifth question to facilitate students’ self-monitoring and self-correction of their thinking in order to impact their learning for the future.
1. **Thinking aloud** – The teacher verbalizes his/her thinking including making assumption, the use of relevant evidence and the logic of the thinking when solving problems.

2. **Coach** – The teachers’ observation and support of students while they are solving the problems where they would use hints such as:
   - Asking the students if they are aware of any important factors related to the patient’s situation that are missing or have not been fully considered by the students e.g. medical history, health problems history, medical records, family-health related issues, and
   - Giving students examples of how to think and do, e.g. “if I were you, I will do this and this”.
   - Giving students alternative ways of doing things e.g. “alternatively, you could possibly do “a” or “b”, let us think about its implication and consequences”, before choosing the most relevant and feasible intervention/s.
I. Description of the scenario

A client in her first semester of pregnancy has arrived at a health care facility complaining of vaginal bleeding and mild abdominal cramps in the last three days. She reports 3 months of amenorrhea. You assess the client and find that:

- She is a G2 P0 A1
- The fundal height is 16 cm which is relevant to a 16 weeks gestation
- She does not smoke or drink alcohol
- Her uterus is soft, non-tender and enlarged appropriate to gestational age.

II. The reasoning process

Question 1: What is the relevant data about this patient? What do you think the possible problems might be? Is any additional information needed – if so, what would this be?

Prompts if needed:

- Remember your lectures on nursing assessment, and subjective and objective data, and think about whether you have identified all the available data here?

1. Patient data to be identified by students

   a. Subjective data:
      - vaginal bleeding since the last three days.
      - mild abdominal cramps,
      - she reports 3 months amenorrhea,
      - she does not smoke or drink alcohol
b. Objective data
- She is a G2 P0 A1
- The fundal height is 16 cm which is relevant to a 16 weeks gestation
- Her uterus is soft, non-tender and
- Enlarged appropriate to gestational age.
- The cervix is closed
- Bloody loss vaginally with moderate amount on pads (less than 6-inch stain).

2. Grouping of data into problem clusters
Prompt if needed:
- Think about the kinds of high risk health problems that can occur early in pregnancy?
- Remember your lectures on nursing assessment, and looking for patterns in the data, e.g. pieces of data that ‘fit together’ in terms of a possible health problem.

Possible health problem

1) Bleeding related to a threatened abortion (Ackley & Ladwig, 2011)

a. Subjective data:
- Vaginal bleeding since the last three days.
- mild abdominal cramps,
- she reports 3 months amenorrhea,
- she does not smoke or drink alcohol

b. Objective data
- She is a G2 P0 A1
- The fundal height is 16 cm which is relevant to a 16 weeks gestation
- Her uterus is soft, non-tender and
- Enlarged appropriate to gestational age.
- The cervix is closed.
- Bloody loss vaginally with moderate amount on pads (less than 6-inch stain).

3. Additional information

Prompts if needed:

- Do you think any other information is needed to confirm your decision here? Why do you think so?

Notes:

The vignette contains **sufficient and relevant** information to determine the existence of key problem and the appropriate intervention. **No** further information needed.

- Students explain their reasoning for this.

**Question 2: What is/are the key problems to be addressed, and why do you think this?**

- Key problem for this vignette is:
  - Bleeding related to a threatened abortion

- Students explain their reasoning for this.

Prompts if needed:

- Have you thought what the most potential risks of vaginal bleeding in the early pregnancy?
- Have you thought about the state of her cervix? Why might this be important?

**Question 3: What intervention/s might be appropriate in this situation?**

- Possible intervention/s that might be appropriate in this situation are:
- Measures BP with woman seated and her arm at heart level.
- Bedrest
- Monitor if the vaginal bleeding and abdominal cramp are prolonged.
- Sending her home
- Giving her analgesia.
- Monitor laboratory tests that evaluate bleeding including hemoglobin and hematocrit.
- Review client history for increased bleeding risk
- Watch for tachycardia and recognize that it may indicate hypovolemia.

• Students explain their reasoning for their suggestions

**Prompts if needed:**

- What actions could be taken independently in this situation?
- What are the reasons for each suggestion?
- What are the advantages/disadvantages of each suggestion? Are there any contraindications, side effects related to the suggested actions?
- What evidence is there to support the suggestions?
- How feasible is each of these actions in this situation?

**Question 4: Which intervention/s would you choose, and what are the reasons for your choice?**

• The most relevant and feasible interventions must be chosen from the possible intervention as listed before.

• Students explain their reasoning for this.

**Prompts if needed:**

- What are your reasons for choosing this action/s?
- How will you monitor the outcome/s of your decision?
Question 5: Reflection on Learning

Prompts:

- Has all the important information been taken into account?
- How confident am I about this decision?
- Thinking back, is there anything that should have been done differently?
- What have I learned, and how will I use this learning in the future?

The questions for students’ reflective thinking:

- How well did I use the information that was available in this scenario? Did I miss anything important?

- How thorough was my decision making process for identifying the key problem/s and most appropriate intervention/s? What are the reasons for my response?

- Would I do anything differently next time? Why, or why not?

- What have I learned from this activity, and how will I use this learning to further improve my thinking?
I. Description of the scenario

A 40-year old client in her third semester of pregnancy arrives at a health care facility complaining of ‘swelling’ in her both ankles. She reported headache and rigidness of her back neck. She also reported unpainful uterine contractions 2-3 times per day. A review of her prenatal record two weeks ago reveals that she is a G4 P3 A0, at 30 weeks gestation, and has history of caesarean delivery of the second child caused by placenta previa. You assess the client and find that:

- She is now in 32\textsuperscript{th} week gestational.
- BP: 145/90 mm Hg.
- Proteinuria: 2+
- Pitting edema on both her ankles: 1+
- Uterus height is 36 cm which indicates a 36 week gestational.
- 5 kg weight gain since the last visit two weeks ago.

II. The reasoning process

Question 1: What is the relevant data about this patient? What do you think the possible problems might be? Is any additional information needed – if so, what would this be?

Prompts if needed:

- Remember your lecturer on nursing assessment and subjective and objective data and think about whether you have identified all the available data here?

1. Patient data to be identified by students

   a. Subjective data:

   - Reported headache and rigidness of her back neck.
   - Reported unpainful uterine contractions 2-3 times per day.
   - Feet feel swollen
b. Objective data

- G4 P3 A0, at 32\textsuperscript{th} week gestation.
- BP: 145/90 mm Hg.
- Pitting edema on both her ankles: 1+
- Uterus height is 36 cm which indicates a 36 week gestational.
- 5 kg weight gain since the last visit 2 weeks ago.
- History of caesarean delivery of the second child caused by placenta previa.

2. Grouping of data into problem clusters

Prompts if needed:

- Think about the kinds of high risk health problems that can occur in the second or third trimester of pregnancy?
- Remember your lectures on nursing assessment, and looking for patterns in the data, eg. pieces of data that ‘fit together’ in terms of a possible health problem.

Possible health problem

1. Risk for injury related to Preeclampsia (Ackley & Ladwig, 2011)

a. Subjective data:

- Reported headache and rigidness of her back neck.
- Reported 2-3 times uterine contractions per day.
- Does she know if she had Hypertension before the pregnancy?

b. Objective data

- G4 P3 A0, at 32\textsuperscript{th} week gestation.
- BP: 145/90 mm Hg.
- Pitting edema on both her ankles: 1+
- Uterus height is 36 cm which indicates a 36 week gestational.
- 5 kg weight gain since the last visit last month.
- Has she been diagnosed as having hypertension before the 20th week of the pregnancy?
3. Additional information

Prompts if needed:

  o Do you think any other information is needed to confirm your decision here? Why do you think so?

Notes:
Students will need additional information because the vignette contains relevant, but insufficient information which suggests the existence of a problem. Yes, further information need to be provided for the students.

Additional information to determine the key problem and appropriate intervention available to students are:

  _ She has been experienced headache and rigidness of her back neck since approximately 2 weeks ago.
  _ She has been diagnosed with mild hypertension in 24\textsuperscript{th} week of pregnancy
  _ No anti-hypertension medication has been prescribed.
  _ The laboratory value for protein urine of this patient is 2+.

  • Students explain their reasoning for this

4. Irrelevant information

Prompts if needed:

  o Do you think any other information is irrelevant to the key problems? Why do you think so?

Note:
The vignette contains irrelevant information that is:

History of caesarean delivery caused by placenta previa.

  • Students explain their reasoning for this.
Question 2: What is/are the key problems to be addressed, and why do you think this?

- Key problem identified from the relevant information is:
  - Risk for injury related to Pre-eclampsia

- Students explain their reasoning for this.

Prompts if needed:
  - Have you thought about what the most relevant potential cause of blood pressure elevation is during pregnancy?
  - Have you thought about the potential risk of blood pressure elevation is during pregnancy?

Question 3: What intervention/s might be appropriate in this situation?

- Possible intervention/s might be appropriate in this situation are:
  - Measures BP with woman seated and her arm at heart level.
  - Administer antihypertensive as per orders (generally for BP > 160/110 mm Hg).
  - Administer magnesium sulfate as per orders.
  - Assess for CNS changes including headache, visual changes, deep tendon reflexes (DTRs), and clonus
  - Auscultate lung sounds for clarity and monitor the respiratory rate.
  - Assess for sign and symptoms of pulmonary edema such as: shortness of breath, chest tightness or discomfort, cough, oxygen saturation less than 95%, increase respiratory and heart rate.
  - Change in behavior such as apprehension, anxiety, or restlessness.
  - Assess for epigastric pain or right upper quadrant pain indicating liver involvement.
  - Assess weight daily and assess for edema to assess for fluid retention.
- Check urine for proteinuria (may include 24 hours urine collection) and
  specific gravity.
- Evaluate laboratory values including:
  - Elevation in serum creatinin (72 mg/dL).
  - Hematocrit levels (>35).
  - Low platelet count (100,000/mm3).
  - Elevated liver enzyme (AST >41 unit/L, ALT >30 unit/L)
- Perform antenatal fetal testing and fetal heart rate monitoring (NST and
  BPP).
- Check intake of adequate calories and protein.
- Provide a quite environment to decrease CNE stimulation.
- Provide information to the woman and her family.
- Report deterioration in maternal and fetal status to medical staff.

- Students explain their reasoning for this.

**Prompts if needed:**

- What actions could be taken independently in this situation?
- What are the reasons for each suggestion?
- What are the advantages/disadvantages of each suggestion? Are there any
  contraindications, side effects related to the suggested actions?
- What evidence is there to support the suggestions?
- How feasible is each of these actions in this situation?

**Question 4: Which intervention/s would you choose, and what are the reasons
  for your choice?**

**Prompts if needed:**

- What are your reasons for choosing this action/s?
- How will you monitor the outcome/s of your decision?

The most relevant and feasible interventions must be chosen from the
possible intervention as listed before.
• Students explain their reasoning for this.

**Question 5: Reflection on Learning**

**Prompts:**

- Has all the important information been taken into account?
- How confident am I about this decision?
- Thinking back, is there anything that should have been done differently?
- What have I learned, and how will I use this learning in the future?

**The questions for students’ reflective thinking:**

- How well did I use the information that was available in this scenario? Did I miss anything important?

- How thorough was my decision making process for identifying the key problem/s and most appropriate intervention/s? What are the reasons for my response?

- Would I do anything differently next time? Why, or why not?

- What have I learned from this activity, and how will I use this learning to further improve my thinking?
I. Description of the scenario.

An Asian pregnant client, 27 years old, arrives at a health care facility complaining of a prolonged nausea and vomiting that is frequent and has become more severe in the last two weeks, particularly in the morning. She reported nausea and vomiting when smelling food that contains fried onion or sea-foods. She complained of decreased bowel elimination frequency that is from every day to every 2-3 days per week and feeling discomfort when passing tools since one month ago. This is in her second prenatal visit. A review of her prenatal record reveals that she is a G1 P0 A0, at 20 weeks gestation. You assess the client and find that:

- BP is 95/70 mm Hg
- She reported 2 kg weight loss since last week.
- 3 kg weight loss recorded since the last visit (4 weeks ago).
- She has been married for 4 years and expressed willingness to have a

II. The reasoning process

*Question 1: What is the relevant data about this patient? What do you think the possible problems might be? Is any additional information needed – if so, what would this be?*

*Prompts if needed:*

- Remember your lecturer on nursing assessment and subjective and objective data and think about whether you have identified all the available data here?
1. Patient data to be identified by students

   a. **Subjective data:**

      - Frequent nausea and vomiting when smelling food that contains fried onion or sea-foods.
      - Severe nausea and vomiting since the last 2 weeks.
      - Decreased bowel elimination frequency that is from every day to every 2-3 days per week.
      - Feeling discomfort when passing tools.
      - Reported 2 kg weight loss since last week.
      - She thinks that it is important to please her husband.
      - She has been married for 4 years and this is the first pregnancy and has expressed willingness to have a baby boy as this will make her feel more valuable in the eyes of her husband’s family.

   b. **Objective data**

      - G1 P0 A0, at 20 weeks gestation.
      - BP is 95/70 mm Hg
      - 3 kg weight loss recorded since the last visit (4 weeks ago).

2. Grouping of data into problem clusters

   **Prompts if needed:**
   
   - *Think about the kind of high-risk health problems that can occur early in pregnancy?*
   - *Remember your lectures on nursing assessment, and looking for patterns in the data, e.g. pieces of data that ‘fit together’ in terms of a possible health problem.*

   **Possible health problem**

   1. Fluid imbalance related to hyperemesis gravidarum

   a. **Subjective data:**

      - Nausea and vomiting when smelling food that contains fried onion or sea-foods.
- Severe nausea and vomiting since the last 2 weeks.
- Reported 2 kg weight loss since last week.
- She thinks that it is important to please her husband

b. Objective data
- G1 P0 A0, at 20 weeks gestation.
- BP is 95/70 mm Hg
- 3 kg weight loss recorded since the last visit (4 weeks ago).
- How about the hydration state of the patient?

2. Compromised family Coping
   a. Subjective data:
      - She has been married for 4 years and this is the first pregnancy
        and she has expressed willingness to have a baby boy as this
        will make her feel more valuable in the eyes of her husband’s
        family.

   b. Objective data
      - G1 P0 A0, at 20th week gestation.

• Students explain their reasoning for this.

3. Additional information

Prompts if needed:
   o Do you think any other information is needed to confirm your decision here? Why do you think so?

Notes:
Students need additional information as the vignette contains relevant, but insufficient information to determine the key problems.
Additional information to determine the key problems will be available to students which are:
- Sign and symptoms of dehydration including:
  - Dry mucous membranes
  - Poor skin turgor.
  - Malaise.
- She thinks that it is very important to please her husband.

- Students explain their reasoning for this.

4. Irrelevant information
   Prompts if needed:
   ○ Do you think any other information is irrelevant to the key problems? Why do you think so?

   Notes:
   The vignette contains irrelevant information that are:
   - Decreased bowel elimination frequency from every day to every 2-3 days per week since one month ago.
   - Feeling discomfort when passing stools.

- Students explain their reasoning for this.

5. Possible but unrelated health problem
   Prompts if needed:
   ○ Do you think any other information is related to other key problems? Why do you think so?

   Notes:
   The vignette suggests the existence of more than 1 problem. The possible but unrelated health problem is Risk for constipation related to decreased motility of gastrointestinal tract.
- Students explain their reasoning for this.
**Question 2: What is/are the key problems to be addressed, and why do you think this?**

- Key problems identified from the relevant information are:
  - Fluid imbalance related to hyperemesis gravidarum
  - Compromised family coping

- Possible problems identified from the irrelevant information are:
  - Risk for constipation related to decreased motility of gastrointestinal tract.

- Students explain their reasoning for this.

**Prompts if needed:**

- Have you thought what the most potential risks of a severe and prolonged vomiting condition during the pregnancy?

**Question 3: What intervention/s might be appropriate in this situation?**

- Fluid imbalance related to hyperemesis gravidarum
  
  Possible intervention/s might be appropriate in this situation are:
  - Assess factors that contribute to nausea and vomiting.
  - Reduce or eliminate factors that contribute to nausea and vomiting such as eliminating odors.
  - Provide emotional support.
  - Provide comfort measures such as good oral hygiene.
  - Provide IV hydration, electrolytes, and antiemetic as per order.
  - Check weight daily.
  - Monitor I&O and specific gravity of urine to monitor hydration
  - Monitor nausea and vomiting.
  - Monitor laboratory values for fluid and electrolyte imbalances.
  - Ensure that women remain NPO until vomiting is controlled, then slowly advance the diet as tolerated.
- Facilitate nutritional and dietary consultation.
- Determine the women’s food preference and provide them.
- Minimizing fluid intake with meals can decrease nausea and vomiting.

- Compromised family coping.
  Possible intervention/s might be appropriate in this situation are:
  - Provide emotional support.
  - Assess what her husband views related to her pregnancy is.
  - Assess for the influence of cultural beliefs, norms, and value on the client’s perception of effective coping.
  - Assess how family members interact with each other.
  - Identify which family members the client can count on for support.
  - Encourage her husband to verbalize his total support for the pregnancy.
  - Provide privacy during visits.
  - Examine antecedent factors within the family system that might exacerbate the current situation.

- Students explain their reasoning for this.

Prompts if needed:
  o What actions could be taken independently in this situation?
  o How feasible is each of these actions in this situation?

**Question 4: Which intervention/s would you choose, and what are the reasons for your choice?**

- Fluid imbalance related to hyperemesis gravidarum
  The most relevant and feasible interventions must be chosen from the possible intervention as listed before.
• Compromised family coping.

The most relevant and feasible interventions must be chosen from the possible intervention as listed before.

• Students explain their reasoning for this.

Prompts if needed:
  o What are your reasons for choosing this action/s?
  o How will you monitor the outcome/s of your decision?

### Question 5: Reflection on Learning

Prompts:
  o Has all the important information been taken into account?
  o How confident am I about this decision?
  o Thinking back, is there anything that should have been done differently?
  o What have I learned, and how will I use this learning in the future?

The questions for students’ reflective thinking:

- How well did I use the information that was available in this scenario? Did I miss anything important?

- How thorough was my decision making process for identifying the key problem/s and most appropriate intervention/s? What are the reasons for my response?

- Would I do anything differently next time? Why, or why not?

- What have I learned from this activity, and how will I use this learning to further improve my thinking?
The Educational Intervention
Helping Students to Apply Clinical Reasoning Skills:

Students' Work Book

Semester 2, 2013
This student learning package is a set of learning activities for helping students to apply clinical reasoning skills. The learning activities will help you develop the skills that are needed for making good clinical judgements in caring for high-risk pregnancy patients.

The specific objectives of the Educational Intervention learning experience are to enable you to:

1. Recognize key clinical characteristics that suggest high-risk pregnancy (abortion, ectopic pregnancy, placenta previa, hyperemesis gravidarum, gestational hypertension).
2. Determine whether high-risk pregnancy problems exist.
3. Prioritize the identified problems and their possible interventions.
4. Choose the most relevant and feasible intervention/s and justify decisions that you make.
5. Reflect on the effectiveness of decisions made and the thinking process which was undertaken.

What are clinical reasoning skills?

Clinical reasoning can be described as a process of thinking that is underpinned by thoughtful reasoning and reflective-based decision making. In nursing, clinical reasoning can be explained as “the process we use to make a judgment about what to believe and what to do about the symptoms our patient is presenting for diagnosis and treatment” (N. Facione & Facione, 2008, p.2). This learning package focuses on six clinical reasoning skills: interpretation, analysis, evaluation, and inference, explanation and self-regulation. The use of these skills allows nurses to
use better clinical judgment to recognise a patient’s health problems, select an appropriate course of action and manage care effectively.

**Why do I need clinical reasoning skills?**

Using the six clinical reasoning skills identified above (interpretation, analysis, evaluation, and inference, explanation and self-regulation) will enable you to make clinical judgements in a systematic manner. This will not only help to you to make appropriate clinical decisions, and avoid poor decisions, errors and mistakes. How? Firstly, interpreting the information available about the patient enables you to identify possible health problem/s the patient may be experiencing. Second, analysis skills help you to identify the key problem/s and set priorities. Inference skills assist you to identify possible actions that can be taken, and find reasons and evidence for your proposals. Evaluation skills will enable you to think about the potential advantages and possible disadvantages of each proposed action, and select the most relevant and feasible intervention to be employed. Explanation skills will enable you to justify the decision and present a clear explanation of the reason behind your decision. Finally, self-regulation skills will help you think back and question your thinking, identify strengths and weaknesses, correct errors and learn from the experience in order to keep improving your clinical judgments in the future.

**How do I use clinical reasoning skills in my clinical judgment?**

The six clinical reasoning skills can be used by always asking these five key questions when making clinical judgments:
The visualisation of the clinical judgment process using the five key questions is follows.

| 1. What are the important data about my patient? Is any additional information needed – if so, what would this be? |
| 2. What is/are the key problems to be addressed, and why do I think this? |
| 3. What possible intervention/s might be appropriate in this situation? |
| 4. Which intervention/s would I choose, and why do I think this? |
| 5. How good was my thinking in this situation? |
Figure 1: The application of key questions to the clinical judgment process

What you can get from answering the key questions

1. Key clinic characteristics that suggest high-risk pregnancy
2. Whether high-risk pregnancy problems exist.
3. Significance of the identified problems and their possible interventions.
4. The most relevant and feasible intervention/s and their reason.
5. Reflection on the effectiveness of decision made and the thinking process which was undertaken.
Learning Activity 1

The following scenario describes a patient situation that is commonly encountered by nurses working in antenatal clinics. It is important that the nurse responds with appropriate interventions that promote good quality patient outcomes.

In the scenario you are acting as a 3rd year student nurse who has been undertaking clinical practicum in the antenatal clinic for the past four weeks. Today you are assessing patients coming to the clinic for the first time. Also working in the clinic are three registered nurses. You have just been asked to assess a patient who has arrived at the clinic complaining of vaginal bleeding and mild, abdominal cramps.

Read the following information which outlines what you find out about this patient, discuss it with your peer group members and then, as a group, answer the Thinking Challenge questions below.

A patient in her first semester of pregnancy has arrived at a health care facility complaining of vaginal bleeding and mild abdominal cramps in the last three days. She reports 3 months of amenorrhea. You assess the patient and find that:

- She is a G2 P0 A1
- The uterus height is 16 cm which is relevant to a 16 weeks gestation.
- She does not smoke or drink alcohol
- Her uterus is soft, non-tender and enlarged appropriate to gestational age.
- Her cervix is closed.
- Bloody loss vaginally with moderate amount on pads (less than 6-inch stain).

Thinking Challenge:

Question 1: What is the relevant data about this patient? What do you think the possible problems might be? Is any additional information needed – if so, what would this be?

Question 2: What is/are the key problems to be addressed, and why do I think this?
Question 3: What possible intervention/s might be appropriate in this situation?

Question 4: Which intervention/s would I choose, and what are the reasons for my choice?

Question 5: How good was my thinking in this situation? (Reflection on Learning)
Q1: What is the relevant data about this patient? What do you think the possible problems might be? Is any additional information needed – if so, what would this be?

Q2: What is/are the key problems to be addressed, and why do I think this?
Q 3: What possible intervention/s might be appropriate in this situation?

Q 4: Which intervention/s would I choose, and what are the reasons for my choice?
In this activity you are asked to individually think back on your decision making in the given situation/scenario. There are 4 (four) reflection questions to guide your reflection. By reflecting on your decision making, you will be able to monitor your thinking, correct any mistakes and subsequently improve your clinical reasoning skills for making better clinical judgments in the future.

- How well did I use the information that was available in this scenario? Did I miss anything important?

- How thorough was my decision making process for identifying the key problem/s and appropriate intervention/s? What are the reasons for my response?
Would I do anything differently next time? Why, or why not?

What have I learned from this activity, and how will I use this learning to further improve my thinking?
The following scenario describes a patient situation that is also commonly encountered by nurses working in antenatal clinics. It is important that the nurse responds with appropriate interventions that promote good quality patient outcomes.

In this scenario you are acting as a 3rd year student nurse who has been undertaking clinical practicum in the antenatal clinic in one of public health centre in remote area. The public health centre has limited health resources and services. There is no specialist doctors available; no advanced laboratory equipment. Today you are working with one registered nurse. You have just been asked to assess a patient who has arrived at the clinic complaining of ‘swelling’ in her both ankles. This is the fourth antenatal visit for the patient.

Read the following information which outlines what you find out about this patient, discuss it with your peer group members and then, as a group, answer the Thinking Challenge questions below.

A 40-year old patient in her third semester of pregnancy arrives at a health care facility complaining of ‘swelling’ in her both ankles. She reported headache and rigidness of her back neck. She also reported unpainful 2-3 times uterine contractions per day. A review of her prenatal record two weeks ago reveals that she is a G4 P3 A0, at 30 weeks gestation, and has history of caesarean delivery of the second child caused by placenta previa. You assess the patient and find that:

- She is now in 32th week gestational.
- BP: 145/90 mm Hg.
- Proteinuria: 2+
- Pitting edema on both her ankle: 1+
- Uterus height is 36 cm which indicates a 36 week gestational.
- 5 kg weight gain since the last visit two weeks ago.
Thinking Challenge:

**Question 1**: What is the relevant data about this patient? What do you think the possible problems might be? Is any additional information needed – if so, what would this be?

**Question 2**: What is/are the key problems to be addressed, and why do I think this?

**Question 3**: What possible intervention/s might be appropriate in this situation?

**Question 4**: Which intervention/s would I choose, and what are the reasons for my choice?

**Question 5**: How good was my thinking in this situation? *(Reflection on Learning)*
Q1: What are the important data about this patient? What do I think the possible problems might be? **Is any additional information** needed if so, what would this be?

Tell your teacher what additional data you need.

Q 2: What is/are the key problems to be addressed, and why do I think this?
Q 3: What possible intervention/s might be appropriate in this situation?

Q 4: Which intervention/s would I choose, and what are the reasons for my choice?
Reflection on Learning 2
(Question 5)

In this activity you are asked to individually think back on your decision making in the given situation/scenario. There are 4 (four) reflection questions to guide your reflection. By reflecting on your decision making, you will be able to monitor your thinking, correct any mistake/s and subsequently improve your clinical reasoning skills for making better clinical judgments in the future.

- How well did I use the information that was available in this scenario? Did I miss anything important?

- How thorough was my decision making process for identifying the key problem/s and most appropriate intervention/s? What are the reasons for my response?
Would I do anything differently next time? Why, or why not?

What have I learned from this activity, and how will I use this learning to further improve my thinking?
The following scenario describes a patient situation that could be encountered by nurses working in antenatal clinics. It is important that the nurse responds with appropriate interventions that promote good quality patient outcomes.

In this scenario you are acting as a 3rd year student nurse who has been undertaking clinical practicum in the maternity ward for the past four weeks. Today is Saturday; you are working with two registered nurses in the afternoon shift. A patient is referred from emergency department complaining of a prolonged vomiting that is frequent and severe, particularly in the morning. Working with you are two registered nurses. As today is weekend, only limited hospital services are provided. You have just been asked to assess the patient.

Read the following information which outlines what you find out about this patient, discuss it with your peer group members and then, as a group, answer the Thinking Challenge questions below.

An Asian pregnant patient, 27 years old, arrives at a health care facility complaining of prolonged nausea and vomiting that is frequent and has become more severe in the last two weeks, particularly in the morning. She reported nausea and vomiting when smelling food that contains fried onion or sea-foods. She complaints of decreased bowel elimination frequency that is from every day to every 2-3 days per week and feeling discomfort when passing stools since one month ago. She is in her second prenatal visit. A review of her prenatal record reveals that she is a G1 P0 A0, at 20 weeks gestation. You assess the patient and find that:

- BP is 95/70 mm Hg
- She reported 2 kg weight loss since last week.
- 3 kg weight loss recorded since the last visit (4 weeks ago).
- She has been married for 4 years and expressed willingness to have a
Thinking Challenge:

**Question 1:** What is the relevant data about this patient? What do you think the possible problems might be? Is any additional information needed – if so, what would this be?

**Question 2:** What is/are the key problems to be addressed, and why do I think this?

**Question 3:** What possible intervention/s might be appropriate in this situation?

**Question 4:** Which intervention/s would I choose, and what are the reasons for my choice?

**Question 5:** How good was my thinking in this situation? *(Reflection on Learning)*
**Worksheet 3**

**Q 1:** What are the important facts about this patient? What do I think the possible problems might be? Is any additional information needed? – if so, what would this be?

Tell your teacher what additional data you need.

**Q 2:** What is/are the key problems to be addressed, and why do I think this?
Q 3: What possible intervention/s might be appropriate in this situation?

Q 4: Which intervention/s would I choose, and what are the reasons for my choice?
In this activity you are asked to individually think back on your decision making in the given situation/scenario. There are 4 (four) reflection questions to guide your reflection. By reflecting on your decision making, you will be able to monitor your thinking, correct any mistake/s and subsequently improve your clinical reasoning skills for making better clinical judgments in the future.

- How well did I use the information that was available in this scenario? Did I miss anything important?

- How thorough was my decision making process for identifying the key problem/s and most appropriate intervention/s? What are the reasons for my response?
Would I do anything differently next time? Why, or why not?

What have I learned from this activity, and how will I use this learning to further improve my thinking?
# Appendix B: Expert-panel Educational-instrument Feedback Instrument

**EXPERT PANEL EI FEEDBACK INSTRUMENT**

Please give your opinion by ticking (√) one of the options: Strongly Disagree (SD), Disagree (D), Agree (A) and Strongly Agree (SA) and typing your comment in the provided boxes to the right of each item.

<table>
<thead>
<tr>
<th>No</th>
<th>Educational Intervention Package</th>
<th>Relevance</th>
<th>Clarity</th>
<th>Feasibility</th>
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<td>Clarity: Whether the education intervention elements are clear.</td>
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<td>Feasibility: The suitability of the education intervention to be used in the undergraduate Indonesian context.</td>
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1. The ‘CritThink’ Educational Intervention.
   Design of the intervention
   - Approach taken to facilitate students' learning (p. 1)
   - Learning objectives (p. 2)
   - The “CriThink” model (Figure1, p.3)
   - The key teaching /learning strategies (p. 3-5)
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<td>The application of key questions to the clinical judgment process (Figure 1, p.3).</td>
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<td>• The visual presentation strategies (the use of graphics, colours, and tables) throughout the student workbook.</td>
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- Learning facilitation approaches used by the teacher (p. 4-6)

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<tr>
<td>• Feasibility:</td>
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</table>

<table>
<thead>
<tr>
<th>Characteristics of Learning Activity 2 as a medium complexity vignette (p. 12-17).</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Teacher prompts used in vignette 2.</td>
</tr>
<tr>
<td>• Case data.</td>
</tr>
<tr>
<td>• Health problems.</td>
</tr>
<tr>
<td>• Possible nursing interventions.</td>
</tr>
<tr>
<td>• Relevance:</td>
</tr>
<tr>
<td>• Clarity:</td>
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<tr>
<td>• Feasibility:</td>
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</table>

<table>
<thead>
<tr>
<th>Characteristics of Learning Activity 3 as a complex vignette (p. 18-25).</th>
</tr>
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<tr>
<td>• Teacher prompts used in vignette 3.</td>
</tr>
<tr>
<td>• Case data.</td>
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<tr>
<td>• Stated health problems.</td>
</tr>
<tr>
<td>• Possible nursing intervention.</td>
</tr>
<tr>
<td>• Relevance:</td>
</tr>
<tr>
<td>• Clarity:</td>
</tr>
<tr>
<td>• Feasibility:</td>
</tr>
</tbody>
</table>
Further comments/ suggestions:

- What do you think could be done differently to improve the relevance of the learning package?
- What do you think could be been done differently to improve the clarity of the learning package?
- What do you think could be done differently to improve the feasibility of the learning package?
- Please make any further comments or recommendations here.
Appendix C: Computation of the Educational-intervention Package I-CVI

<table>
<thead>
<tr>
<th>No.</th>
<th>The Educational Intervention</th>
<th>Relevance</th>
<th>Clarity</th>
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<td>Item CVI</td>
<td>Experts in Agreement</td>
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<td>The learning enhancement strategies (p.6-7)</td>
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<tr>
<td>6</td>
<td>The presentation of information in Tables 1 and 2</td>
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<td>1.00</td>
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<td></td>
<td>Subscale I-CVI scores</td>
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Appendix D: Ethics Approval

University Human Research Ethics Committee
HUMAN ETHICS APPROVAL CERTIFICATE
NHMRC Registered Committee Number EC00171

Dear Ms Indrani Yauri,

A UHREC should clearly communicate its decisions about a research proposal to the researcher and the final decision to approve or reject a proposal should be communicated to the researcher in writing. This Approval Certificate serves as your written notice that the proposal has met the requirements of the National Statement on Research Involving Human Participation and has been approved on that basis. You are therefore authorised to commence activities as outlined in your proposal application, subject to any specific and standard conditions detailed in this document.

Within this Approval Certificate are:

* Project Details
* Participant Details
* Conditions of Approval (Specific and Standard)

Researchers should report to the UHREC, via the Research Ethics Coordinator, events that might affect continued ethical acceptability of the project, including, but not limited to:

(a) serious or unexpected adverse effects on participants; and
(b) proposed significant changes in the conduct, the participant profile or the risks of the proposed research.

Further information regarding your ongoing obligations regarding human based research can be found via the Research Ethics website http://www.research.qut.edu.au/ethics/ or by contacting the Research Ethics Coordinator on 07 3130 2051 or ethicscontact@qut.edu.au

If any details within this Approval Certificate are incorrect please advise the Research Ethics Unit within 10 days of receipt of this certificate.

**Project Details**

<table>
<thead>
<tr>
<th>Category of Approval:</th>
<th>Human non-HREC</th>
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<td>Approved From:</td>
<td>1/11/2012</td>
</tr>
<tr>
<td>Approved Until:</td>
<td>1/11/2015 (subject to annual reports)</td>
</tr>
<tr>
<td>Approval Number:</td>
<td>1200000568</td>
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<tr>
<td>Project Title:</td>
<td>Development, measurement and evaluation of an educational intervention for improving student nurses’ application of critical thinking skills in the context of clinical judgment to examine student perceptions regarding the impact of the intervention on their learning.</td>
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<tr>
<td>Experiment Summary:</td>
<td>Investigating the impact of an educational intervention on nursing students’ application of critical thinking skills in the context of clinical judgment to examine student perceptions regarding the impact of the intervention on their learning.</td>
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</tbody>
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**Investigator Details**

<table>
<thead>
<tr>
<th>Chief Investigator:</th>
<th>Ms Indrani Yauri</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Staff/Students:</td>
<td></td>
</tr>
<tr>
<td>Investigator Name:</td>
<td>Type</td>
</tr>
<tr>
<td>Prof Robyn Nash</td>
<td>Internal</td>
</tr>
<tr>
<td>Dr Joanne Ramsbotham</td>
<td>Internal</td>
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**Participant Details**

<table>
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<th>Participants:</th>
<th>Approximately 100</th>
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<tr>
<td>Location(s) of the Work:</td>
<td>The Catholic University of Da La Salle, Manado, Indonesia</td>
</tr>
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University Human Research Ethics Committee
HUMAN ETHICS APPROVAL CERTIFICATE
NHMRC Registered Committee Number EC00171

Date of Issue: 5/11/12 (supersedes all previously issued certificates)

Conditions of Approval

Specific Conditions of Approval:
None apply

Standard Conditions of Approval:
The University's standard conditions of approval require the research team to:

1. Conduct the project in accordance with University policy, NHMRC / AVCC guidelines and regulations, and the provisions of any relevant State / Territory or Commonwealth regulations or legislation;
2. Respond to the requests and instructions of the University Human Research Ethics Committee (UHREC);
3. Advise the Research Ethics Coordinator immediately if any complaints are made, or expressions of concern are raised, in relation to the project;
4. Suspend or modify the project if the risks to participants are found to be disproportionate to the benefits, and immediately advise the Research Ethics Coordinator of this action;
5. Stop any involvement of any participant if continuation of the research may be harmful to that person, and immediately advise the Research Ethics Coordinator of this action;
6. Advise the Research Ethics Coordinator of any unforeseen development or events that might affect the continued ethical acceptability of the project;
7. Report on the progress of the approved project at least annually, or at intervals determined by the Committee;
8. (Where the research is publicly or privately funded) publish the results of the project in such a way to permit scrutiny and contribute to public knowledge; and
9. Ensure that the results of the research are made available to the participants.

Modifying your Ethical Clearance:
Requests for variations must be made via submission of a Request for Variation to Existing Clearance Form (http://www.research.qut.edu.au/ethics/forms/humenvar/verjcp) to the Research Ethics Coordinator. Minor changes will be assessed on a case by case basis.

It generally takes 7-14 days to process and notify the Chief Investigator of the outcome of a request for a variation.

Major changes, depending upon the nature of your request, may require submission of a new application.

Audits:
All active ethical clearances are subject to random audit by the UHREC, which will include the review of the signed consent forms for participants, whether any modifications / variations to the project have been approved, and the data storage arrangements.

end of document
Appendix E: Ethics Variation Approval

Ethics Variation -- 1200000588
QUT Research Ethics Unit
Sent: 01 May 2013 12:20
To: Indriani Yauri
Cc: Janette Lamb
Attachments:
Dear Ms Indriani Yauri

Approval #: 1200000588
End Date: 1/11/2015
Project Title: Exploring an innovative educational approach to facilitating student nurses' clinical reasoning skills in North Sulawesi Province, Indonesia

This email is to advise that your variation has been considered by the Chair, University Human Research Ethics Committee.

Approval has been provided for:

< The change in title.
< Changes in data collection tools to emphasise clinical reasoning.
< A focus group for control group as well as intervention group.
< Consequent changes in Participant documents.

PLEASE NOTE:
RESEARCH SAFETY -- Ensure any health and safety risks relating to this variation have been appropriately considered, particularly if your project required a Health and Safety Risk Assessment.
CONFLICTS OF INTEREST -- If this variation will introduce any additional perceived or actual conflicts of interest please advise the Research Ethics Unit by return email.

Please don't hesitate to contact us if you have any questions.

Regards

Janette Lamb on behalf of Chair UHREC
Research Ethics Unit | Office of Research
Level 4 | 88 Musk Avenue | Kelvin Grove
p: +61 7 3138 5123
e: ethicscontact@qut.edu.au
w: http://www.research.qut.edu.au/ethics/
Appendix F: Focus-group Questions

Based on your experience (intervention group):

1. What are your perceptions of the implementation of the Educational Intervention (EI)?
2. Was the EI helpful in facilitating clinical reasoning?
3. What parts/sections of the EI were helpful or difficult for you?
4. Why was that helpful or difficult?
5. Can you describe the differences between your experience of traditional learning and the EI?
6. How did the EI influence your clinical reasoning skills?
7. How confident are you in using your clinical reasoning skills in making CJ in your clinical practice?
8. What do you think might improve the implementation of the EI?

Based on your experience (control group):

1. What are your perceptions of teaching and learning in the high risk pregnancy nursing care?
2. Were the teaching and learning approaches helpful in facilitating clinical reasoning?
3. What parts/sections of teaching and learning in the high risk pregnancy nursing care were helpful or difficult for you?
4. Why was that helpful or difficult?
5. How did the teaching and learning approaches influence your clinical reasoning skills?
6. How confident are you in using your clinical reasoning skills in making CJ in your clinical practice?
7. What do you think might improve of teaching and learning in the high risk pregnancy nursing care?

Additional prompts to elicit discussion regarding thinking:

1. Did anyone else have a similar/different experience?
2. What was it like for others in the group?

Please give your opinion by ticking (√) one of the options: Strongly Disagree (SD), Disagree (D), Agree (A) and Strongly Agree (SA) and typing your comment in the provided boxes to the right of each item.

<table>
<thead>
<tr>
<th>No.</th>
<th>The Clinical Vignette (Impact Evaluation)</th>
<th>Relevance</th>
<th>Clarity</th>
<th>Feasibility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>1  2  3  4</td>
<td>1  2  3  4</td>
<td>1  2  3  4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD  D  A  SA</td>
<td>SD  D  A  SA</td>
<td>SD  D  A  SA</td>
</tr>
</tbody>
</table>

**Further comment regarding your views**

Relevance: Whether the scenario adequately represents characteristics of the targeted health problems and the questions use stimulate students' clinical reasoning.

Clarity: Whether the clinical vignette impact evaluation is clear.

Feasibility: The suitability of the clinical vignette impact evaluation to be used in the undergraduate Indonesian context.

1 Case data

- Relevance:
- Clarity:
- Feasibility:

2 Application of clinical reasoning questions to the vignette

- Relevance:
- Clarity:
- Feasibility:

3 Application of self-confidence with clinical reasoning questions

- Relevance:
- Clarity:
- Feasibility:
Further comments/ suggestions:

1. What do you think could be done differently to improve the **relevance** of the learning package?

2. What do you think could be been done differently to improve the **clarity** of the learning package?

3. What do you think could be done differently to improve the **feasibility** of the learning package?

4. Please make any further comments or recommendations here.
Appendix H: Refined Clinical Vignette
‘Clinical Reasoning’ Study

Clinical Scenario
Clinical –reasoning Study- Refined clinical scenario

Please read these instructions before you begin:

1. Read the clinical scenario carefully.
2. The clinical scenario is accompanied by five critical thinking questions, you are asked to write your response on each question and circle the number that best represents your opinion regarding the level of your self-confidence in responding to the every question.
3. If you wish, you are allowed to ask your teacher for additional data and it will be made available for you.
4. There will be approx. 90 minutes time to respond to the questions.
5. By responding to the all thinking challenge questions, you have made valuable contribution to this study.

Thank you

Clinical scenario

In this scenario you are acting as a 3rd year student nurse who has been undertaking clinical practicum in the antenatal clinic in one of the public health centers in a remote area. The public health center has limited health resources and services. There are no specialist doctors available and no advanced laboratory services. Today you are working with one registered nurse. You have just been asked to assess a client who has arrived at the clinic complaining of vaginal bleeding during the last week. This is the fourth antenatal visit for the client.

A 30-year old client in her third semester of pregnancy arrives at a health care facility complaining of vaginal bleeding. She reported vaginal bleeding happening during the last week. The occurrence of bleeding is intermittent and increased when she does more walking related activities. She complains of increased voiding frequency in the night. A review of her prenatal record reveals that she is a G2 P1 A0, at 32 weeks gestation, and has history of caesarean delivery of the first child caused by mal-presentation of the fetus. You assess the client and find that:

- She is a G2 P1 A0
- The uterus height is 36 cm and just below the sternum which is relevant to 36 weeks gestation.
- She smokes approx. 8-10 cigarettes per day
- Her uterus is soft, non-tender.
- BP: 115/85 mm Hg.
- 1-2 times voiding in the night.
Question 1

After reading the clinical scenario (above), write down your ideas about the possible health problems this patient may be experiencing, and the clinical information or patient data that caused you to think of these possibilities? List as many as you wish. You can also request additional data—just asks your teacher.

Here is an example.

Example: Maybe reduced hydration

Clinical information – severe nausea and vomiting
Before proceeding to Q2, please do the following:

a. rate how confident you are that you have identified all possible health problems in this scenario (circle the number that best represents your opinion).

<table>
<thead>
<tr>
<th>Not confident at all</th>
<th>Extremely confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
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<td>3</td>
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<tr>
<td>5</td>
<td>5</td>
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</tbody>
</table>

b. rate how confident you are that you have sufficient information from which to make a decision regarding the health problem/s this patient is experiencing? (circle the number that best represents your opinion).

<table>
<thead>
<tr>
<th>Not confident at all</th>
<th>Extremely confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
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<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Now proceed to Question 2.

**Question 2**

Having thought carefully about the data that you have, identify the health problem/s that you believe requires nursing intervention (and the clinical data on which it is based)? An example is provided below.

*Problem example: Body fluid imbalance*  
*Specific clinical information – poor skin turgor, malaise, dry mucous membranes*
Before proceeding to Q3, please rate how confident you are that you have correctly identified the health problem/s this patient is experiencing? (circle the number that best represents your opinion)

Now proceed to Question 3.

<table>
<thead>
<tr>
<th>Question 3</th>
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</thead>
<tbody>
<tr>
<td>For the problem/s you identified in Question 2, write down the possible interventions that could be taken by the nurse?</td>
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</table>
Before proceeding to Q4, please rate how confident you are about the possible intervention/s for this patient? (circle the number that best represents your opinion)

Now proceed to Question 4 (next page)

<table>
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<tr>
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</thead>
<tbody>
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<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Question 4

Having thought about these possibilities, which intervention/s would you choose to undertake with this client, and briefly explain the reason/s why?
Before proceeding to Q5, please rate how confident you are about your choice of intervention/s for this patient? (circle the number that best represents your opinion)

**Now proceed to Question 5.**

<table>
<thead>
<tr>
<th>Question 5</th>
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<tbody>
<tr>
<td>Thinking back on your responses to this scenario, please rate how confident you are that you have made good decisions about the nursing care for this patient.</td>
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</table>

<table>
<thead>
<tr>
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</tr>
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<td>2</td>
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<table>
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<th>Extremely confident</th>
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Appendix I: Permission to Conduct Research

UNIVERSITAS KATOLIK DE LA SALLE
MANADO INDONESIA

To:
Mrs. Indriani Yauri, SKM, MN
School of Nursing and Midwifery, Faculty of Health
Queensland University of Technology,
Victoria Park Road
Kelvin Grove Qld 4059 Australia

Dear Mrs Indri,

In response to your letter of Request for Permission to undertake your Research Project: “Improving Nurse’s Critical Thinking in North Sulawesi Province, Indonesia”, at Catholic University of De La Salle Manado, as the Rector, I give you my permission to access our database and to investigate your research participants from Catholic University of De La Salle Manado, or any other information you need for your research.

We wish you good luck for the success of your research.

Manado, 21th May, 2012

Sincerely Yours,

Fr. Revi Rafael H. M. Tanod, SS, SE, MA
Rector
Appendix J: Permission to Use Instrument

Regarding: Request for NLN Survey Instruments
Nasreen Ferdous [nferdous@nln.org]
To help protect your privacy, some content in this message has been blocked. If you are sure that this message is from a trusted sender and you want to re-enable the blocked features, click here.
You forwarded this message on 08/10/2012 14:20.
Sent: 02 October 2012 02:49
To: Indriani Yauri

Attachments: Instrument 1_Educational P~1.pdf (20 KB)[Open as Web Page]; Instrument 2_Satisfaction ~1.pdf (30 KB)[Open as Web Page]; Instrument 3_Simulation De~1.pdf (21 KB)[Open as Web Page]

It is my pleasure to grant you permission to use the “Educational Practices Questionnaire,” “Simulation Design Scale” and “Student Satisfaction and Self-Confidence in Learning” NLN/Laerdal Research Tools. In granting permission to use the instruments, it is understood that the following assumptions operate and "caveats" will be respected:

1. It is the sole responsibility of (you) the researcher to determine whether the NLN questionnaire is appropriate to her or his particular study.

2. Modifications to a survey may affect the reliability and/or validity of results. Any modifications made to a survey are the sole responsibility of the researcher.

3. When published or printed, any research findings produced using an NLN survey must be properly cited as specified in the Instrument Request Form. If the content of the NLN survey was modified in any way, this must also be clearly indicated in the text, footnotes and endnotes of all materials where findings are published or printed.

I am pleased that material developed by the National League for Nursing is seen as valuable as you evaluate ways to enhance learning, and I am pleased that we are able to grant permission for use of the “Educational Practices Questionnaire,” “Simulation Design Scale” and “Student Satisfaction and Self-Confidence in Learning” instruments.

Nasreen Ferdous | Administrative Coordinator for Grants/R&PD | National League for Nursing |
www.nln.org | nferdous@nln.org | Phone: 212-812-0315 | Fax: 212-812-0391 | 61 Broadway | New York, NY 10006

Appendix K: Scoring Methods for the Sub-variable Results
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<th>Students’ responses to the clinical vignette</th>
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<td>1-2 interventions</td>
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<td>3-4 interventions</td>
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<tr>
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<td>Very confident</td>
</tr>
<tr>
<td></td>
<td>Extremely confident</td>
</tr>
</tbody>
</table>
Appendix L: Post-test Answer Guide
Clinical-reasoning Study – Answer Guide

Please read these instructions before you begin:

1. Read the clinical scenario carefully.
2. The clinical scenario is accompanied by five critical thinking questions, you are asked to write your response on each question and circle the number that best represents your opinion regarding the level of your self-confidence in responding to the every question.
3. If you wish, you are allowed to ask your teacher for additional data and it will be made available for you.
4. There will be approx. 90 minutes time to respond to the questions.
5. By responding to the all thinking challenge questions, you have made valuable contribution to this study.

Thank you

Clinical scenario
In this scenario you are acting as a 3rd year student nurse who has been undertaking clinical practicum in the antenatal clinic in one of the public health centers in a remote area. The public health center has limited health resources and services. There are no specialist doctors available and no advanced laboratory services. Today you are working with one registered nurse. You have just been asked to assess a client who has arrived at the clinic complaining of vaginal bleeding during the last week. This is the fourth antenatal visit for the client.

A 30-year old client in her third semester of pregnancy arrvies at a health care facility complaining of vaginal bleeding. She reported vaginal bleeding happening during the last week. The occurrence of bleeding is intermittent and increased when she does more walking related activities. She complains of increased voiding frequency in the night. A review of her prenatal record reveals that she is a G2 P1 A0, at 32 weeks gestation, and has history of caesarean delivery of the first child caused by mal-presentation of the fetus. You assess the client and find that:

- She is a G2 P1 A0
- The uterus height is 36 cm and just below the sternum which is relevant to 36 weeks gestation.
- She smokes approx. 8-10 cigarettes per day
- Her uterus is soft, non-tender.
- BP: 115/85 mm Hg.
- 1-2 times voiding in the night.
Question 1

After reading the clinical scenario (above), write down your ideas about the possible health problems this patient may be experiencing, and the clinical information or patient data that caused you to think of these possibilities? List as many as you wish. You can also request additional data—just asks your teacher.

Here is an example.

Example: Maybe reduced hydration  
Clinical information – severe nausea and vomiting

Possible HP:
1) Risk for vaginal bleeding related to placenta previa. 2) Risk for haemorrhagic and hypovolemic shock related to excessive blood loss.

Clinical Information;

- Third semester of pregnancy
- Vaginal bleeding.
- intermittent and increased when she does more walking related activities
- a G2 P1 A0, at 32 weeks gestation
- The uterus height is 36 cm and just below the sternum which is relevant to 36 weeks gestation.
- Her uterus is soft, non-tender.
- BP: 115/85 mm Hg.
- FHR: 144 bpm
- She smokes approx. 8-10 cigarettes per day
- History of caesarean delivery

Additional Data:

Vaginal bleeding is painless, blood colour is bright
The amount of blood is moderate (< 500 ml)
Before proceeding to Q2, please do the following:

c. rate how confident you are that you have identified all possible health problems in this scenario (circle the number that best represents your opinion).

d. rate how confident you are that you have sufficient information from which to make a decision regarding the health problem/s this patient is experiencing? (circle the number that best represents your opinion).

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Now proceed to Question 2.

**Question 2**

Having thought carefully about the data that you have, identify the health problem/s that you believe requires nursing intervention (and the clinical data on which it is based)? An example is provided below.

*Problem example: Maybe fluid imbalance related to hyperemesis gravidarum? Clinical information – frequent nausea and vomiting; at 20th week gestation*

1) Risk for vaginal bleeding related to placenta praevia
2) Specific Information:
   - third semester of pregnancy
   - vaginal bleeding is painless,
   - blood colour is bright
   - The amount of blood is moderate (< 500 ml)
Before proceeding to Q3, please rate how confident you are that you have correctly identified the health problem/s this patient is experiencing? (circle the number that best represents your opinion)

Now proceed to Question 3.

**Question 3**
For the problem/s you identified in Question 2, write down the possible interventions that could be taken by the nurse?

1. Explain intervention, treatments, and procedure and plan of care.
2. Reassure the patient and her family.
3. Perform the initial assessment: evaluation of colour character and amount of vaginal bleeding and assessment of vital signs.
5. Assess FHR and UCs
6. Inform the patient and family of maternal and foetal status.
7. Ensure bed rest.
8. Maintain IV access in case blood replacement therapy is needed.
9. Notify physician of any deterioration
10. Monitor lab values CBC, platelets and clotting studies.
11. Anticipate a caesarean birth.

Before proceeding to Q4, please rate how confident you are about the possible intervention/s for this patient? (circle the number that best represents your opinion)

Now proceed to Question 4 (next page)
**Question 4**

Having thought about these possibilities, which intervention/s would *you* chose to undertake with this client, and briefly explain the reason/s why?

1. Explain intervention, treatments, and procedure and plan of care.
2. Reassure the patient and her family.
3. Perform the initial assessment: evaluation of colour character and amount of vaginal bleeding and assessment of vital signs.
5. Assess FHR and UCs
6. Inform the patient and family of maternal and foetal status.
7. Ensure bed rest.
8. Notify physician if any deterioration
Before proceeding to Q5, please rate how confident you are about your choice of intervention/s for this patient? (circle the number that best represents your opinion)

Now proceed to Question 5.

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**Question 5**
Thinking back on your responses to this scenario, please rate how confident you are that you have made good decisions about the nursing care for this patient.

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