

UNIVERSITI PENDIDIKAN SULTAN IDRIS

UNIVERSITI PENDIDIKAN SULTAN IDRIS

UNIVERSITI PENDID

N IDRIS

UNIVERSITI PENDIDIKAN SULTAN IDRIS

UNIVERSITI PENDIDIKAN SULTAN IDRIS

UNIVERSITI F

**ENHANCING HIGHER ORDER THINKING SKILLS THROUGH  
CLINICAL SIMULATION: A STUDY ON DESIGN,  
IMPLEMENTATION PROCESS  
AND OUTCOME**

**ELENGOVAN VARUTHARAJU**

**THESIS SUBMITTED IN FULFILLMENT OF THE  
REQUIREMENT FOR THE DEGREE OF  
DOCTOR OF PHILOSOPHY**

**FACULTY OF EDUCATION & HUMAN DEVELOPMENT  
UNIVERSITI PENDIDIKAN SULTAN IDRIS**

UNIVERSITI PENDIDIKAN SULTAN IDRIS

UNIVERSITI PENDIDIKAN SULTAN IDRIS

UNIVERSITI PENDIDIKA

DRIS

UNIVERSITI PENDIDIKAN SULTAN IDRIS

UNIVERSITI PENDIDIKAN SULTAN IDRIS

UNIVERSITI PEN

## ABSTRACT

The study aimed to explore, describe, and interpret the effectiveness of clinical simulation as pedagogical tool in bridging the deficiency of higher order thinking skills among Medical Assistant students and make recommendations on incorporating clinical simulation as a pedagogical tool in enhancing thinking skills and aligning the curriculum. Qualitative approach using *interpretative-descriptive* case study design was utilized in framing the research study. Purposive sampling using twenty (20) final year Medical Assistant students and five (5) teaching staff participated in this study. Data was collected through direct and participatory observation, interviews, and documents analysis. Thematic analysis using Stake's Countenance Model was utilized to analyze and present the findings. The study revealed a positive outlook in supporting the theme that (i) clinical simulation design facilitates the infusion of higher order thinking skills; (ii) clinical simulation that uses thinking pedagogy nurtures the development of higher order thinking skills; and (iii) clinical simulation that uses higher order thinking modality promotes learning for understanding and transfer of learning. Facilitators played a crucial role in engaging learners with higher order thinking modality and making students' thinking visible by utilizing the use of meta-cognition and self-regulation abilities, while learners became more autonomous, strategic, and motivated to apply effort and strategies in a variety of meaningful context. Clinical simulation justifies the means and the end for the development of higher order thinking skills among Medical Assistant students and warrants the incorporation across the curriculum to nurture professional knowledge and clinical competence. The findings of this study provided a thick description in assisting curriculum managers, college administrators and educators on the inclusion of clinical simulation as an instructional approach in enhancing higher order thinking skills among Medical Assistant students.



## ABSTRAK

Kajian ini bertujuan untuk meninjau, menghurai, dan menginterpretasi keberkesanan simulasi klinikal sebagai alat pedagogi dalam merapatkan jurang kemahiran berfikir aras tinggi dikalangan pelajar Pembantu Perubatan dan mencadangkan pembangunan simulasi klinikal sebagai alat pedagogi dalam memantapkan kemahiran berfikir dan penjajaran kurikulum. Pendekatan kualitatif dengan rekabentuk kajian kes *deskriptif-interpretasi* digunakan dalam merangka kajian penyelidikan. Persampelan *purposive* digunakan dengan melibatkan seramai dua puluh (20) pelatih Pembantu Perubatan tahun akhir dan lima (5) tenaga pengajar sebagai peserta kajian. Data dikumpul melalui pemerhatian secara langsung dan penyertaan, temu bual dan analisis dokumen. Analisis tematik menggunakan *Stake's Countenance Model* digunakan untuk menganalisis dan membentangkan penemuan. Kajian ini menyumbang pandangan yang positif dalam menyokong tema umum bahawa (i) rekabentuk simulasi klinikal memudahkan infusi kemahiran berfikir aras tinggi; (ii) simulasi klinikal yang menggunakan pedagogi berfikir memupuk pembangunan kemahiran pemikiran aras tinggi; dan (iii) simulasi klinikal yang menggunakan modaliti pemikiran aras tinggi meningkatkan pemahaman yang lebih mendalam dan pemindahan pembelajaran. Fasilitator memainkan peranan penting dalam melibatkan pelajar dengan modaliti berfikir aras tinggi, dan menjadikan pemikiran pelajar lebih telus melalui penggunaan meta-kognisi dan kebolehan sendiri, manakala pelajar menjadi lebih sendiri, strategik, dan bermotivasi untuk meneruskan usaha dan strategi dalam pelbagai konteks yang bermakna. Simulasi klinikal menjelaskan kaedah dan penghasilannya dalam memantapkan kemahiran berfikir aras tinggi dikalangan pelajar Pembantu Perubatan dan menggalakan integrasi pendidikan simulasi merentasi kurikulum bagi memupuk pembangunan pengetahuan profesional dan kompetensi klinikal. Penemuan kajian ini menyumbang penghuraian terperinci dalam membantu pengurus kurikulum, pentadbir kolej, dan pendidik menggunakan simulasi klinikal sebagai pendekatan pengajaran dalam memantapkan kemahiran berfikir aras tinggi dikalangan pelajar Pembantu Perubatan.

**TABLE OF CONTENT**

	<b>Pages</b>
DECLARATION	ii
ACKNOWLEDGEMENT	iii
ABSTRACT	iv
ABSTRAK	v
TABLE OF CONTENT	vi
<b>CHAPTER 1: INTRODUCTION</b>	
1.1 Introduction	1
1.2 Background of study	3
1.2.1 Milestone of Assistant Medical Officer's Profession and Education	4
1.2.2 Scope of Professional Practice	6
1.2.3 Medical Assistant Education Program	7
1.2.4 Health Care Dynamics, Quest for Competent Workforce and Role of Assistant Medical Officers	9
1.2.5 Challenges for Medical Assistant Education	10
1.3 Statement of Problem	12
1.4 Operational Definition	15
1.4.1 Higher Order Thinking Skills	15
1.4.2 Simulation-based Learning	16
1.4.3 Transfer of Learning	17



**Pages**

	<b>Pages</b>
iii. Fink's Taxonomy of Significant Learning	43
iv. Structure of Observed Learning Outcome	44
2.2.2 Philosophical Perspective of Thinking in Education	45
2.2.3 Theories Supporting Higher Order Thinking Skills	48
i. Behavioural Theory	49
ii. Cognitive & Constructivist Theory	52
a. Piaget's Cognitive Learning Theory	53
b. Vygotsky's Social Cognitive Theory	55
c. Bruner's Constructivist Theory	57
d. Gardner's Five Mind for the Future	61
2.2.4 Applying Gardner's Five Mind for the Future in Medical, Nursing and Health Science Education	63
2.2.5 Learning environment, learning activities and learning strategies that nurture Higher Order Thinking Skills	65
i. Teaching for thinking	67
ii. Teaching of thinking	68
iii. Teaching about thinking	69
2.2.6 Assessing Higher Order Thinking Skills	71
2.3 Clinical Simulation in Health Profession's Education	73
2.3.1 Concept of Clinical Simulation	74









**Pages**

	<b>Pages</b>
4.3 Theme 2: Simulation-based learning that utilizes thinking pedagogy nurtures the development of higher order thinking skills.	168
4.3.1 Sub theme 2.1: Clinical simulation module's content arrangement and instructional design facilitate the infusion of higher order thinking skills.	169
4.3.2 Sub theme 2.2: Simulation learning cycle promotes thinking modality in nurturing higher order thinking skills.	174
Sub theme 2.2.1: Simulation-based learning that uses thinking modality facilitated with probing activities during briefing provided the scope and opportunity for the development of higher order thinking.	174
Sub theme 2.2.2: Experiential learning using student centred approach and peer group learning supported by probing questions and thinking aloud approach promotes thinking modality that enhances the development of higher order thinking skills.	177
Sub theme 2.2.3: Probing questions during discussion and feedbacks facilitate thinking modality that provides a pathway towards transformation of the individual, both intellectually and behaviourally in managing clinical situations.	179
Sub theme 2.2.4: Students performance at level of applying, analyzing, evaluating and creating using higher order mental processes, think aloud strategy and holistic learning.	182
Sub theme 2.2.5: Discussion, critics and reflection allow learners to articulate, reflect, evaluate, and correct knowledge deficit that promote deeper learning and facilitate transfer of learning for future endeavors.	184

## Pages

4.3.3	Coherence of logical contingency (Intent) and empirical contingency (Observation) of simulation-based learning process in enhancing higher order thinking skills.	186
4.4	Theme 3: Clinical simulation that uses higher order thinking modality promotes learning for understanding and transfer of learning.	188
4.4.1	Sub Theme 3.1: The development of simulation module's learning outcome addresses the infusion of higher order thinking skills.	189
4.4.2	Sub theme 3.2: Engaging students in simulated learning facilitates performance at higher order thinking, learning for understanding and transfer of learning.	192
4.4.3	Coherence of logical contingency (Intent) and empirical contingency (Observation) of simulation-based learning outcome in enhancing higher order thinking skills.	197
4.5	Theme 4. Students experience clinical simulation as a learning approach that enhances thinking modality of higher order thinking skills, confidence, learning for understanding and transfer of learning through probing activities, holistic and contextual learning, collaborative and reflective practices.	199
4.5.1.	Sub Theme 4.1: Clinical simulation engages thinking modality and student centred learning that promotes experiential learning and collaborative practices in enhancing higher order thinking skills and promotes learning for understanding and transfer of learning.	202
4.5.2	Sub Theme 4.2: Clinical simulation provides a shift from rote learning to learning for understanding that is contextual through active engagement, discussion, feedback and reflective practices.	203

**Pages**

4.5.3	Sub Theme 4.3: Clinical simulation can be a proximate system that can function parallel with the target system of real clinical setting.	204
4.5.4	Sub Theme 4.4: Clinical simulation promotes confidence, sharing of knowledge, thinking modality and transfer of learning through repeated encounter of clinical cases from differing context or situations.	205
4.5.5	Sub theme 4.5: Clinical simulation can be introduced early during the didactic session through mentoring and requires pre requisite knowledge on clinical, behavioural and physical sciences.	206
4.6	Theme 5: Facilitators perceived that simulation based learning improves thinking modalities, enhance higher order thinking skills, and promote learning for understanding and transfer of learning.	208
4.6.1	Sub Theme 5.1: Simulation intervention using simulation learning cycle facilitate thinking modality in solving clinical cases and promote active learning through discussion, reflection and sharing of knowledge without fear of harming the patient.	211
4.6.2	Sub Theme 5.2: Clinical simulation provides a conducive learning environment that complies with students learning needs, enhances motivation and enthusiasm to promote transfer of learning in a controlled environment towards holistic management of patient.	213
4.6.3	Sub Theme 5.3: Clinical simulation enhances quality in learning, promotes collaborative learning and reflection in rectifying knowledge deficits.	214
4.6.4	Sub Theme 5.4: Clinical simulation cannot replace real clinical placement.	214

**Pages**

4.7	Theme 6: Facilitators promote fun and excitement in gauging student's knowledge, skills and ability through engaging probing activities in managing clinical cases and knowledge deficit, promote meta cognitive activities and self-regulation, enhance confidence and facilitate transfer or learning.	215
4.7.1	Theme 6.1: Facilitators played an important role in engaging probing activities of connecting previous knowledge and experience in enhancing higher order thinking skills, learning for understanding and transfer of learning.	217
4.7.2	Theme 6.2: Facilitators gauge student's knowledge, skills and ability in managing cases, manage knowledge deficit, promote meta-cognitive activities and self-regulation, enhance confidence and facilitate transfer or learning.	219
4.7.3	Theme 6.3: Facilitators promote fun and excitement in providing the learning experience and opportunity for transfer of learning.	220
4.8	Effectiveness of clinical simulation in enhancing higher order thinking skills among Medical Assistant Students.	222

**CHAPTER 5: DISCUSSION**

5.1	Introduction	225
5.2	Learning environment, learning activities and learning strategies that foster the enhancement of higher order thinking skills in clinical simulation.	227
5.3	Significance of theoretical framework in supporting the development of clinical simulation design for enhancing higher order thinking skills.	235

**Pages**

	<b>Pages</b>
5.4 Effectiveness of the clinical simulation in enhancing higher order thinking skills among Medical Assistant students.	241
5.4.1 Theme 1: The development of simulation-based learning model in clinical education facilitates the infusion of higher order thinking skills.	242
Sub-theme 1.1: Simulation-based learning module's aim and objectives support the development of higher order thinking skills at the level of applying, analyzing, evaluating and creating.	247
Sub theme 1.2: Engaging problem-based clinical scenario in simulation program facilitated the infusion of higher order thinking skills at the level of applying, analyzing, evaluating and creating.	250
5.4.2 Theme 2: Engaging thinking modality and pedagogy in clinical simulation nurtures development of higher order thinking and promotes learning for understanding.	253
Sub theme 2.1: Clinical simulation module's content structuring and instructional design facilitate the infusion of higher order thinking skills.	255
Sub theme 2.2: Engaging thinking modality in simulation-based learning provided learning experience in nurturing higher order thinking skills.	259
5.4.3 Theme 3: Clinical simulation that uses higher order thinking modality promotes learning for understanding and transfer of learning.	266

**Pages**

	<b>Sub Theme 3.1: The development of clinical simulation module's learning outcome engages higher order thinking skills.</b>	<b>267</b>
	<b>Sub theme 3.2: Engaging students in simulated learning facilitates performance at higher order thinking, learning for understanding and transfer of learning.</b>	<b>270</b>
5.4.4	<b>Theme 4. Clinical simulation as a learning approach that enhances thinking modality of higher order thinking skills, confidence, learning for understanding and transfer of learning through probing activities, holistic and contextual learning, collaborative and reflective practices.</b>	<b>281</b>
5.4.5	<b>Theme 5: Facilitators promote fun and excitement in gauging student's knowledge, skills and ability through engaging probing activities in managing clinical cases and knowledge deficit, promote meta cognitive activities and self-regulation, enhance confidence and facilitate transfer or learning.</b>	<b>284</b>
5.4.6	<b>Effectiveness of clinical simulation education in enhancing higher order thinking skills in Medical Assistant Education.</b>	<b>289</b>
5.5	<b>Integrating and managing clinical simulation across the curriculum.</b>	<b>293</b>
5.6	<b>Conclusion.</b>	<b>298</b>
5.7	<b>Implication of Findings and suggestion for future research.</b>	<b>299</b>
5.8	<b>Limitation of the study.</b>	<b>301</b>

**LIST OF FIGURES**

		<b>Pages</b>
Fig 1.1	Theoretical Framework for cultivating higher order thinking skills using clinical simulation	21
Fig. 1.2	Conceptual Framework for enhancing higher order thinking skills using clinical simulation.	30
Fig. 3.1	Study protocol for determining the effectiveness of simulation-based learning in enhancing higher order thinking skills.	131
Fig. 3.2	Learning cycle based on Gagne's Theory of Instruction	133
Fig. 3.3	Clinical simulation framework	135
Fig. 3.4	Assessment Triangle	142
Fig. 3.5	Stake's Countenance Approach	148
Fig 3.6	Judging the effectiveness of Clinical Simulation	151
Fig. 4.1	A study on student's perception towards simulation-based learning.	200
Fig. 4.2	Thematic Analysis on facilitator's perception towards simulation-based learning.	209
Fig 4.3	Thematic Analysis on facilitator's role in simulation-based learning.	216

**LIST OF TABLES**

		<b>Pages</b>
Table 3.1	Unit of Analysis	123
Table 3.2	Evaluation of clinical simulation program using Stake Countenance Model (1967)	150
Table 4.1	Inclusion of Higher Order Thinking Skills in Simulation-Based Learning Module as Intent.	159
Table 4.2	Inclusion of higher order thinking skills in simulation-based clinical scenarios as observation.	162
Table 4.3	Coherence of logical contingency (Intent) and empirical contingency (Observation) of simulation-based learning module in enhancing higher order thinking skills.	167
Table 4.4	Inclusion of Higher Order Thinking Skills in the content and instructional design of Simulation-Based Learning Module as Intent.	170
Table 4.5	A study on the role of briefing during simulation-based learning and teaching process for the inclusion of higher order thinking skill	175
Table 4.6	Simulation-based learning and teaching process at the stage of performing for the inclusion of higher order thinking skills.	178
Table 4.7	Simulation-based learning and teaching process at the stage of discussion for the inclusion of higher order thinking skills.	180
Table 4.8	Simulation-based learning and teaching process at the stage of assessment for the inclusion of higher order thinking skills as observation.	183
Table 4.9	Simulation-based learning and teaching process at the stage of debriefing for the inclusion of higher order thinking skills.	185
Table 4.10	Evaluation of simulation-based learning process in enhancing higher order thinking skills.	187

**Pages**

Table 4.11	Inclusion of Higher Order Thinking Skills in learning outcome of simulation-based Learning Module.	189
Table 4.12	A study on the simulation-based learning and teaching process for the inclusion of higher order thinking skills at the level application, analysis, evaluation and creating as outcome.	320
Table 4.13	Evaluation of Clinical Simulation in Enhancing Higher Order Thinking Skills	198
Table 4.14	A study on student's perception towards simulation-based learning.	330
Table 4.15	A study on facilitator's perception towards simulation-based learning.	336
Table 4.16	A study on role of facilitators in clinical simulation.	340



**LIST OF SCHEDULES**

	<b>Pages</b>
Schedule 1.1 Curriculum Structure of Medical Assistant Program	344
Schedule 2.1 Operational Definition of Thinking Skills based on Bloom's Taxonomy	345
Schedule 2.2 Revised Bloom's Taxonomy	346
Schedule 2.3 Fink's Taxonomy of Significant Learning	347
Schedule 2.4 Structure of Observed Learning Outcome	348
Schedule 2.5 Types of Simulation	349
Schedule 3.1 Clinical Case Scenario	350
Schedule 3.2 Document Analysis Of Simulation-Based Learning Module	376
Schedule 3.3 Observation Protocol	377
Schedule 3.4 Interview Protocol	380
Schedule 3.5 Performance Evaluation Format	382
Schedule 3.6 Audit Trail	386
Schedule 3.7 Informed Consent sample format	391
Schedule 3.8 Approval to carry out the study	392
Schedule 3.9 Research Plan	393

**APPENDICES:  
SAMPLE OF CONTENT ANALYSIS, OBSERVATIONS,  
INTERVIEWS, AND VIDEO DOCUMENT**

	<b>Pages</b>
Appendix 4.1 Content Analysis of simulation module	394
Appendix 4.2 Transcription of Pre simulation observation and assessment	398
Appendix 4.3 Transcription of Post simulation observation and assessment	416
Appendix 4.4 Transcription of Student's perception towards clinical simulation	437
Appendix 4.5 Transcription facilitators perception towards clinical simulation	442
Appendix 4.6 Video Document of Clinical Simulation Intervention	447

## CHAPTER 1

### INTRODUCTION

#### 1.1 Introduction

Clinical competence, confidence, intellectual integrity and social cognition are integral components that underpin the provision of quality healthcare to the society. In the era of health consumerism that focuses on quality necessitate healthcare providers to be equipped with relevant knowledge, skills, attributes and values to be competent and functional in rendering safer care (WHO, 2009). Competence relates to the ability of transferring knowledge, skills, and attitudes that ties to personal abilities in performing a task (Carraccio, Wolfsthal, Englander, Ferentz, & Martin, 2002; Kak, Burkhalter and Cooper, 2001). This requires the ability to use mental processes to think about and articulate problems, churn ideas and opinion; infer from context; generalizing ideas and information from one context to another; information synthesis and evaluation, understanding differences of opinion among individuals and working ethically which involves higher order thinking (Baron & Sternberg, 1987; Gardner, 2008; Pogrow, 2005).

The importance of higher order thinking skills in Medical and Nursing education, especially the component of critical thinking, clinical reasoning and problem solving skills, and its relation to rendering quality care has been well supported by numerous studies (Banning, 2008b; Bridger, 2007; Salvage, 1993; Wong et al., 2005). Similarly, Elengovan (2009) have identified the need for higher order thinking skills in Medical Assistant education to produce clinically competent graduates who will be working in collaboration with medical practitioners and allied health professionals to render quality health care services. Infusing higher order thinking skills into the main streamline of the educational process requires a blend of technology and pedagogy that can accommodate a myriad of cognitive skills that can be defined, packaged, and consumed at various levels of student's maturity and readiness, and ultimately measured and assessed at individual basis. Current advances in the field of medical technology and artificial intelligence provides a broader scope in exploring ways and mean to blend technology with pedagogy to bring about thinking, learning for understanding, and transfer of learning. A breakthrough in Medical education is the introduction of clinical simulation as teaching and learning model for improving clinical competency.

Medical and Nursing education has placed increased reliance on simulation technology to boost the growth of learner knowledge, provide controlled and safe practice opportunities, and shapes clinical competencies (Alinier, Hunt, & Gordon, 2004; Gordon, Harder, 2009; McCaughey & Traynor, 2010). Simulation allows multiple learning objectives to be taught in a realistic environment that improves competence and confidence without harming patients and simultaneously offer students the opportunity to gain and improve their knowledge in a non-threatening, experiential environment (Medley & Horne, 2005; Moule, Wilford, Sales & Lockyer, 2008; Wilson, Shepherd, Kelly & Pitzner, 2005; Ziv, Wolpe, Small & Glick, 2003) as well as enhancing clinical reasoning

and decision making skills (Croskerry, 2000b; Issenberg, Mc-Gaghie, Petrusa, Gordon & Scalese, 2005). Clinical reasoning and decision making skills are important component of clinical competence that requires higher order thinking. The ability to frequently practice and manage clinical scenarios helps students to prevent medical error (McCallum, 2006); while detailed feedback promotes discussion and reinforces the learning process (Croskerry, 2000b). Although, most studies on clinical simulation focused on areas of clinical competence; the usefulness of clinical simulation in enhancing higher order thinking skills need to be explored. The question is how well does clinical simulation function to enhance higher order thinking skills among students of the Medical Assistant Program?

## **1.2 Background of Study**

The importance of teaching higher order thinking skills in Medical Assistant Education to prepare its graduates for personal and professional competence is increasingly recognize as a primary function of training (Elengovan, 2009). The need for learners to critically appraise evidence and make clear clinical judgments in the prevention and management of diseases as well as in the promotion of health requires higher order thinking. Medical and Nursing education has placed great importance and emphasis on engaging higher order thinking skills in diagnosing and managing clinical cases (Edwards, 2004; Vrahnos et al., 1998; Wong et al., 2005). The ability to engage in carefully with reflective thought that has been viewed in various dimensions and decisions of good choice requires effective thinking. Nurses have long talked about higher order thinking skills as an expected competency at all levels of education and practice (Reed & Procter, 1993). Higher order thinking skills not only develop confidence, open-mindedness, flexibility, inquisitiveness,