Instructional simulations and the concepts of shared cognition

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INSTRUCTIONAL SIMULATIONS AND THE CONCEPTS OF
SHARED COGNITION

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ABSTRACT

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Graduates of registered nurse educational programs are expected to bring some degree of preparedness for intervening in emergency situations. However, within the clinical portion of the curricula a student may not have the opportunity to observe and or participate in patient respiratory or cardiac resuscitation. Volunteer participants, student nurses, engaged in practice with a human simulator (SimMan) and teacher guided dialogue to assist in the construction of nursing knowledge in a safe, supportive environment. SimMan was programmed with eight scenarios depicting common patient emergency situations. Simulations and debriefings were videotaped and transcribed. Post employment interviews were audio taped and transcribed. Discourse analysis was utilized to determine if the simulations assisted the students to incorporate the language used in verbal communication within the usual discourse of the setting and the discipline, as well as incorporating previous and new information.

Participants demonstrated acquisition of meaning of selected scientific concepts and constructed a personal scaffold of learning. Employed graduates, reported that simulation
and debriefing, was consequential in their progress as a student, as well as a new nurse employee. It accelerated their confidence in assuming the appropriate role responsibilities, hastened participation, and lessened hesitancy in acting.
TABLE OF CONTENTS

ABSTRACT ................................................................................................................................. iii

LIST OF FIGURES .................................................................................................................. viii

LIST OF TABLES ....................................................................................................................... ix

ACKNOWLEDGMENTS ....................................................................................................... x

CHAPTER 1  INTRODUCTION ............................................................................................1
  Purpose and Significance ................................................................................................. 5
  Theoretical Framework ......................................................................................................... 6
  Research Questions ............................................................................................................... 7
  Limitations .............................................................................................................................. 9

CHAPTER 2  REVIEW OF LITERATURE ...................................................................... 10
  Search Process .................................................................................................................... 10
    Nursing Profession ........................................................................................................ 11
  Simulation in Nursing ......................................................................................................... 15
  Simulation Development .................................................................................................... 30
  Vygotsky .............................................................................................................................. 33
    Vygotsky’s Social/Cultural/Historical Theory of Learning and Development .. 33
  Instruction ............................................................................................................................ 39
  Criticisms of Vygotsky’s Theory ....................................................................................... 41
  Distributed Cognition .......................................................................................................... 44
  Situated Cognition ................................................................................................................. 51
  Shared Cognition .................................................................................................................. 54
  Gaps in the literature ........................................................................................................... 63

CHAPTER 3  METHODOLOGY ....................................................................................... 65
  Design of the Study ............................................................................................................. 65
  The Context of the Setting .................................................................................................. 67
  Pilot Study ............................................................................................................................ 73
  Study Procedures ................................................................................................................. 73
  Data Collection Procedures .............................................................................................. 76
  Participants ............................................................................................................................ 77
  Simulation Context ............................................................................................................. 80
  Role of the Researcher ......................................................................................................... 81
  Research Questions ............................................................................................................. 82
CHAPTER 4  FINDINGS OF THE STUDY ......................................................... 96
Research Questions ....................................................................................... 96
  Research Question One .................................................................................. 96
    Jointly Developed Knowledge ...................................................................... 97
    Common Ground .......................................................................................... 99
    Required Previous Knowledge ................................................................... 101
    Nursing Knowledge Used ........................................................................... 103
  Research Question Two ................................................................................ 105
    Knowledge Gained from the Interaction .................................................. 105
    Comparison between Perceived Actions and Actions Viewed ............... 107
    Simulation Roles ....................................................................................... 108
    Problem Solving ....................................................................................... 113
  Research Question Three ............................................................................. 116
    Preparation for Role .................................................................................. 117
    Changes in Thinking ................................................................................. 120
    Modification Correction of Inaccuracies ................................................... 122
Summary of Findings ...................................................................................... 123

CHAPTER 5  CONCLUSIONS AND RECOMMENDATIONS ............................ 126
Conclusions ..................................................................................................... 126
  Scaffolding of Ideas ..................................................................................... 127
  Higher Concept Formulization .................................................................... 128
  Intertextuality and Intercontextuality ......................................................... 128
  Learning Communities ............................................................................... 129
  Shared Cognition ....................................................................................... 129
  Consequential Progression ....................................................................... 130
  Convergence of Shared Cognition ............................................................... 132
Implications for Nursing Education .............................................................. 135
  Subsequent Curricular Revisions ................................................................. 137
Recommendations .......................................................................................... 139
  Future Research Potentials ........................................................................ 140

APPENDIX I  EXAMPLES OF CONVERSATIONS DURING SIMULATIONS 142

APPENDIX II  DEFINITION OF CONCEPTS .................................................. 153

APPENDIX III  SOCIAL/BEHAVIORAL IRB – EXEMPT REVIEW .................. 156

BIBLIOGRAPHY ............................................................................................... 158
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>Theoretical Framework</td>
<td>8</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Everyday and Scientific Concept Development</td>
<td>38</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Event Map</td>
<td>71</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Study Timeline</td>
<td>76</td>
</tr>
<tr>
<td>Figure 5</td>
<td>SimMan Monitor and Manikin</td>
<td>80</td>
</tr>
<tr>
<td>Figure 6</td>
<td>SimMan Close Up</td>
<td>80</td>
</tr>
<tr>
<td>Figure 7</td>
<td>Convergence of Shared Cognition Over the Simulations</td>
<td>136</td>
</tr>
</tbody>
</table>
LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1</td>
<td>Description of Patients Conditions and Simulation Objectives</td>
<td>69</td>
</tr>
<tr>
<td>Table 2</td>
<td>Debriefing Questions</td>
<td>72</td>
</tr>
<tr>
<td>Table 3</td>
<td>Sketch of Participants</td>
<td>79</td>
</tr>
<tr>
<td>Table 4</td>
<td>Dialogue Interactions</td>
<td>89</td>
</tr>
<tr>
<td>Table 5</td>
<td>Data Analysis RQ1 and RQ2</td>
<td>115</td>
</tr>
<tr>
<td>Table 6</td>
<td>Post Employment Interview Questions</td>
<td>116</td>
</tr>
<tr>
<td>Table 7</td>
<td>Data Analysis RQ3</td>
<td>123</td>
</tr>
<tr>
<td>Table 8</td>
<td>Development of Shared Cognition</td>
<td>134</td>
</tr>
</tbody>
</table>
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CHAPTER 1

INTRODUCTION

One goal of the nursing faculty, as well as an expectation of employment agencies, is that graduating students have experience in providing life saving skills associated with emergencies. However within the clinical portion of the curriculum a student may not have the opportunity to observe patient respiratory or cardiac resuscitation. Even if the student had participated in an actual emergency code situation, the learning opportunity may have been overshadowed by the student’s stress and emotional response. High fidelity simulation experiences can rectify some of these learning issues. Winn (2002) discussed how technology should support learning and that simulation could create a facsimile of the phenomena in which the same technical and intellectual tools were used. The social aspect of learning could “shed light on processes and products of learning” (p. 340).

Hovancsek (2007) briefly traces the path of simulation from early resuscitation trainers, use in aviation training and anesthesia education to the rapid influx into nursing education curricula. Aronson, Rosa, Anfinson, and Light (1997) identified multiple benefits to simulated clinical problem-solving: simulation can overcome the difficulty of teaching problem-solving while simultaneously caring for a real patient; student anxiety tied to provision of care is lessened; the unpredictability of both the specific situation...
and the repeatability of the situation can be controlled; and the pace of delivery of
nursing care can be slowed, unlike care provided in most acute care agencies. The
simulations on which Aronson, et al., (1997) reported were based on the use of task and
skill trainer manikins and the goal of the simulation was to increase the “student’s clinical
thinking process” (p. 18). Simulations have been used in the education of medical
students (Muramoto, Campbell, & Salazar, 2003; Boulet, Murray, Kras, Woodhouse,
However, evidence of the use and value of simulations in nursing education is in its
infancy.

Simulated learning allows the student to actively participate; gain information and
learn from more skilled people (Rogoff, 1991). Rogoff suggested that apprenticeship
affords the learner the provision of “tools for thinking...and discussion of rationale for
decisions” (1991, p. 356). Apprenticeships typically occur within the community of
practice, which is also true with nursing, however due to the gravity of situations that
students may face upon graduation; a time for long apprenticeships on the job is not
available. One can view simulations as a modified form of an apprenticeship, which
allows new graduates a more comfortable entry into the profession. This welcoming of
“newcomers” into the profession, an established community of practice, has been of
concern for many years, and was studied by Lave and Wenger (1991). In both the 1991
Lave and Wenger study and in Lave’s follow up study (1996), the learning necessary to
become a member of a community of practice in which the person is socially situated was
described. It was noted that learning occurs as the person participates in the ongoing
activities of the community (legitimate peripheral participation). As the practices of the
community change, so does the learner (apprenticeship learning) change. Leave emphasized that the learner, the situation, the teacher, and the cultural tools could not be separated artificially for study. In her research, Tanner (2006) focused on the assumption of professional discourse in the role of the nurse. Specifically the research examined if following exposure to an educational experience of simulation, where appropriate terms, descriptions and professional language, were used would the students’ discourse become more ‘nurse like’.

When an individual, in this case the student nurse, gains a “sense of the thinking” within a domain and subsequently uses that understanding or common knowledge in practice, shared cognition has occurred. Shared cognition incorporates language, verbal and non-verbal communication, previous and new information, and the usual discourse of the setting and or discipline. Shared cognition is defined as the appropriate use of symbol systems, methods of reasoning, vocabulary, and word meaning in discourse.

The domain, or community in this study, was clarified using the Henri and Pudelko (2003) model for studying communities. These authors believed that the primary learning objective of each community type and how meaning is derived within the community serves as the means for assessing the characteristics of a community. The four types of communities identified were: communities of common interest; goal-oriented or project teams; learners comprised of students; and members of a discipline or practitioners working together. Henri and Pudelko defined a learners’ community as “participation in practice as a means to learn” (p. 482 and a community of practice as “developing among people who, in the real world, are already part of a given community” or “is the results of
involvement of individual in the actions of professional practice (p. 483). The type of community in the current study was identified as a learners'/practice community or a simulated community of practice.

To provide students the opportunity to acquire needed skills the School of Nursing purchased a human simulator, Laerdal’s “SimMan”. Faculty members use SimMan to teach assessment, psychomotor, and organizational skills associated with various clinical situations, including the “code” experience. The human simulator can be programmed for common and uncommon patient scenarios. It allows students the opportunity for repeated practice and limited interference in a safe, supportive environment. However, specific methodologies to assist the student to “construct meaning” of the situation have not been utilized or not utilized in a systematic manner.

As noted previously, simulations provide students an opportunity to develop an understanding of who is involved, what and how participants behave and what learners need to learn to become full participants in the professional community. The simulation experience also allowed the practice of discourse, and through discussion assisted the student to garner meaning of the event. The fulcrum of situated cognition is on the activities of the community and the ongoing interactions in which the newcomer participates. Because the novice is continually practicing, they eventually develop expertise in the situation.

Shared cognition captured the authors’ attention since introduction to the construct. Each concept, contributing to the construct of shared cognition, appeared relevant to the methods and techniques used in nursing education. A major goal of nursing education is to socialize students into the profession. The length of time allowed for this socialization
is relatively short. For students to be successful, they must construct a personal scaffold of learning. The scaffold allows students to adopt, organize and elaborate higher order scientific concepts. Concepts are introduced and developed in the classroom, but it is frequently during the clinical experience that meaning is attached to the concepts on the scaffold. Nursing’s use of the apprenticeship model, allows students to interact with faculty, peers, and a whole myriad of clinical staff within the practice setting (learning laboratories, hospitals, community centers, etc) to gain knowledge, skills and attitudes of the professional nurse. The above participation opportunity fits the description of a community of practice, and within this setting experiential opportunities and discussion provide the student the opportunity to engage in higher concept formulation and adoption. The experiences in both the learning laboratory via simulation or in the clinical setting occur in what Vygotsky described as a zone of proximal development.

Purpose and Significance

Joining a community of practice includes mastering the symbol systems of the culture, methods of reasoning, vocabulary and word meaning. If participants (nursing students) do not master these processes, they may experience difficulty in planning and problem solving during school and beyond. The development of complex functions, where meaning is acquired and internalized by the learner through practice, begins in interactions within the zone of proximal development. Edwards and Mercer (1987) describe the process as the acquisition of principled knowledge. Principled knowledge is explanatory, aimed at understanding how procedures and processes work and why certain conclusions are necessary or valid. Acquiring mastery of principled knowledge, as
opposed to ritual knowledge, is the goal. Ritual knowledge was defined as knowing how to do something without grasping the underlying principles. The purpose of this explanatory study was to explore the relationships and patterns of the usual discourse of the setting and discipline that result in shared cognition.

Theoretical Framework

Wertsch (1991) describes shared cognition as mental functioning which occurs within social interactions among two or more individuals and takes place in the larger context of the culture and society of the participants. Distributed, situated and shared cognition literature were reviewed, with fuller exploration related to distributed and situated cognition, as they formed the basic structure of this study. Shared cognition encompasses legitimate peripheral participation of apprentice learning (situated cognition) and distributed cognition is a needed inclusion of mediated activities across the group, tools and artifacts. Shared cognition relies on understanding concepts of Vygotsky’s zone of proximal development and scientific and everyday conceptual development and the contribution of developing common knowledge. Common knowledge is developed by establishing intersubjectivity in the conversation and written work of the participants.

Shared cognition relies on understanding Vygotsky’s concepts of zone of proximal development, the acquiring of scientific and everyday conceptual knowledge, and how these concepts contribute to the development of common knowledge. Common knowledge is developed by establishing intersubjectivity (shared understanding between communicants) in the conversation and written work of the participants (Edwards and
Mercer, 1987). As nursing students are socialized into the profession, higher order scientific concepts are adopted, organized and elaborated upon by the student and other group participants. The participation in a community of practice and apprenticeship learning results in opportunities via discussion, or scaffolding, to enhance the student nurses’ abilities. Vygotsky believed that higher forms of thinking were not achievable until adolescence. The current research attempted to expand the range of the discussion to include adult assumption of discipline reasoning and examined discourse of the participants through the lens of the identified theoretical framework (figure 1).

Research Questions

The current study was designed to contribute clarification as to how to foster acquisition of shared cognition or common knowledge. Yin (2006, p. 112) states that research questions may be both descriptive (asking what happened) and explanatory (asking how or why things happened). In this study both aspects were explored. Research questions of the study were:

1. What is the role of simulation as part of the learning process?
2. How does the interaction during and after the simulation contribute to the knowledge base?
3. How does the participation in the simulation prepare students for future roles?

In examining the role of simulation as part of the learning process, (RQ1) the researcher noted jointly developed knowledge, the degree of common knowledge, was used as discussed by the participants during the debriefings. In analyzing the interactions during and after the simulations, (RQ2) the researcher noted what knowledge resulted
from the interaction, what roles were needed in the simulation and in practice and how problem solved during the simulation were discussed in the debriefings. For determining whether participation in the simulation prepared students for future roles (RQ3), the researcher identified how prepared the students were to assume the identified roles, how thinking changed due to involvement in the simulation, resulting from analysis of the discourse during the debriefing.

Figure 1. Theoretical Framework
Limitations

The aim of the activity during the study was to prepare the student via simulated practice to participate successfully in the shared thinking of the health care team during an actual code. Limitations include the fact that thinking that was sampled focused only on emergency practices. In addition, it was not verified through observation if participants retained or transferred knowledge to actual emergency cases. Development of expertise was not anticipated in that deliberate practice, over many years, is necessary prior to mastery.

Kneebone, Scott, Darzi and Horrocks (2004) urged the linkage of clinical simulation with clinical practice. However, timing or scheduling of emergencies isn't possible. Students may or may not be practicing in the clinical area on the day an emergency occurs. If the student does have the opportunity to participate in an actual code, revisiting the simulation laboratory for additional practice is not planned within the study. Formal practice such as certification in advanced cardiac life support (ACLS) does occur after licensure and employment.

My role as a researcher and as a teacher could have limited or enhanced the readiness of the responses from the students if the students view the role as being in conflict. However, the activity is not graded and is a usual occurrence in the course.
CHAPTER 2

REVIEW OF LITERATURE

Literature reviewed in support of the study included a summary of the search process, followed by description of the context of nursing education and challenges faced in integrating technology such as simulation into the curriculum. The theoretical framework will be introduced and expanded. Theoretical direction from Vygotsky's social cultural historical theory of learning and development and views of instructional purpose were studied. In addition, a comparison of distributed, situated and shared cognition precepts, and selected simulation literature of practical and theoretical importance to prospective researchers, discourse analysis pertinent to the study and gaps in the literature were addressed.

Search Process

On-line databases were used to review material a the University of Nevada, Las Vegas library website. Databases used were Academic Search Premier, ERIC, Professional Development Collection, PsycINFO, PsycARTICLES and Dissertation Abstracts. The initial searches cast broadly, for example search descriptor were Shared Cognition, Distributed Cognition, Situated Cognition, Vygotsky, Simulation and Nursing. Each concept was then explored individually and in combination in searching for relevant
literature. Searches were refined by further specification of terms such as adding terms to modify results. When appropriate articles were identified, the researcher used the listed references to discover additional literature for evaluation for inclusion in this study. The process of extending the search for relevant sources included literature introduced in coursework and the discovery of three particularly helpful books, *Distributed Cognitions and Educational Consideration*, (1991) edited by G. Salomon, *Perspectives on Socially Shared Cognition*, (1991/2004) edited by L. Resnick, J. Levine & S. Teasley and the *Handbook of Complementary Methods in Education Research*, (2006) edited by J.L. Green, G. Camilli, & P.B. Elmore.

Literature as either deemed appropriate to the review and retained or discarded as ill fitting to the study. The researcher discarded literature found to be only tangentially related after reviewing the article. Selection of the article in the first place was a result of inclusion of the term of interest in the citation or abstract often selected based on inclusion of a selected term in the citation or abstract. Time limitations were not placed on any of the searches and periodic revisits to the databases took place over the course of the two-half year study. Theoretical literature was more abundant than empirical literature and the researcher was careful to include studies reflecting research based articles when available.

**Nursing Profession**

The knowledge needed by the new nursing graduate has continued to evolve and expand as conditions in the health care arena change and advances are made. Nursing curricula has been added to by expansion of specialties, inclusion of health promotion as well as illness prevention and intervention and the increased acuity of patients in their
illness trajectory prior to treatment being sought. Nursing care is set in the broader context of health care concerns, including increased demand for evidence based nursing practice in practice settings and the nursing shortage in both registered and providers and nurse educators. Rising health care costs make up a growing portion of gross national product. In response to the identified changes, the essential content needed for undergraduate education was revised by the American Association of Colleges of Nursing in 1998 and again in Fall 2008. The current revision has just been disseminated. The documents serve as guidelines for curricular revision in schools of nursing. In writing about the 1998 version, Tanner, editor of the Journal of Nursing Education, shared her concerns in an editorial:

“The American Association of Colleges of Professional Nursing Practice recently completed a landmark work on the Essentials of Baccalaureate Education for Professional Nursing Practice (AACN, 1998). This document details professional values, core competencies, core knowledge and role development. My study of the document suggests it is a blueprint for the 21-year curriculum; yet, I cannot identify a single competency or set of core knowledge that I think should be left out of a basic professional nursing curriculum (p. 384).

The concern about the increasing amount of content needed has continued, as voiced by Diekelmann (2001) in her description of the additive curriculum. Ironside (2004) suggested that covering the content as a conventional pedagogy had precluded emphasis on thinking about how teaching might change to engage students in leaning and “how students learn to think in evolving and complex health care environments (p. 6).
Giddens and Brady (2007) traced the influences of content saturation arising from continued explosion of information and technology; teacher centered pedagogy in nursing, repetition of content in both the prerequisite coursework and across courses within the nursing program and employer demands for an increasing accomplished nurse graduate.

Both medical students and practicing physicians have used simulation for the purpose of teaching, as well as, the evaluation of clinical performance. Simulation in preparation for practice has been in use in aviation and medicine over the past several decades. Gaba, Howard, Fish, Smith and Sowb (2001) reported on the Anesthesia Crisis Resource Management curriculum, patterned after crew resource management used in aviation training, and its implementation in 1990. The curriculum focused on crew training consisting of scenarios based in the operating room, accompanied by usual team members (surgeon, anesthesiologist, circulating nurse and scrub technician). The scenarios are realistic situations including patient deterioration potential-patients were not allowed to die except in the scenario designed for experience with death.

Gaba, Howard, Flanagan, Smith, Fish and Botney (1998) rated performance of anesthesia teams patterned after team training used in aviation industry, 72 subjects participated in teams of four. The authors in the article reported on two simulations, cardiac arrest and malignant hyperthermia, the performance ratings and crisis management behavior ratings. Technical performance ratings were in the acceptable category and received high inter-rater reliability scores. The authors noted that team behavior ratings was substantially different between teams and inter-rater reliability
system needed to be improved. The authors concluded that both types of performance can be rated meaningfully from video-taped simulations.

Weller (2004) conducted a simulation class on management of medical emergencies as a sub-section of a larger medical student rotation. Thirty-three 4 year medical students participated in one of four simulations in groups of 5-6 students. The students debriefed following the simulation focusing on how they performed and what improvement could be made in their reasoning and treatment plans. The nonparticipants observed the simulation. Participants reported increased confidence levels, improved integration of theory and practice, the learning experience was rated as a valuable teaching strategy and their competence risen.

The simulation experiences have taken many forms, but Kneebone, Scott, Darzi and Horrocks, (2004) who are physicians, urged the linkage of clinical simulation with clinical practice. They encouraged mixing practice in the simulated patient experience with actual situated learning in clinical care. The authors believed that acquiring at least minimal levels of competence in the safety of a simulated laboratory would lessen risk for patients and for learners.

Bradley (2006) reported on the stimulus behind the use of simulation in medical education as a result of needed reform in medical education (need for improved clinical skills learning); the advent of the first resuscitation trainer and improved outcomes in resuscitation, and the development of more sophisticated high fidelity simulators capable of supporting improved team based functioning such as crew resource management used in aviation training and applied to anesthesia training. Clinical simulation education was also driven by societal expectation (shorten training time, reform of training practice
conditions, increasing population acuity), professional regulation (inter-professional learning) and political accountability (patient safety). The same forces were present and have influenced nursing education.

Nursing education has made use of laboratories to help students gain psychomotor skills. Practice developing skills help students to bridge gap between theoretical knowledge and experience in the clinical patient area. Technology has always played an important tole. Preparation for clinical nursing practice has changed from practice on fellow classmates; viewing filmstrips and listening to audio-taped breathe sounds to the use of static manikins and computer based instruction. Practice formats have continued to evolve from role playing of clinical situations among students (Johnson, Zervic & Theis, 1999) to the use of low fidelity manikins; and since the late 1990s, the use of high fidelity human patient simulators. However, evidence of the use of simulations is a relatively recent event in nursing literature.

Simulation in Nursing

The breadth and depth of nursing research studies about stimulation has increased over the last 15 years and has ranged from studies assessing simulation’s viability as a teaching strategy, to provision of “instruction manuals” for conducting simulation; as well as survey’s of utilization of simulation.

Nehring, Ellis and Lashley (2001) documented their experiences with human patient simulators in nursing education in the spring of 2000. The authors noted that there was only one article at the time of their study that has used human patient simulation in nursing courses. A convenience sample, 42 senior nursing students, participated in human patient simulations during an advanced medical-surgical course to test retention of
learning. The students listened to a one hour lecture focused on the disease process of concern, completed a pretest, and participated in one of three scenarios. The students were asked to care for the patient using the nursing process of assessment, planning, intervening and evaluating outcomes. The participants completed two post tests, the first immediately after their participation and the second, 5-7 days later. The participants results on the first post test differed significantly (Wilcoxon signed ranks tests) from the pre test but no difference was found between the first post test and the second post test.

Through the auspices of the National League for Nursing and the Laerdal Corporation, a multisite, multi-method study was initiated in 2003 focused on simulation use in nursing education. The project director and subsequent book editor was Jefferies, a nurse researcher and Rizzolo, senior director of professional development at the National League for Nursing. The project was developed in phases occurring over a three year period. Phase 1 included design of the research, IRB approval and recruitment of project director and coordinators at the eight sites selected for participation. Next in phase 2, the researchers developed and tested a video typed simulation based on care of a post-operative adult patient and validated instruments to be used in subsequent studies with 395 students. The simulation was pilot tested at one site in phase 3 and refined as necessary. The standardized simulation was implemented at the multiple sites using both a control groups and experimental groups. The simulations were provided to a total of 403 students randomized into three different formats for delivery of the simulation, paper/pencil case study simulation, hands-on simulation with a static mannequin and hands-on with a high-fidelity patient simulator. In the phase 4, the experience using both paper/pencil case study and high-fidelity simulator were compared. Both groups (110
students) participated in the two formats, half of the group in paper/pencil case study first followed by simulator experience and half receiving the revered order of simulations.

The research question in phase 4 compared differences in learner satisfaction with the formats, differences in the learners’ perceptions of importance of educational practices when two formats or only one type of simulation was used and differences in how the students perceived their performance in the two formats. Results included ratings of significantly higher satisfaction, confidence and presence of active leaning in the high-fidelity simulation group. The paper/pencil case study group reported significantly higher ratings of higher expectations and collaboration.

Rauen (2004) reported on the use of HPS in school of nursing and an acute care hospital. A list of benefits was shared and provided in support of simulation as a strategy to improve critical thinking and skill training in nurses new to the intensive care unit. A partial benefit list were involvement of nurses via an active learning process mimicking realistic patient problem while providing control of the clinical situation without risking harm to an actual patient.

Spunt (2004) found that a simulated mock code was a bridge between clinical experience and theory discussion in the development of nursing student’s clinical thinking process. The students participated in a patient-nurse scenario requiring the performance of various code roles by the nurse and implementation of a resuscitation process. It was noted that team dynamics and role performance were experienced in a safe, predictable setting. Cognitive, affective and psychomotor domains of learning available for exploration during the debriefing session.
Feingold, Calaluse, and Kallen (2004) described benefits of simulation as including reduced risk, the interactive nature, opportunity for repeated practice (especially for infrequent events), feedback, reproducibility, and the ability to interrupt for performance improvement, plus the benefit of repeated practice with improved practice and corrected errors. These conclusions were reached while studying student participants in a course focusing on advanced acute care of the adult (Spring-n of 37 and Fall-n of 28). The methodology of the study included distribution of a shift change report, entry into the simulation based on one of several presented scenarios. Each scenario included diagnostic laboratory values and new physician orders for the patient. Students were asked to interact with the patient in a realistic manner for the purpose of prioritizing problems, implementing actions and communicating with the patient, family and health care team. Following the simulation, participants completed a survey focused on the realism of the simulation, the ability to transfer skills, and the overall value of the experience. Eight-five percent of the students believed that the simulation was realistic. However, agreement concerning the transferability of learning was mixed. The degree to which the simulation tested clinical skills performance and decision making was greater than 83% agreement and 69% of the students reported the experience to be valuable and improved learning (76%). Fifty-four point seven percent of the students did not believe that the simulation would prepare them to “function in a real clinical environment” (p160).

Medley and Horne (2005) pointed out several advantages related to the use of simulation in nursing education. These advantages included fidelity to clinical practice situations, high student involvement, consistent reproducibility of scenarios, and immediate feedback for the learner. They stressed the importance of identification of the
content and goals of the session, arranging times for practice in the simulation laboratory, and prior ability of the facilitators to use equipment when planning to use simulation. They also believed that the goals and conduct of the debriefing sessions should be established before the experience and that time for group review of their performance, as well as critique for improving performance was essential.

Comer (2005) identified benefits of simulations as actual demonstration of preparation for clinical performance, the ease of linking theory content with clinical practice, the creation of a safe, non-threatening environment to actively learn and hone competencies. The simulations were structured to include identification of the clinical condition, planning and implementing nursing interventions. If the appropriateness of interventions were doubtful, the patient experienced deterioration in his or her clinical status. Students could ask for additional information as needed. The debriefing session included emphasis on the key ideas and essential judgments, perceptions of fidelity of the simulation, and any likely changes in thinking or anticipated behavior changes.

Hravnak, Tuite, and Baldisseri (2005) reiterated common advantages to high fidelity human simulations as decreased patient risk, realism, enhanced critical thinking process, skill development, exposure to scenario directed toward specific learning targets. The disadvantages listed were the inability to reproduce a real patient experience no matter the degree of fidelity in simulation, the initial and on-going costs to support simulation, and the consumption of faculty and student time. The unique contribution of this article was the description of debriefing: the topics for discussion after the simulation were identified as event management, the student’s decision making process, communication during the simulation, and awareness of resources used. The debriefing consisted of a joint critique.
of the taped simulation by students and faculty members. Suggestions were made and alternative actions were identified.

Childs and Sepples (2006) tested the reliability and validity of two instruments used in the National League for Nursing (NLN) study discussed above. 55 nursing students (registered nurses and undergraduate initial nursing degree students) participated in the study to test the reliability and validity of two instruments used in the eight-site UNLV study. Two students completed the simulations and the other students observed their performance which was ranked and evaluated on forms. Data was collected on the Educational Practice Scale for Simulation (EPSS), a 16 item instrument using a five-point scale to measure whether four education practices (active learning, collaboration, and diverse ways of learning and high expectations) were present in the simulation and the importance of each practice to the learner. The study produced multiple findings. The EPSS was valid and reliable (data included in a follow up article by the authors). Two technical issues were identified-the appropriate gender voice for the scenario should be used, not the faculty member running the simulation voice and that more than 10 minutes was needed for debriefing. The student’s found that the feedback was the most important factor from their perspective. “These interactive, focused, energetic laboratory experiences proved to be valuable experiences for learning psychomotor skills and developing critical thinking.” (p. 158).

Bremner, Aduddell, Bennett & VanGeest (2006) evaluated specific students’ response regarding the use of HPS in simulated clinical scenarios, 56 students participated in the scenarios in preparation for their first clinical experience. The authors gained information in four areas of interest: the utility of simulation as a teaching learning
strategy, perceptions of realism of the HPS, limitations identified in using HPS methodology and the student's confidence and comfort with the use of the HPS in teaching assessment skills during clinical scenarios. 41 students completed a questionnaire about the experience in which 95% rated the session from good to excellent; 68% thought simulation should be a mandatory part of nursing education; and 61% felt they had gained confidence.

Larew, Lessans, Spunt, Foster and Covington (2006) outlined the factors they believed to be necessary to provide an effective simulated patient care experience. They emphasized that the simulation protocol must be developed starting with preparation of the learning objectives, gathering needed equipment and providing for an adequate number of facilitators. They believed that the patient scenario should focus on development of student's capabilities in solving a common or typical problem faced by patients in clinical settings. The protocol design should be flexible enough to allow a range of responses, from the ideal student response to no recognition of cues and clues that would lead to deterioration of the patient's condition. The authors noted, that Laerdal's SimMan, can be programmed (computerized responses) to respond to the student's interventions and decisions. In addition, they believed it is beneficial to construct scenarios that required consultation with other caregivers, family members, or any other personnel. The authors cautioned that the level of complexity of the scenario must not exceed the student's capabilities, should develop in response to the student direction, and that the scenario should be presented at an appropriate pace allowing the learner to process information and deliver care.
Nehring & Lashley (2006) reported the results of an international survey of human patient simulator use (Medical Education Technologies, Inc or METI) in responding schools of nursing (34). The authors summarized use of HPS in nursing education as still developing and used primarily in “undergraduate physical assessment, advanced undergraduate medical-surgical, graduate physical assessment and nurse anesthesia courses” (p. 248).

Robertson (2006) implemented an obstetrical nursing care simulation with senior nursing students in preparation for their clinical rotation in obstetrics. The students conducted assessments and provided nursing care for a simulated patient. The simulated patient experienced both usual and emergency care needs which were revealed by performance of appropriate care interventions. Three students formed a team and the additional group members observed the exercise until their subgroup took over. The patient care scenario consisted of three distinct sub-sections through which the groups rotated. Each participant had the opportunity to perform within their team. Debriefing sessions were conducted to assess the student’s perception post simulation. The students provided feedback on a simulation and learning environment questionnaire including what was liked most and least about the experience. The author reported the student’s comments reflected the simulation closely approximated an actual patient care experience and the student’s had enjoyed their participation. However, comments expanding on how the experience required them to “think on their toes” and “to work through steps; prioritizing” was not the focus of this study.

Schoening, Sittner and Todd (2006) examined students’ perceptions of a preterm labor in a simulated clinical experience (SCE). The SCE as a method of instruction was
conducted as a non-experimental pilot with a convenience sample of 60 baccalaureate, junior year second semester students. The authors followed Joyce and Weil's model for teaching simulation (orientation, participant training, simulation operations and debriefing). The simulations were videotaped and projected in real time to nonparticipating students. Students completed 10 item faculty developed questionnaire using a 4 point Likert scale. On the scale, students rated the experience as 3.64 as meeting the course objectives and 3.75 as increasing confidence and providing a satisfying experience. Qualitative data, derived from student written comments and weekly reflective journals provided several categories supportive of this learning methodology. The researchers found that the SCE allowed students the opportunity to have hands-on learning experiences that refined clinical skills and assisted in gaining confidence, self-efficacy and the opportunity to learn in a non-threatening environment. This study reinforced the work of previous authors.

Larew, Lessans, Spunt, Foster and Covington (2006) prepared clinical simulations corresponding to the novice learner's current performance capabilities, but permitted higher levels of performance if demonstrated. Initially prompts were vague, but increasingly became more obvious to the specific problem identification. Supplemental information included the patient's chart, the change of shift patient report, and bedside assessment data. The designers of the study noted the importance of matching the complexity of the patient problems with the actual and potential knowledge base of the student, the permissive presentation of patient problems directed by the student's pursuit of their first selected patient issue, and appropriate pacing of the scenario to accommodate the learner's processing and organizational needs.
Parr and Sweeney (2006) discussed implementation of simulation technology into a critical care nursing course. Students were asked to evaluate participation in the scenario via a six item posttest survey. Eight-one (81) percent of the participants (n=21) completed the survey. Results reported by the authors indicated one item, degree to which the students felt their decision making abilities were tested, was significantly different from mean scores on the other items (using a Wilcoxon signed rank test). The other items evaluated helpfulness of preparation for clinical practice, skill acquisition, cost/benefit of time spent, provision of safe arena for making mistakes, and recommendations for continuing simulator use.

Alinier, Hunt, Gordon, and Harwood (2006) compared treatment and control group scores of undergraduate nursing students on a clinical exam in an experimentally designed study. The control group experienced the usual course curriculum and the treatment group participated in additional training, two clinical simulated scenarios. The group who participated in simulations improved their performance scores on a subsequent exam by 14% in comparison to a 7% improvement in scores by the control group (p<0.001). The authors concluded that participation in simulations contributed positively to undergraduate student learning.

Reilly and Spratt (2007) conducted a qualitative assessment of the value of simulation as a learning strategy in undergraduate nursing curriculum. Twenty-one (21) second year nursing students voluntarily participated in a case-based VitalSim simulation. Each student pair cared for two patients over 40 minutes. Participation in the scenarios was used as preparation for their clinical practicum, which followed immediately after the simulation. Students received feedback generated by the simulator computer program and
debriefed for five minutes with the researcher. Two focus group interviews occurred with participants (n=20), the first interview, three days after the simulation and the second, eight weeks post simulation and five weeks after completion of the clinical rotation. The researchers found that students believed that they were prepared for their clinical experience and that their confidence was increased by participation. In addition, the authors found support for the simulation teaching strategy as evidenced by student comments related to actively thinking and feelings of authentic interaction in the scenario. The authors reported that increased self confidence translated to feelings of knowing what to do in the clinical setting.

Radhakrishnan, Roche, and Cunningham (2007) conducted a quasi-experimental study using systematic practice with simulated patients and the subsequent evaluation of clinical performance of senior, second degree (registered nurses working on a baccalaureate degree) nursing students. A total of twelve students participated, with six students in the control group and six students in the intervention group. Each student in the intervention group participated twice in the care of two-patient simulated clinical scenarios and then participated in the usual clinical assignment. The control group students only participated in the usual clinical assignments. Both groups then completed the end of semester two-patient simulated clinical scenarios. All study participants were evaluated using the same criteria on their performance. The intervention group of students scored higher on two categories (safety and basic assessment) using a Chi-square test. There were no significant differences between the two groups on the other five categories of care. The intervention group students practiced greater safety measures in patient identification and provided better basic assessment of vital sign changes.
The strengths of Radhakrishnan, Roche, and Cunningham’s study included the quasi-experimental design and the use of non-course faculty members for evaluation of performance. The study appears to be the first in nursing literature that used a two-patient design. The systematic practice required only two additional hours above to the usual experience, and may have contributed to the small difference between the groups. The authors identified limitations of small sample size, that generalizations to other populations were limited, and the study used convenience sampling.

Dieckmann, Gaba, and Rall (2007) discussed simulations as a social practice—an event with a defined purpose, context and expectations of interaction. The authors use Laucken’s modes of thinking; physical (resemblance to reality), semantical (the meaning interpreted), and phenomenal (known through the senses); to evaluate the simulation’s realism. Dieckmann, et al explored primary frames and modulations, as defined by Goffman, that participant’s bring to a simulation and how a scenario might tap into social primary frames. Social primary frames encompass what might be expected and how interactions would typically occur based on usual patterns. The authors believed that multiple primary frames exist within each participant and the frame adopted depends upon the role the person is asked to play. Each participant in a simulation perceives the scenario and interprets meaning on an individual basis. Therefore, not all of the participants experience the same scenario in the same way. The authors emphasized the need for clarifying perspectives and differences of opinion. The authors also believe that the social practices, or social character of the group, influence what is taken from the scenario. The authors emphasize providing simulations that clarify what’s important to learn and not how closely the physical reality is maintained.
Lasater, (2007) examined the development of clinical judgment and the influence of participation in simulations. Thirty-nine junior nursing students were potential subjects, eight students volunteered to join a focused interview group after completing the semester’s simulations. The volunteers were described as nontraditional students (older than 25, 8 with previous degrees or of a racial/ethnic minority). The author collapsed the findings into major codes: learning benefits from simulations, conflicting feeling of anxiety and increased awareness, felt need for increased feedback from the facilitator, and learning from others. Participation in the ill-defined patient situation simulations enhanced the student’s clinical judgment making and integration of theory and clinical experiences.

Wallin, Meurling, Hedman, Hedegar, and Fellander-Tsai (2007) recruited 15 volunteer medical students to participate in a quasi-experimental study aimed at teaching teamwork skills. The students participated prior to any clinical career experiences. One day of trauma care and team training instruction was provided; the next two days participants practiced with simulated patient scenarios. Overall, students participated in five trauma scenarios: observers in two, team leader in one, and team member in two scenarios. The final and fifth day, each student was the team leader for one scenario which included two passive trainers acting as team members. Participants completed pre and post-test attitude questionnaires (Operating Team Resource Management Survey). Mean attitude scores increased on each of the 18 items but only one was statistically significant (p<0.025) junior members of the team should not assume control of patient management. In addition, three observers rated teamwork competencies before and after training. An inter-rater reliability of 0.68 was reported. The team leader function was
evaluated from scenario video recordings. Teamwork skills emphasized in the training and found to have been statically significant were assumption of the leadership role (p<0.001), team member communication (p<0.001), and early calls for help when self limitations were recognized (p<0.034). The study demonstrated that teamwork skills could be successfully taught using operating team resource management training and was unique in using non-clinically experienced students.

Birch, Jones, Doyle, Green, McLaughlin, Champney, Williams, Gibbon and Taylor (2007) explored the effects of different instructional methods (lecture only, lecture/simulation, and simulation only) on performance in a simulated post partum hemorrhage scenario. Method of instruction was randomly assigned to groups (total of six groups) with two groups each receiving the same instructional method. Each group of six members had their prior knowledge assessed, the group received instruction in their assigned method and the group participated in the care of a simulated patient experiencing post partum hemorrhage. The scenarios were video recorded and groups were debriefed after the simulation. The recordings were assessed against predetermined criteria for necessary performance of tasks by independent raters. At the end of the training day, group members repeated assessment of their knowledge using the same pre-instruction tool and rated their video performance against the predetermined task list. Watching the video performance and rating their performance was conducted again after three months time. Each participant earned three performance ratings: pre-instruction, post-instruction, and time lapse of three months rating. A separate interview was conducted one year post instruction focused on debriefing themes.
All of the methods of instruction yielded improvements in performance scores on the day of instruction. The lecture/simulation group demonstrated the greatest increase in improvement but no difference was statistically significant among the groups. The authors reported that the simulation only group continued to demonstrate improvement in their scores at the three month assessment ($p=0.086$) and the two other methods of instruction group scores had experienced a slight decrease in scores.

The one year post instruction interviews focused on debriefing themes and involved one half of the original study participants (18 subjects). All group members reported an increase in knowledge and confidence after the instruction. The simulation only instruction group experienced less anxiety in emergencies after training and believed “they had developed transferable skills” to other emergencies (p. 921). The authors stated that the one year post instruction participants were representative of the total group but numbers from each instruction group were not identified.

In a descriptive study, Kuiper, Matthias, Graham and Bell-Kotwall (2008) compared perceived outcome scores of 44 senior nursing students when caring for critically ill medical surgical patients in a simulated and in an actual clinical experience. Clinical reasoning scores were determined by analyzing completed Outcome Present State-Test (OPT) worksheets. All students participated in one simulation and five or six clinical experiences. Students did not have prior practice with simulated high fidelity patient care, but had used the same OPT worksheets to document learning in prior clinical rotations. Immediately after caring for the simulated patient, debriefing occurred. The participants discussed clinical decision making together and individually completed the OPT. The OPT worksheets were also independently formulated after clinical experiences. The
comparison occurred between the highest rated clinical experience worksheet of each student and the worksheet produced by the student following the simulation. The OPT Model rating tool achieved inter-rater reliability of 87% in this study and detected differences (p=.001) between students on subsection scores of the tool. Kuiper, Matthias, Graham and Bell-Kotwall found no difference between the mean subsection scores on the OPT worksheet documenting clinical reasoning resulting from simulation or authentic clinical experiences. The authors concluded that clinical reasoning processes were similar in both settings and the OPT Model could be used to debrief students after simulation experience with outcomes consistent with clinical experiences. In reviewing the study it should be noted that, the study subjects participated in the one simulation at various times during the semester and the debriefing process differed from OPT worksheet completion following the clinical experiences. The findings could have strengthened if a greater number of participation simulation opportunities had occurred for each student and if the timing of simulation were similar across the student groups. The authors acknowledged plans for future study involving greater controls for maturation, practice and group process.

Simulation Development

Cioffi (2001) constructed four simulations and reported the measures used to establish validity and reliability. She acknowledges difficulty in attempting to mimic reality due to the uncertainty associated with clinical process; the data which is only partially known in the beginning, the unpredictability of what could develop during the process, and the required flexibility in the response. Cioffi suggested creating simulations
which include varied amounts of relevant information and degrees of certainty or predictability in the linkage between decision relationships. Additional fidelity to reality should include freedom to proceed in any manner of the participant’s choosing. Information available for clinical reasoning should be a result of the participant’s assessments and clinical competency.

Cioffi advised that content validity be established using a panel of experts with appropriate clinical backgrounds. She used experts to rate the relevance, the degree of pertinence, and predictability of information within the simulation. Validity and reliability of four simulations situations was established by the experts. The experts rated simulation from the most uncertain to the least uncertain, based on an evaluation of degree of uncertainty and predictability. Construct validity was determined by establishing the degree of expertise needed to successfully diagnosis the situation (novice to expert performance) and the likelihood of level of certainty the decision held for the decision maker (varying degrees of uncertainty). The known groups technique was used to determine construct validity for expertise and the degree of difference among the participants performance. Experts were expected to perform more quickly and with greater precision (less data needed). Rationale for difficulty in establishing construct validity for uncertainty was included. The simulations were modeled after actual clinical case studies but the author stated that "the concept of uncertainty has not been operationally defined sufficiently to permit ready measurement" (p. 482) and "effects of different levels of uncertainty aren’t agreed upon" (p. 483). Reliability was assumed in the simulations but was not formally established.
Beaubein and Baker (2004) discussed three types of fidelity in simulations: environment, equipment and psychological. The equipment should closely align with equipment found in the actual situation and the environment should resemble the clinical setting as much as possible. However, the authors believed that the most important type of fidelity was psychological fidelity, which was the degree to which the trainee “perceives the simulation to be a believable surrogate for the trained task” (p. 52). Without psychological fidelity, the person won’t perform realistically. Beaubein and Baker re-enforced the need for well designed instruction, noting that advanced technical capabilities do not replace adequate instructional design. The authors suggest using full simulations after learners have acquired knowledge and attitudinal competency using case studies or role plays. The authors believed that full simulations can develop the ability to perform in conditions of stress, time pressure and problem solving. The provision of feedback was of great priority for the authors. They “recommend some form of post-simulation debriefing be used to identify the lessons that were learned and to generate strategies for team self-development” (p. 55).

Issenberg, McGaghie, Petrusa, Gordon and Scalese (2005) conducted a meta-analysis of medical education literature seeking to answer the question of effectiveness of learning from high-fidelity simulations. 109 studies met criteria for inclusion; the earliest study was published in 1989 but the bulk of the articles were published since 2000. The meta-analysis yielded ten indicators of effective learning: 1. provision of feedback on performance, 2. opportunity for repetitive practice, 3. integration of simulation into curriculum, 4. and 5. variation of levels of difficulty, range and complexity of scenarios, 6. flexibility in group size (large groups to individualized sessions), 7. a practice
environment supportive of learning, 8. active participation, 9. ability to compare performance with benchmark, and 10. fidelity to clinical situations.

Vygotsky

Vygotsky's Social/Cultural/Historical Theory of Learning and Development

During the 1920’s and 1930’s, L. S. Vygotsky, a Russian psychologist, set forth scientific theories which have influenced different fields of study (such as psychology, pedagogies, psychiatry). This study relied on the writings of several neo-Vygotskians, whose comments were included where appropriate.

Wink and Putney (2002) described the Vygotsky’s social constructionist perspective as knowledge being constructed in relationship with other people and changing over time. The collaboration which contributes to shared knowledge takes place within a sociocultural setting influenced by history and culture. Construction of reality is a social process based on the interactions with past and present members of the culture and is subject to revision over time. Vygotsky’s perspective is a theory of psychology and also a theory of learning or that of a “cultural theorist” (Bruner, 1987, p. 1). In other words, Vygotsky situates learning within the culture in which it occurs. Theory of phenomena and the phenomena itself are the result of interactions/transactions within the culture. The process of discovery is one of dialectical interchange and the search for shared meaning. Learning occurs by developing a shared understanding of “meaningful ideas, materials, others” (Wink and Putney, p. 33). Children advance by integrating knowledge gained by speech, language and the use of tools, representing mediated methods. Speech, language and tool use in social interaction change the learner’s thinking. Social
interaction with a more capable other can facilitate the learner’s abilities, or provide a scaffold, allowing the learner to accomplish a task with the other’s help that they could not have done without the assistance (Vygotsky, 1978). The learner’s performance can be accelerated in the zone of proximal development (ZPD). Bruner states that “the ZPD focuses attention on the role of dialogue as a precursor to inner speech….once a concept is explicated in dialogue, the learner is enabled to reflect on the dialogue, to use its distinctions and connections to reformulate his own thought” (Vygotsky, 1987, p. 4). The notion of internalization then, is an active process of reformulation on the part of the learner (Putney, et. al, 2000).

Within a culture, the way we think reflects what we have learned from the culture or the way reasoning occurs within that culture. Our ways of thinking come from the social interactions that take place among individuals in the conversation. Vygotsky states that the “structure of speech mastered by the child becomes the basic structure of the child’s thinking” (Vygotsky, 1987, p. 120). “Speaking reorganizes our thinking, and our language comes to us as a cultural heritage through our interactions with others. Because we actively use language, it changes our thinking, and our thinking and actions change language.” (Wink & Putney, 2002, p. 28). The interchange fosters adoption of language usage to facilitate learning among individuals involved in the co-construction of knowledge. Thus, language from a Vygotskian perspective becomes both a tool for constructing knowledge and also a result of knowledge construction (Vygotsky, 1987).

The assumptions underlying Vygotsky’s perspective (1978, 1987) are identified in the following passages. Humans construct culture through social interactions. Individuals learn from the social group within their culture via an intermental process which is
internalized (intramental process) and may be altered by the individual. A portion of the learning processes includes cultural tools (such as language, speech and written, or psychological processes such as sign and symbol systems) as well as cognitive technologies which can change mental functioning, particularly higher mental functions. Mental functions change as a result of conceptual development gained through speech (verbal exchanges with others and inner speech) and “acquisition of concepts restructures the structure of our mental processes” (Van der Veer, 1994, p. 295). Development of higher mental functions occur with instruction and result in the individual having voluntary, intentional, and “conscious awareness of what he does” (Vygotsky, 1987, p. 206). Changes in higher mental functions (logical memory, abstract thinking, concept formation, violation) influence the environment by the thinking and actions of the individual. The actions may have been a result of collaboration in the zone of proximal development but the individual has gained control over the functions or mastered them (Vygotsky, 1987, p. 216).

John-Steiner and Mahn (1996) suggested that the interchange or dialectic process of “interdependence of social and individual processes” (p. 192) is the heart of Vygotsky’s ideas. “Vygotsky conceptualized development as the transformation of socially shared activities into internalized processes” (p. 192). The authors reported that Vygotsky’s principles include the idea that human development occurs within a social context, communication of all types contributes to co-construction of knowledge, and that the interconnectedness of the person, culture and social setting are functionally intertwined. This perspective views human development as non-divisible, highly interrelated, and
dynamic. Knowledge development is a result of simultaneous events occurring within the
setting and the person.

Vygotsky (1987) stated that higher levels of cognition are both formed by and
expressed through language, which is developed in social processes. Vygotsky describes
development of higher mental functions as an outcome of the eventual fusion of “two
lines cross (speech and thought): thinking becomes verbal and speech becomes
intellectual” (Vygotsky, 1987, p. 112) and “it is the general law of development that
conscious awareness and mastery characterize only the higher stages of the development
of a given function” (Vygotsky, 1987, p. 189)

Development of concepts in general are dependent upon the individual using
language and the “functional use of the sign or word as a means through which the
adolescent masters and subordinates his own mental operations and directs their activity
to the resolution of the tasks which face him” (Vygotsky, 1987, p. 131). “All higher
mental functions are mediated processes” and the “use of the sign as a means of directing
and mastering mental processes” (Vygotsky, 1987, p. 126) is part of the road leading to
formation of concepts. “The higher mental functions rely on the mediation of behavior by
signs and sign systems, the most important of which is speech” (Minick, 1987, p. 20).
“Verbally mediated social interaction and the development of psychological functions”
are connected (Minick, p. 20). Sign systems assist people to think and communicate.
Development is not a gradual accumulation but “is a complex dialectical process
characterized by periodicity, unevenness in the development of different functions,
intertwining of external and internal factors” (Vygotsky, 1978, p. 73). “The interpersonal
process is transformed into an intrapersonal one” and “the transformation of an
interpersonal process into an intrapersonal one is the result of a long series of developmental events” (Vygotsky, 1978, p. 57).

Scientific concepts formed within formal school settings, are “formed through thought” (Vygotsky, 1987, p. 176) and are possible only after certain spontaneous concepts development has begun which occurs in the school age child (p. 177).

Concept formation, then involves the specific use of words as functional tools to solve problems, create products, or complete tasks. Scientific concepts are not directly tied to phenomena or objects and are defined in a generalized fashion; that is, in a relationship between other concepts. Scientific concepts relate to phenomena in a medicated way, through previously established concepts. The scientific concept changes the everyday concept and the everyday concept changes the scientific concept, changing the conceptual system (Shepardson, 1999, p. 634).

Figure 2, displayed on the following page, Everyday and Scientific Concept Development, is a graphic representation which attempts to reference the development of everyday and scientific concepts in a one dimensional plane and was constructed by Vygotsky (1987) writings. From Vygotsky’s perspectives scientific concepts are those proposed and learned through instruction and grow downward to intercept with spontaneous concepts. Spontaneous concepts are those acquired through experience and form a foundation on which the scientific concepts can be constructed. It is through their linkages in the zone of proximal development that meaning is derived, formulated and reformulated.
Figure 2. Everyday and Scientific Concept Development
In support of Vygotsky, Hatano and Wertsch (2001) state that participation by individuals within sociocultural situations influence the way people think. Thinking is affected by the tools and artifacts, the symbols and signs systems, reflected in a setting. Individuals within the same culture share similar influences, such as language. The influence may be a result of physical tool use, and "common sense knowledge and beliefs, social organizations, conventional patterns of behavior associated with the physical, symbolic, and social tools" (p. 79). The outcome of the participation forms an intermental and intramental function. "Any function in the child's cultural development appears twice or on two planes....It appears first between people as an intermental category, and then within the child as an intramental category" (Minick, 1987, p. 21).

Instruction

Vygotsky (1987) stated that "instruction is the source of the development of this new type of concept (scientific)" (p. 187). He believed that instruction did not have to wait for the child to develop to a certain level, but that instruction could move ahead of development, with a resultant encouragement of development and form (p. 198). He viewed development and instruction as intertwined processes.

The timing of instruction was presented as occurring prior to maturation. "Instruction always moves ahead of development" (Vygotsky, 1987, p. 207), the processes of thinking in the abstract develops within each subject, and there is "significant commonality in the mental foundations underlying instruction in various school subjects,... instruction influences development of mental functions... and mental
functions are interdependent and interconnected” (p. 208). Instruction lays out the structure within which scientific concept development occurs.

The zone of proximal development should be utilized in instruction in that the student can “do more in collaboration than independently” and the zone of proximal development has more significance for the dynamics of intellectual development and for the success of instruction than does the actual level of development” (p. 209). “Our research demonstrates that these sensitive periods are associated with the social processes involved in the development of the higher mental functions. These mental functions are an aspect of the child’s cultural development and have their source in collaboration and instruction” (p. 213). Both scientific and everyday concepts are linked to each other in the zone of proximal development.

Van der Veer (1998) suggested that scientific concepts are systematized as an outcome of instruction in a discipline and the intent of instruction should be explicit. Everyday or spontaneous concepts are not explicitly introduced but arise through events of the day. “The strength of the scientific concept is that it is embedded in a whole, connected, conceptual structure that supposedly reflects the true nature of the subject one is talking about” (p. 91). On the other hand, scientific concepts are by their very nature disconnected from personal experience and may be forgotten if not linked with lived experience. Every day concepts are part of the fabric of events and are not easily forgotten but everyday concepts “are only locally valid...and not part of a logically connected system of concepts” (p. 91). Van der Veer states that Vygotsky “attached great importance to articulate knowledge...and such knowledge must become personal by applying it in practice” (p. 92). Conceptual thinking is enhanced by teacher/student
sharing of intermental thinking in the clinical and classroom settings. Wertsch and Tulviste (1992) comment that “forms of mediated intermental functioning involved must themselves to be recognized as being socioculturally situated with respect to activity settings and associated mediational means” (p. 553). That is to say those participants in clinical classroom settings negotiate meaning through their interactions and the meditational tool of language.

Criticisms of Vygotsky’s Theory

Wertsch and Tulviste (1992) identified two broad weaknesses in Vygotsky’s work. First, they believed that the perspective was too Eurocentric in its assumption of superiority of cultural tools and ways of thinking. In that, the results of research studies conducted by Vygotsky and Luria “tended to interpret these studies in terms of whether subjects were from primitive or advanced societies” (p. 553). Wertsch and Tulviste later suggested a moderation of this perspective in written work to one of mental functioning embedded in the “particular institutionally situated activities” (p. 554). A specific culture wasn’t necessarily better than another but different from another.

Second, Wertsch and Tulviste believed that the natural line of development wasn’t well explained and was viewed as developing separately from the cultural line, but at the same time viewed as in contact and of influence on one another. Knowledge seemed to have been attributed as coming from the environment or transmitted to the individual. Wertsch and Tulviste refute this interpretation as overlooking the role of mediated action of the tools of culture and “the individual or individuals using them in unique, concrete instances” (p. 555). This misconception ignores Vygotsky’s statement of “every function
in the cultural development of the child appears on the stage twice, in two planes, first, the social, than the psychological, first between people as an intermental category, then within the child as an intramental category” (1997, p.106).

Van der Veer (1994) states that Vygotsky argued that school instruction is the stimulus for the general development of conceptual thinking and changes in conceptual thinking influence all of the other mental processes. Another area of critique was that school instruction, as the predominant cause of conceptual thinking, was too broad a conjecture. This linkage was reminiscent of thinking associated with classical training of the mind. Studying the classic disciplines provided the furniture of the mind and that the exercise of studying Latin, for example, was the same as exercising a muscle. The exercise developed thinking capabilities. Van der Veer (1994) described thought as reason that “will allow the child to grasp other subjects more profoundly and more rapidly” (p. 296). He pointed out that this thinking relies overly on scientific, rational approach to produce solutions and reflects the hope of 1920’s Soviet views of science. Conceptual thinking is enhanced by teacher/student sharing of intermental thinking in the clinical and classroom settings.

John-Steiner and Mahn (1996) discussed similar criticisms of knowledge transmission claims as a misunderstanding of the process of internalization. The authors also included criticisms that internalization is a process of individual mental processing only. John-Steiner and Mahn described internalization as both external and internal, concurrent co-construction of knowledge occurring in a dialectical process. “In working with, through, and beyond what they have appropriated in social participation and then internalized, individuals’ co-construct new knowledge” (p. 197).
Additionally, Vygotsky (1987) wrote that concept development reached its height during adolescence:

The greatest difficulty of all is the application of a concept, finally grasped and formulated on the abstract level, to new and concrete situations that must be viewed in these abstract terms—a kind of transfer usually mastered only toward the end of the adolescent period. (p. 142).

However, Vygotsky was interested in the learning and development of children and not necessarily the adult. His writings imply that development ends in adolescence, a conclusion that might have been replaced if he had lived longer.

Van der Veer (1998) described Vygotsky’s view of knowledge of one of emphasizing conceptual knowledge at the expense of discussion of skills and attitudes. Robbins (2001) cautions that Vygotsky’s interpretations “would be different if he had lived longer” and scientific concepts would not be a sufficient description of intellectual processes of an educated person (p. 64). However, much of what Vygotsky discussed regarding instruction is very applicable for teaching and learning practice.

Instruction plays a decisive role in determining the entire fate of the child’s mental development, during the school age, including the development of his concepts. Further, scientific concepts can arise in the child’s head only on the foundation provided by the lower and more elementary forms of generalization which previously exist. They cannot simply be introduced into the child’s consciousness from the outside (Vygotsky, p. 177).

Putney (personal communication, November 14, 2004) identified misconceptions commonly held concerning Vygotsky’s work. A major weakness frequently cited, is that
meaning is socially constructed and misinterpreted as social, implying no construction of knowledge by the individual. However, it was noted that the process Vygotsky identifies is a dialectical synthesis, involving antithesis and thesis. The social and the individual are conjointly involved in interpersonal relationships within a historical cultural situation making meaning, which tends to be collective, but not universal and also making individual sense based on the person’s background and experience.

Review of the primary premises and criticisms of Vygotsky’s theories, provides an overview of his perspective about thinking. Knowledge development is a result of simultaneous events occurring within the setting and the person. Interaction among people, and what meaning must be developed from the situation, is not specifically addressed. Shared cognition is derived from language, communication both verbal and non-verbal, previous information, new information, and the usual discourse of the setting and or discipline. Ideas about cognition in various relationships were explored next.

Distributed Cognition

Salomon (1993), in an edited book, Distributed Cognitions, presented the idea that cognition is distributed among individuals, occurs through social process, and has the purpose of completing objectives (p. xiv). The idea of distributed cognition was first written about by Pea (1985) in an article which described how computer use does more than amplify abilities, in that, computers can qualitatively reorganize the way an individual thinks.
Wertsch and Rupert (1993) believed that social processes and cultural tools must be taken into account as having an effect on intramental functioning or individual thinking. When individuals learn from their social group, especially in virtual communities, knowledge construction is developed across the group members.

Cole and Engestrom (1993) described cognition as distributed across activity systems. Each activity system has its own social rules, subjects, mediating artifacts, objects, communities and division of labor between the subject and others. An activity or process has different ways that cognition might be distributed depending upon the goal of the activity, the participants in the activity, and cultural artifacts used. “Precisely how cognition is distributed must be worked out for different kinds of activity, with their different forms of mediation, division of labor, social rules, and so on” (Cole and Engestrom, p. 42). Cognition is distributed across the learner, the teacher, and the tools used. Tool mediation is the use of a tool (could be a device or another person’s help) through which the task or goal is indirectly accomplished. Cultural practices act as a set of control mechanisms for governing behavior by establishing rules, norms, or instructions embedded in social processes.

Perkins (1993) discussed the concept of person plus as a “vehicle of thought” (p. 90). The plus is the surrounding physical and social situations (including other people) which are in addition to the individual. Knowledge processing is in common between the person and any supporting artifact such as a notebook, person, or any technological support. Some of the information learned remains within the pages of the notebook as the plus or an amplification of the individuals’ thinking capabilities whenever the notebook or technology application is used.
Fischer (2000) defined distributed cognition as the work of groups of "minds in interaction with each other and minds interacting with tools and artifacts" (p. 8). Tools or artifacts support the group’s functioning by providing an externalization of the mental process performed by the group. The information needed by the group is possessed across the individuals; no one person may have all of the information necessary but the "required knowledge...is distributed between the mind and the world" (p. 8). Information may be stored as external cognition (printed or computational media) or as prior personal experience. There is a need to "accumulate information, but (also) deliver the right knowledge at the right time to the right person in the right way" (p. 10). An example might be of an organization’s information system which stores within its records the history of process and outcomes for use by current and future individuals in the ongoing concerns across the organization.

Karasavvidis (2002) drew distinctions between the meaning of distributed cognition from two viewpoints, educational psychology and cognitive science. Karasavvidis presented traditional cognitive scientists as defining cognition as occurring only inside the mental processes of the individual. He suggested that the expansion of the idea encompasses assessing the individual as a part of their whole environment but the focus remains primarily on the individual as the unit of analysis.

Educational psychologists, such as Pea and Salomon, as reported by Karasavvidis (2002), defined distributed cognition as learning as a result of a social process, involving cooperation and guidance, among individuals. The teacher and the learner or the learner and fellow students, are jointly engaged. The learner might be engaged with a task involving a cognitive tool such as a calculator, rather than another person. The use of the
tool circumscribes the thinking by virtue of the tools capabilities. By using a tool such as
a computer, a portion of the processing is carried out on the computer, not directly within
the person. "The tool used defines what the task is, and how it will be perceived and
understood. The teaching and learning conceptions should also be reformulated as to what
learning is and how it is effected" p. 23). Karasavvidis advised the teacher to be cognizant
of the need to revise learning objectives when new innovations are added to the
classroom.

Courtney (2002) provided a case study with data taken from a documentary film,
The Dig, which demonstrated the implementation of distributed cognition. The film was
based on a middle school social studies teacher's practices and his classroom students
(number unknown) and former students (n=17). The case is contrasted with examples of
the customary classroom milieu demonstrating teacher centered learning, information to
be learned that is represented in texts, and interactions focused on the work of the class.
The implementation of the dig consisted of two parts; classroom learning in preparation
and the actual 'staged' archaeological excavation. Courtney believed that the
documentary demonstrated that the learning occurred during the activity combining the
thinking of classmates and teachers interacting in the context of a staged excavation;
learning is a result of a social process, involving cooperation and guidance, among
individuals and the tools or the information gained by tool use. Courtney cited support of
distributed cognition occurring as evidenced by the real performance of both the students
and teachers in the co-creation of knowledge. Students experience connected knowing
gained by participating in the social process of shared learning.
Daradoumis and Marques (2002) studied how cognition is socially distributed among students who were engaged in dialogues in a virtual learning environment. The objectives of the exchanges were to accomplish an assigned task. The author's objective was to design a model for cooperative problem-solving to be used in distance education. The students' communication was assessed by using a model to classify exchanges as giving information, eliciting information, or ascertaining information. The discourse was evaluated for turn taking, information shared, presence of exchange of views held, monitoring of task completion, and the degree of planning ahead. Dradoumis and Marques state that distributed cognition was manifested by the "combination of different exchange types, and the purpose and role that each exchange plays with respect to the related exchanges" (p. 145). Group member interactions could be analyzed by assessing their discourse and evaluating how communication exchanges contributed to collaborative learning.

Additional data were obtained through group interviews, surveys, individual self assessments and reflections. The findings identified were distinguished by individual student cognitive factors, group dynamics and roles factors, and by how well the tool supported collaborative learning. Individual student cognitive factors which affected learning were the type or purpose of the communication, how many knowledge transfer exchanges occurred (the number of exchanges started by the student) and how active a role the student assumed in the exchanges. Group dynamics were influenced by the communication climate created in the interactions. The authors recommended continued study of the role distributed cognition in collaborative learning.
Halverson and Clifford (2006) studied how a school principal constructed meaning from the context of the school system’s policies and practices and teacher evaluation reform. The first part of the article establishes the groundwork for the experimental aspects of the study. The second portion of the article utilizes a very detailed case study method, to examine how actors, in this case, principals of schools, attempted to meet the needs of the district in achieving the macro task of teacher evaluation while immersed in the organizational practices and policies of the local school. Data were collected from members of the district teacher evaluation design team related to intentions of the plan and then the implementation was observed by following the evaluation of 16 different teachers (40%) within the district. To evaluate the evaluation process of the teachers, the principals were shadowed during the classroom observations, the principal-teacher post-observation conferences were videotaped and the teachers and the principals were interviewed following the conference. Complete data were collected on 11 participants. However, the case study in the article focused only on one principal.

Qualitative data analysis of the video and the transcripts were facilitated by Atlas.ti software. Analysis included coding the relevant tasks, artifacts and features of the cognitive system, in an attempt to determine which micro tasks, contributed to the macro task of evaluation. The frequency and duration of the conference interactions, between principals and teachers, were noted.

Preliminary data drafts wee shared with the evaluators to provide an opportunity to correct any oversights or errors in the representations of the conversations. The authors presented the case study by answering the questions of what are the tasks (macro and micro), what are the relevant artifacts and what forms the cognitive system of the district.
The case analysis supported previous observations about how the context of the situation influences implementation of the policies but also demonstrated that specific aspects of the context mattered, and that the practitioner (school principal) was influenced by the school's cognitive system. For example, the principal displayed 'cognitive flexibility' when deciding which aspects of the cognitive system to emphasize (relational trust, teacher tenure, expectations and social position within the school), thus the principal's ability to implement artifact feature 'on the fly' allowed her to move toward the organizational goal of accepting a new artifact (teacher evaluation plan) while attempting to maintain current organizational initiatives. The authors summarized the importance of the study by stating that distributed cognition analysis made cognitive activity, such as managerial discretion, available by externalization of the cognitive activity. It was also noted that identified tasks demonstrated how the players in the situation used the resources of the cognitive system. The article concluded by emphasizing the usefulness of a distributed cognition framework to make sense of the context of a situation.

Lave (1991) criticized the cognitive plus perspective because the view did not acknowledge the situatedness or being in the situation. Lave believed that the circumstance was an additional factor that needed to be considered, including the location of social interaction of the individual. Thus, research from the person plus perspective on the individual would consist of study of the effects on the person not of the interconnections in the situation (p. 66).
Situated Cognition

Lave and Wenger (1991), state that all theories of learning are based on assumptions about the person, the world and relationships. The authors believed that the theories did not adequately describe the relationship between these understandings and theories about situated activity and about the production and reproduction of the social order (p. 47). The authors attempted to make these connections with the introduction of the concepts of the theory of legitimate peripheral participation. The authors viewed learning as a situated activity in a sociocultural practice. Their work focused on describing how learners develop mastery in role performances in the practice arena. The concepts recognized that in structured schooling a schemata for learning might not have been fully developed and that learning occurred in situations where learners have access and participation in expert role performances.

Mastery was defined as involving “… timing of actions relative to changing circumstances, the ability to improvise” (p. 20). Lave and Wenger believed that a comprehensive understanding was not based on receiving a body of factual knowledge, but that learning becomes an integral aspect of practice and involved the whole person. Within the legitimate peripheral participation construct, engagement in social practice is an integral constituent of learning (p. 35). The authors point out that belonging to the field of participation is not a crucial condition for learning. Peripherality was viewed as a positive, suggesting a way of gaining access to sources for understanding (Lave & Wenger, p. 37). Sources for understanding are located in the multiple, varied fields of participation as defined by the community of practice.
Lave and Wenger (1991) emphasized that learning is not just a cerebral process (inside) of internalization gained from the transmission of knowledge (from the outside) which is assimilated, but rather a dimension of social practice. The authors point out that concept of internalization have been linked to Vygotsky’s zones of proximal development in varying ways, and each of these interpretations can be linked to categories of pedagogical approaches. In brief the three approaches described are:

1. The “scaffolding” interpretation, which focuses on the difference between problem solving abilities acquired by the learner working alone and by learner working with a more experience person.

2. The cultural interpretation, which focuses on the distance between the cultural knowledge provided by the sociohistorical context (understood knowledge provided by instruction), and the everyday experience of individuals (active knowledge owned by the individual). This interpretation is based Vygotsky’s distinction between scientific and everyday concepts. and

3. The societal perspective which focuses on the distance between everyday actions and actions that can lead social transformation via collectively generated solutions (p. 48 and 49).

Lave and Wenger appear to embrace some aspects of each perspective, emphasizing that learning occurs via participation in communities of practice rather than via internalization. They set forth a theory of social practice that emphasizes the “relational interdependency of agent and world, activity, meaning, cognition, learning, and knowing”. This theory recognizes the socially negotiated character of meaning and claims that “learning, thinking and knowing are relations among people in activity in, with, and
arising from the socially and culturally structured world (p. 50)". Knowledge is viewed as open ended, but cognition and communication are situated in the historical development of ongoing activity.

They further described learning as the historical production, transformation, and change of persons. Learning implies becoming a different person, or constructing a new identity, with respect to the possibilities enabled in the system relations. Legitimate peripheral participation leads to the development of knowledgeably skilled identities in practice and to the reproduction and transformation of communities of practice. Emphasis is placed on “… the changing relations between newcomers and old-timers in the context of changing shared practice (p. 49).

Within the same time period, Lave (1991) proposed that ‘situatedness’ is a social interaction founded on the use of language establishing negotiated meaning within the situation. The meaning derived by the person is based on the interest and intersubjectivity of the individual (p. 67). Lave stated that proponents of this interpretive approach view the world as one of multiple realities wherein each person having their own perspective of the world. Language is used to clarify meaning and lessen ambiguities, noting that the interaction is not tied to a specific place or setting but the meaning is attached to the interaction.

Hay and Barab (2001) compared high school students (n=18) attending summer learning camps structured as a constructionist learning environment or as an apprentice learning environment. The constructionism was defined as participation in activity groups (designing and developing virtual tours of a State House, a solar system or a virtual theater) by the learner creating “meaning, understanding, and knowledge” (p. 283).
Apprentice learning was defined as participation in an authentic practice community with the goal of becoming a full participant over time, or in the limited time period of the project, gaining a sense of the thinking typical of the domain. Characteristics of apprentice learning are development of shared understandings, continuity of existence (history and future), mechanism of continuation (gaining new members), and “learning through enculturation” (p. 292).

Differences among the learning environments were identified as to where the authentic work was accomplished and to which group the students belonged. Work was accomplished among the students by the students in the constructionist group and the students identified as being members of the activity group; work was accomplished among the community practitioners in the apprentice group and the students identified as being beginning members of the community. Control over instruction was established among the students in their activity group but control was maintained by the community practitioners (scientists) in the apprentice group. Learning in the constructionist group resulted from social negotiated outcomes. However, apprenticeship learning emerged from the ongoing practices of the community. “Students in (constructionist group) could create their learning/doing context, which students (apprenticeship group) had theirs appropriated” (Hay & Barab, p. 316).

Shared Cognition

Shared cognition is a refinement of the idea of situated cognition. Both, shared and situated cognitions, are based on the theoretical writings of Vygotsky. Vygotsky’s theoretical perspective, while developed several years earlier, has been revisited in recent
years, as the original writings have been translated from his native Russian language.

While Vygotsky may have never actually utilized the words "shared cognition" he did write about constructing meaning via discussions.

Agreement of exactly what is meant by shared cognition is indefinite. Some authors approach the task by describing what shared cognition is not. For example, Cole (1991/2004) states that shared cognition is not symbolic processing taking place within an individual's head or mind.

Edwards and Mercer (1987) concluded that while identified by various names, common knowledge or mutual understanding forms the basic ideas about shared cognition. These authors investigated patterns of talk in schools between 8 to 10 year old, and believe that this is the starting point for the development of common knowledge. The authors focused on the mutuality or the total contexts of the place, person and activity and how interaction becomes knowledge commonly shared. Edwards and Mercer stated that participants in a conversation (videotaped school lessons) expect others to abide by cooperative principles in talking with one another. The principles include truthfulness of information and that contributions to a discussion will be informative, relevant and concise. The authors looked at how the principles have been used by teachers and students in school, asking what are the usual ways of communicating? Via discourse analysis the communication patterns were categorized as initiation by the teacher, response by the student, and feedback from the teacher. The authors wrote that establishing common knowledge is in the talk or the discourse of the classroom. They described the context of learning as mental "...a property of general understandings among individuals involved in conversations. Context is anything and everything that
people know and understand in a conversation, over and above what is said that contributes to how they make sense of what is said” (p. 63). Edwards and Mercer believed that growth of shared understanding occurs over time and is fostered by guidance provided by a knowledgeable other (zones of proximal development) in shared activities (p. 86).

Krauss and Fussell (1991) investigated how common ground and mutual knowledge are developed in communication. The authors reported findings from a previous study (Fussell & Krauss, 1989) conducted on 40 undergraduate psychology students. The study found that shared understandings were affected by the degree to which additional literal descriptive messages were used and the length of the messages. The authors state that two elements are necessary to develop shared meaning: prior beliefs and expectations about others and feedback from the interaction. In addition the authors proposed that back channel messages, (non verbal responses, facial expressions, and brief verbalization), clarify member understanding of the conversation. The authors state that common ground is created by "coordinating knowledge, perspective and other information” (p. 194) among participants in the conversation. Other elements involved in coordination are assessment of relevant attributes such as dialect or dress as clues to group membership, the modification of what’s expected based on feedback, and consideration of the mode of communication (internet, telephone or written messages).

Wetsch (1991) described socially shared cognition as mental functioning which occurs within social interactions among two or more individuals and taking place in the larger context of the culture and society of the participants. Wetsch acknowledged that his sociocultural approach of thinking relied on both Vygotsky and Bakhtin for significant
direction. From Vygotsky, Wetsch incorporates the sociocultural aspects of development of individual functions as occurring between individuals or intermentally in the social interaction and then intramentally or cognition within the person. Both types of actions take place in the social situation and culture of the participants.

Wetsch (1991) focused on semiotic mediation as the use of language as the means to link intermental and intramental higher mental functioning. From Bakhtin, Wetsch included the concept of social languages as “a way of speaking that is characteristic of a particular group in a particular sociocultural setting” (p. 95). Wetsch extended his ideas to include the importance of understanding how social language participates in the development of sociocultural setting and how social language is changed by the participation (p. 97) and the impact on the person’s thinking and the formation of intramental functions.

Levine and Moreland (1991) assessed shared cognition within work groups. The authors defined a work group as three or more persons who are functioning interdependently, consistently, and from within the same group culture and have as a goal the accomplishment of a task. The group’s culture is related to how the group members view themselves as a group. Questions informing the culture include: is the group like or different from the larger society, what is the perception of the self worth or quality of the group, what is the climate of group interactions, and what is the contribution of the group to the larger society. The results of shared thinking may be displayed in the routines, jargon, rituals, and symbols of the group and the meaning attached to each function. The authors developed a model of group socialization consisting of when and how a new person joins the group and knowledge is shared with the newcomer. Roles and both the
newcomer and the old-timer are described. The work group culture is most productive when the world view of group members is common or shared.

Thompson and Fine (1999) defined shared cognition as socially shared meaning of “how dyads, groups, and larger collectives create and utilize interpersonal understanding” (p. 280) or how the group creates and shares meaning. The authors identified four models in the review of socially shared cognition: information processing, supraindividual, communication, and interaction.

The primary idea encompassing the information processing model is the accomplishment of a task as a result of mental group processes of encoding, storage and retrieval of information such as a shared mental model. Distributed cognition is a subtype of an information processing model. The supra-individual model is a reflection of the idea that the group because of social interaction becomes greater (transformed) than any one of the group members by themselves or the group has a collective identity. Language usage as the means of creating common ground is the focus of the communication model. The social interaction model describes group processes developed as a result of interactions among individuals.

Concepts of intersubjectivity, communication rules, and perspective taking are significant ideas which comprise the communication model. Intersubjectivity is the establishment of shared understanding between communicates or a developed common ground. Communication rules are the parameters established which govern the participant’s social activities. Perspective taking is the creation of understanding of another’s point of view involved in the communication process.
Social interaction behavior models focus on the creation and development of collective meaning as a result of group member interactions. Thompson and Fine describe four elements essential to the perspective: definition and interpretation of the situation by the participants, recognition of the generalized other (Mead, 1934) which if shared by other group members influences moral and normative values, moderation of personal action based on group expectations, and negotiated order. Negotiated order is the accommodation of behavior to fit into a group based on members holding diverse beliefs or goals.

Cole (1991/2004) added to the discussion by describing responses to the concept of socially shared cognition as one of three reactions. Within the first reaction, shared cognition is an extension of individual thought processes which considers the social setting to be an addition to the circumstances of the interaction. Thinking remains inside the head of a person or persons who may share their individual perceptions and knowledge but each in an individual process. Within the second reaction, all aspects of the social interaction, (people, the cultural past, present and future, and the interaction itself) must be considered in total. The third reaction is presented as the study of each “condition of its sharing in concrete cases, with minimal concern for interdisciplinary work or paradigmatic reform” (p. 397).

Cole (1991/2004) questioned what should be studied and how should a study be conducted if the second reaction, consideration of the sociocultural knowledge in specific context in and of interaction itself, assumes dominance as a paradigm. Cole suggested the focus of the study should be on “socially shared and distributed form of cognitive activity emerging from, and constituting, joint activity” (p. 405) and the unit of analysis should be
“two or more human beings acting in a culturally mediated setting” (p. 413). Cole believed that cognitive processes “are then differentially organized and elaborated into complex systems of higher psychological functions, depending on the actual activities in which people engage. These activities, in turn, depend crucially on the historical and cultural circumstances in which people live” (p. 410).

Socially shared cognition is a result of joining the distribution of thinking across people and artifacts with the circumstances of the situation. Shared cognition is both distributed and situated. “The precise ways in which mind is distributed depend crucially on the tools through which one interacts with the world, which in turn have been shaped by one’s cultural past as well as one’s current circumstances and goals” (Cole, 1991/2004, p. 412).

In the above referenced writing, Cole referred to an interrelated concept in the learning process, that of distributed cognition. In 1993, Pea summarized ideas about how people use tools in learning. He labeled the process as distributed intelligences rather than distributed cognition. Pea’s writings emphasized that while people do the thinking, objects may aid in the process. Pea describes the process as occurring “across minds, persons, and the symbolic and physical environments, both natural and artificial” (p. 47).

Mediating structures (tools or artifacts) provide a way of organizing or establishing boundaries or constraints on contemplated activities. The structures could be tools designed for specific purposes or social relationships with people. The use of tools or artifacts in activities influence what people contemplate as possible, save mental work, or avoid making errors. Pea suggests that designing for distributed intelligence should be the
aim of education. Students should be encouraged to use tools or artifacts to expand their capabilities, to collaborate with fellow students and teachers, and to engage in more complex thought.

Hatano and Wertsch (2001) stated that participation by individuals within sociocultural situations influence the way people think. They continued that thinking is affected by the tools, artifacts, symbols and signs systems reflected in the setting. The authors note that individuals within the same culture share similar influences, such as language, and this influence may be a result in “common sense knowledge and beliefs, social organizations, conventional patterns of behavior associated with the physical, symbolic, and social tools” (p. 79). The outcome of the participation forms a mind set. Dialectical interchange and the search for shared meaning leads to the process of discovery.

The above writings also include the concept of intersubjectivity. Wink and Putney (2002) expanded on the above observations, further defined the construct in relationship to the classroom. They wrote that “knowledge is collectively constructed”. The relationship includes “individuals whose purpose is to share their expertise in order to construct and negotiate meaning” and a learners whose role is “…to bring what is already known into the relationship and gain new information through interaction with others in the classroom” (p. 12). Wink and Putney (2002) continue that learning occurs by developing a shared understanding of “meaningful ideas, materials, others” (p. 33) and that a “child’s reasoning was socially constructed through interaction with adults and peers” (p. 30).
They further defined intersubjectivity as the “act of constructing common meaning between speakers” (p. 151) and that intersubjectivity can be examined through concepts of intertextuality and intercontextuality. Intersubjectivity results from mutual understanding of both ideational and interpersonal functions. Intertextuality is the point at which connections are made between prior knowledge from texts or conversation and current information from texts or conversation (Bazerman, 2006; Wink & Putney, 2002). Intercontextuality is the process of interacting with text and/or talk that takes place within an activity bounded by the culture, actions, purposes associated with the activity (Bazerman, 2006).

Bazerman (2006) also described the analysis of the kind of text and how it is organized as possible insight into the expectations of the interaction or the genre. Genres inform the participants about the probable actions, social organization, and regular activities expected. “Knowledge of genres is knowledge about a way of life and how to participate in that way of life” (Bazerman, 2006, p. 91).

Park, (2008) conducted a study of communication among group members who had received the same instruction either about being polite or efficient in their conversations while constructing a radio. The participants were 236 undergraduate students joining in the experiment for additional course credit. Park considered the task a simulation of a work process. The experiment conditions where divided into two halves; groups who shared the same instruction within each half were instructed to be either polite or efficient. In the non-shared condition, the instruction given was mixed with the group, some group members where instructed to be polite and others to be efficient. The shared instruction groups were significantly different in rating their group satisfaction with group

62
process from the non-shared instruction groups but were not different from one another in task performance. The instruction type (be polite or be efficient) given to the group did not change the results. Both groups having the same shared instruction rated their satisfaction higher than the non-shared instruction groups. Park states that, “regardless of the type of communication rules, the conditions of members sharing the same expectations was consequential for increasing satisfaction, compared to the condition of members not sharing the same expectation” (p. 100).

In summary, the description and circumstances of three types of cognition; distributed, situated, and shared, were reviewed. Definitions were compared via selected literature review. The merging of distributed and situated cognition into shared cognition was the concept adopted for use in this study. Shared cognition encompasses legitimate peripheral participation of apprentice learning and distributed cognition inclusion of mediated activities across the group, tools and artifacts. Shared cognition relies on understanding concepts of Vygotsky’s zone of proximal development and scientific and everyday conceptual development and the contribution of developing common knowledge. It is believed that common knowledge is developed by establishing intersubjectivity in the conversation and written work of participants.

Gaps in the Literature

In spite of response to needed changes in nursing curriculum identified by the AACN in 1998 and 2008, knowledge needed by new nursing graduates continues to evolve and expand as conditions in the health care arena change and advances are made. Although nursing curricula has been updated by expansion of specialties, inclusion of
health promotion as well as illness prevention and intervention, more research needs to be conducted in the realm of how knowledge is shared and disseminated throughout the profession. Thus the need for in-depth studies of formulating common knowledge in naturalistic settings has been identified. A specific area of need is in examining and evaluating the use of simulations for the benefit of improving shared cognition among nursing students and faculty.

Shared cognition and the variations which preceded it are continually evolving in the educational psychology literature and the evolution appears to be without many gaps. However, shared cognition has not been a focus in nursing research, Benner (1984). initiated a strand of research focused on how individuals develop increasing competencies (novice to expert) in decision making. This research has been the subject of continuing study, particularly related to the development of psychomotor skills. In nursing, information on how disciplinary knowledge is gained via shared cognition was not found in the current literature. This study could contribute to the development of both the nursing and educational psychology knowledge base.
CHAPTER 3

METHODOLOGY

Design of the Study

Marshall and Rossman (2006) describe qualitative research as taking place in a natural world, focusing on context, using multiple interactive and humanistic methods, are emergent rather than tightly prefigured and are fundamentally interpretive. They point out that qualitative research has been grouped into various typologies in an attempt to organize the field. The organizational schema they utilize is provided by Gall, Borg, and Gall (1996) which provides three major genres: (a) individual lived experiences, (b) society and culture as seen in ethnography, and (c) language and communication, including such sociolinguistic approaches as discourse analysis (p. 3). Marshall and Rossman, drawing on the work of Rossman and Rallis (2003) state that:

- traditional qualitative research assumes that (a) knowledge is not objective Truth but is produced intersubjectivity; (b) the research learns from participants to understand the meaning of their lives but should maintain a certain stance of neutrality, and (c) society is reasonably structured and is orderly (p. 5).

The interactional ethnography researcher investigated how nursing faculty and students share information and gain knowledge within ‘real life’ simulations of emergency practices. Interactional ethnography combines an ethnographic perspective of
viewing people acting as if in a culture over time with a sociolinguistic approach to analyzing the discourse among participants. The discourse analysis allows the researcher to illustrate moment by moment constructions of meaning and make visible how the cultural resources are constructed by the participants (Putney, Green, Dixon, Duran & Yeager, 2000). As a classroom ethnographer, the researcher documented procedures over the course of the semester in which the students were involved in the course. The purpose of the study was to explore the process of creating shared cognition within the classroom across nursing students, the teacher, and any artifacts which mediate the activity within the situation.

Gee (1999) describes seven building tasks necessary to analyze language in use in a discourse. Discourse with a capital “D” reflects language plus (gestures, actions, interactions, symbols, tools technology, values attitudes, beliefs and emotions) used to refer to context of history, culture and ideas of a society and the global aspects. Discourse with a “d” reflects language in use in day to day, face to face interactions. The building tasks are: significance or the meaning attributed; activities or representation of intentions through activity or what’s being done; identity or possession of a role or what is recognized as consequential; relationship suggested by language used or what’s enacted; politics or point of view represented or what’s at stake; connections or establishment of relevancy to discussion; and finally, sign systems and knowledge claims or consideration of what is relevant or privileged. Social languages are language used for different purposes. Language in use describes who (identity or role of the person speaking or acting), and in what particular circumstance (socially situated activity) the language used, the purpose of the activity, other participants, and the timing of the particular instance. In
addition, Gee states that discourses can split apart or come together, evolve over
time, die, spring up, but are always in relationship with other discourses and are limitless (p.
30). Gee provides an explanation of acquiring meaning within a context as more than
pattern recognition, it’s recognition of the pattern that assists in making sense of what has
been experienced within a domain. “Theories are rooted in the practices of socioculturally
defined groups of people” (p. 60). The theories are connected to different discourse
models and discourse models are linked with specific social groups. The specific social
group might be a profession laying claim to certain rights of ways of knowing (in this
study, the nursing profession). Gee continues that “The situated meaning a word has is
relative to a specific Discourse.” (p. 64). How a person speaks and thinks is guided by
their model of Discourse. “Thinking and using language is an active matter of assembling
the situated meaning that you need for action in the world... relative to your
socioculturally defined experiences... and more or less routinized through Discourse
models and various social practices of the Discourses to which you belong” (p. 67).
Discourse models help in understanding what we’re observing or participating in, assist
in preparing us to act and to recognize that’s important in the situation.

The Context of the Setting

The development of scientific concepts continues as the adult enters a professional
discipline such as nursing. Teaching and learning are focused on creating patterns or
professional schemas. As systematic framework, development of scientific conceptual
knowledge is begun in theory classes. Clinical practice assists the student in interpreting
and integrating everyday concepts into the structures framework and grounding scientific conceptual knowledge in the student nurses’ lived experience.

The simulations focused on content included in the theory portion of the course and was timed to follow presentations in the classroom. Each scenario focused on disease processes which could produce complications, which without appropriate intervention, could deteriorate into a code situation. Each scenario was developed by the researcher relying on advanced cardiac life support protocols. The scenarios included emergencies arising from: respiratory arrest from overdoses of benzodiazepines; hypovolemic shock from blood loss; diabetic ketoacidosis and congestive heart failure; post-operative craniotomy after a subarachnoid bleed and subsequent vasospasm; kidney transplant rejection and sepsis; cardiogenic failure and atrial fibrillation, symptomatic bradycardia, and septic shock and cardiac arrest. Patient histories and objectives of the scenarios used are presented in Table 1 on the next page. The simulation activity supported the first course objective which states “the learner will collect pertinent patient data, follow protocols, and apply formal, theoretical knowledge in clinical decision making”.

68
<table>
<thead>
<tr>
<th>Simulation</th>
<th>Scenario Patient Description</th>
<th>Overall Simulation Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>Ingestion error of benzodiazepines: A previously healthy, diabetic 33 year old male arrived via ambulance after father-in-law called 911. Sinus brady, responds with stimulation, lethargic, but immediately falls asleep. Speech is slurred. Recent death of wife and child in auto accident. He was driving and views the accident as his fault. Architect, owns his own business. His in-laws are supportive but grieving themselves. Smokes 1 pack/day.</td>
<td>Demonstrate appropriate physical exam skills. Recognize signs and symptoms of drug overdose. Implement appropriate nursing interventions for the patient in respiratory distress (ABC's). Use non-rebreather mask and ambu bag. Use SBAR to call physician.</td>
</tr>
<tr>
<td>Two</td>
<td>Gastrointestinal bleed and hypovolemic shock: Mr. R came to the ER complaining of stomach pain, nausea and vomiting. He has been vomiting for 2 days, coffee ground material. He has a history of osteoarthritis and takes Advil three tablets three times per day. Reported to ER, now has an IV; labs pending: CBD with diff, metabolic panel and coagulation studies.</td>
<td>As above and recognize signs and symptoms of GI bleed and hypovolemic shock. Intervene for patient in shock.</td>
</tr>
<tr>
<td>Three</td>
<td>Diabetic ketoacidosis and septic shock: Mrs. G 57 year old female. Patient found by husband lethargic and slightly confused. She is difficult to arouse, speech is slurred and difficult to understand. Breathe has fruity odor, EKG shows sinus tach. Married, mother of two adult children who live out of state. Husband at bedside. Owns a travel agency with her husband. Wearing a bracelet-Diabetic. History of Type 1 Diabetes and CHF.</td>
<td>Interpret lab work, critical lab values. Skills: Insertion of NG, neuro checks, monitor blood glucose. Practice using Insulin drip protocols.</td>
</tr>
<tr>
<td>Five</td>
<td>Subarachnoid bleed, Increased ICP: J.E. 28 year old female, seen in the ER with complaints of severe, explosive headache after collapsing at home. She was cooperative but confused as to time and place but her pupils were equal and reactive. Nauseated, sensitive to light. Glasgow Coma Scale was 14, CT of the head revealed a subarachnoid hemorrhage. She was taken to the OR for a craniotomy, clip ligation of the aneurysm. You are assuming care several hours after surgery. She is awake and alert and now complains of a headache, and is having difficulty moving her right hand.</td>
<td>Neurological assessment. Monitoring ICP, Cerebral perfusion pressure calculation. Treatment with hypervolemic/hypertensive therapy to increase MAP.</td>
</tr>
<tr>
<td>Six</td>
<td>Transfusion reaction: Mrs. J. post-operative after MVA, trauma. Liver laceration/spleenectomy. In the ICU.</td>
<td>Assessment of fluid status, SBAR. Administration of blood and use of appropriate procedure. Transfusion reaction, use of appropriate procedure.</td>
</tr>
<tr>
<td>Seven</td>
<td>V Tach, V Fib, code: Mr. E was admitted earlier in the week to one of the regular floors with toxic megacolon, he is chronically ill with ulcerative colitis. He just returned from OR again for repair of perforation of the colon, possible sepsis. Intubated and on a ventilator.</td>
<td>Care of intubated patient, use of arterial line and pulmonary artery catheter. Member of code team and resuscitation.</td>
</tr>
<tr>
<td>Eight</td>
<td>Symptomatic bradycardia, asystole: Mr. L a 74 year old male admitted for symptomatic bradycardia, syncope episodes at home.</td>
<td>Recognition of symptoms, call for Atropine orders. Recognize asystole, member of code team and resuscitation.</td>
</tr>
</tbody>
</table>
In the simulation experience, a group of four or five students participated in eight simulations. The simulation manikin, via the researcher/faculty member adjusting the computer, exhibited different signs and symptoms depending on the interventions undertaken by the student(s). If the interventions were incorrect, the researcher allowed the patient’s symptoms to worsen and the patient could die, if correct interventions were instituted, the patient responds positively. After the emergency was resolved, students and the faculty member/researcher discussed the process. The simulation was recorded and studied, via discourse analysis (the unit of analysis was the interaction), to determine how the shared thinking among group members occurred during the situation.

In total 32 debriefing sessions occurred following the simulations. The length of time spent in debriefing varied; the shortest session was 15 minutes and the longest 32 minutes. The participants and the researcher watched the videotaped scenario together. The researcher used the printed debriefing record from the simulator as an event map to the simulation and recorded field notes while the simulation was replayed in debriefing (Table 3). In debriefing sessions the faculty member/researcher pointed out cues, asked leading questions, and answered questions posed by the students. Students also asked one another questions and provided answers. Debriefing session transcripts, notes made by the researcher/faculty member during each of the eight simulations and also notes made by the research while viewing recordings were the source of data analysis. Steinwachs (1992) described three primary purposes of debriefing; description of
Liver transplant sepsis
00:00:00 Scenario started: Liver transplant sepsis
00:00:00 Name: Iris Laiier Age: 56 years Weight: 60 kg Height: 62 cm Gender: Female
Description: 56 year old female
Trend started: hypovolemia changes
00:00:21 Simulation paused
00:00:45 Simulation resumed
00:01:00 Vocal sound = Cough
00:01:00 ECG leads attached
00:01:00 ABP sensor connected
00:01:00 PAP sensor connected
00:01:00 SpO2 probe attached
00:10:13 Respiration rate = 19
00:10:14 Heart rate = 103
00:10:25 BP = 87/56
00:10:40 BP = 83/40
00:11:00 BP = 104/71 24/11 37.2°C
00:11:31 BP = 87/19
00:11:39 Respiration rate = 30
00:11:41 Alarm: HR HIGH
00:11:49 Heart rate = 120
00:24:00 Frame: Frame1
00:30:10 Alarm: ABP LOW
00:30:21 Alarm: HR LOW
00:30:30 Heart rate = 74
00:44:30 BP = 74/0
00:44:30 SpO2 = 86
00:50:00 BP = 87/19 24/11 37.2°C
00:50:00 Alarm: Naso-gastric tube inserted
00:51:00 Stomach distention disabled
00:51:50 SpO2 = 78
00:53:00 Frame: Frame2
00:53:00 Trend started: Dopamine, moderate dose
00:53:00 Vocal sound = I don't feel well
00:55:00 Rhythm = Sinus with Inferior Axis, ST elevation, HR: 101
00:55:00 Pulse rate = 62/11 37.2°C
00:55:00 Pulmonary edema, bradypnea, Pulse strength = weak
00:55:00 Central pulses, Pulse strength = weak
00:55:00 RBC's
00:55:00 Dopamine
00:55:00 Alarm: Pulse HIGH
00:55:00 HR: 139 24/11 37.2°C
00:55:00 Alarm: SK-SAT
00:55:00 BP = 66/25
00:55:00 Frame: Frame3
00:57:00 Rhythm = Sinus with Inferior Axis, ST elevation, HR: 101
00:57:00 EMG/PhA off
00:57:00 Muscular artifacts off
00:57:00 50Gd/L Hz artifacts off

Figure 3. Event Map
what happened during the event, analysis of how likely the simulation portrayed real-life situations, and potential application of what may have been learned from the simulation. The author described practical concerns such as group size, preliminary preparations, and the process of debriefing. Debriefing questions (Table 2, on next page) in the current study, were patterned after the sample questions provided by Steinwachs and were used to facilitate discussion and progression through the debriefing. Lederman (1992) suggested that the debriefing process must also include description of emotional feelings of the experience, as well as discussion of how the experience might be used in the future. These suggestions were also incorporated into the debriefing utilized in this study. In addition, the faculty member shared her insights into assessments found to be important when assessing previous situations similar to the practice situation.

<table>
<thead>
<tr>
<th>Table 2. Debriefing Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of events:</td>
</tr>
<tr>
<td>What were the important events?</td>
</tr>
<tr>
<td>What were the decisions that had to be made?</td>
</tr>
<tr>
<td>What were the results?</td>
</tr>
<tr>
<td>Description of feelings:</td>
</tr>
<tr>
<td>What were your feelings?</td>
</tr>
<tr>
<td>Did what you were thinking and feeling change during the simulation?</td>
</tr>
<tr>
<td>Description of learning:</td>
</tr>
<tr>
<td>What did you learn from this experience?</td>
</tr>
<tr>
<td>How does what you learned relate to real life?</td>
</tr>
</tbody>
</table>

72
Pilot Study

Each semester students participate in the simulation activity which reflects the customary events in the semester. Because of the number of students within the class, multiple sessions of the simulation activity were conducted. Typically there are six-seven groups, each comprised of six to eight students. During the fall and spring semesters prior to the study, a pilot study was conducted to allow the researcher to troubleshoot the process of data collection. Students usually participated in three simulations in the semester. The pilot study informed the researcher of aspects of the study process which needed to be revised and revisions were incorporated into the study. Debriefing questions and the general procedure for the scenario (assignment of simulation roles, hand over report, scenario conduction, watching the simulation and debriefing) was retained. However, artifacts were improved such as additional documents were added to the patient’s chart to enhance realism of the scene and supplies were made more accessible. The improved artifacts were kept intact and used in the study. Lists of needed supplies were also entered into the simulator files. The debriefing questions were simplified in terms of formality after the pilot series of simulations.

Study Procedures

All students in the class participated in three simulations. To provide additional data collection opportunities, students who volunteered for the study were afforded the opportunity to participate in five additional simulations. The additional simulations took place over several weeks and were not a part of the student’s normal clinical hour commitment. Eight simulations were designed by the researcher/faculty member. The
opportunity to participate was initially offered to students enrolled in the class in Summer 07. In Summer 07 fewer than anticipated number of students participated, thus necessitating the two semester data collection period to include students enrolled in the Fall 07 class. All eight simulations were offered in both semesters. During the Summer 07 semester, simulation one, two and three were recorded but the debriefings were not. The following semester all of the debriefing were recorded and included in the data. Originally, the researcher had planned to record only the additional simulations; the first three simulations that were a usual part of the class. However, the pilot study indicated that learning changed over all eight of the simulations. The number of simulations needed to develop shared cognition was not known prior to the study.

In the initial scenarios, roles associated with care giving were assigned by the researcher. However, the students keep track of who had assumed each role and rotated roles among themselves. The roles consisted of the primary nurse, nursing student, nurse co-workers, and occasionally, family member. The student who adopted the role of registered nurse in the scenario performed and coordinated the care being provided. A verbal patient report was provided which included an opportunity to ask questions concerning the patient’s status prior to beginning care. All students heard report.

Video disc recordings were made during the simulation and during the debriefing session. Immediately following the simulation, participants viewed the video recording of the simulation and then debriefed. Feedback on performance from the researcher and the other students was shared with the group and discussion of their learning was pursued. Summary of the simulation experience occurred at the completion of the eighth simulation session. The participants were asked to review their overall group experience.
Students were asked to identify what was gained from participation in the activity including perceptions, feelings, what was learned and how they made sense of the simulation (Glesne, 1999, p. 68). The group session explored their perception of the development of shared cognition from their group. At the end of final discussion, students were asked to volunteer for participation in a follow up interview which would occur after the first months of their employment in an acute care setting.

The post employment interviews took place on an individual basis, in a location of the graduate’s choice, and were audio recorded. It had been anticipated that similar employment patterns would occur among group members. However, group members did not display a typical employment trajectory following graduation (review, licensure, and employment within one to two months). Individuals who were assessable post employment were asked to review their overall group experience. Individuals were asked how and what transferred from the simulation to the work setting (Table 6, Post employment interview questions). The interviews were conducted within the first months of employment to offset continued learning gained in a health care agency. (See below, Figure 4, Study Timeline).
Figure 4. Study Timeline

Data Collection Procedures

The simulation and debriefing sessions were recorded as suggested by Erickson (2006). Erickson identified that video recordings were useful in attempting to capture the moment to moment interactions and served as a device from which transcripts of the interactions could be made and analyzed. In this study, the camera was placed in a position that focused simultaneously on the students and SimMan during the simulated code activity. Camera placement allowed the researcher to examine the raw video footage from a fixed camera position with little camera movement, as suggested by Erickson. The
goal was to obtain a comprehensive record of social interaction from which data could be constructed, and acknowledged Erickson's caution that the while the interaction is recorded and viewed the reviewer does not gain direct, unmediated access (p. 179) to the interaction. The information gained from the recording was treated as qualitatively derived data.

Data were constructed using a systematic approach to review the recordings. The data were viewed from a neo-Vygotskian learning theory perspective. Meaning that the focus on the use of language and other cultural tools as the mediating factor of what thinking is developed and shared and what learning is taking place.

Participants

College seniors, students in their final semester of a nursing program were asked to volunteer as participants in the study. The student's participation occurred as an additional time commitment and was not a portion of their mandated clinical hours. Each semester group (Summer 07 and Fall 07) experienced the same number of simulations and the same presentation order of scenarios. However, group one and two, in the Summer 07 session, were not recorded during debriefing following simulations one, two and three.

Seven students' volunteered in the initial grouping (Summer 07) and nine students joined the study in the subsequent grouping (Fall 07). The student's ages ranged from 21 to 40. Brief student portraits were compiled. (See Figure 7, following page) The student's participation required an additional time commitment and was not a portion of
their mandated clinical hours. Each group experienced the same number of simulations and the same presentation order of scenarios.

The first group of seven divided themselves into two groups based on their own convenience in scheduling. The group members remained the same throughout the simulations. Group one participated immediately following theory class and was made up of four students, one male and three female. Group two scheduled their participation for the day following their clinical experiences, and was comprised of two females and one male. The subsequent semester groups divided themselves into groups of five students (one male and four females, participating following clinical experiences) and four students (four females, participating before theory class). The simulation extension took place during the student’s preceptorships. Preceptorships were clinical experiences which took place over twelve, 12 hour work shifts and in conjunction with an arranged staff nurse preceptor. Participants were in various clinical acute care settings: Three students were placed on neonatal intensive care units (the only non-adult patient care units); three students were on intermediate care units; four students were on intensive care units; three were on emergency rooms; and three participated on medical-surgical units.
Table 3  Sketch of Participants

<table>
<thead>
<tr>
<th>Sketch of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages 21-40</td>
</tr>
</tbody>
</table>

Gender N=15

<table>
<thead>
<tr>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>3</td>
</tr>
</tbody>
</table>

Previous experience in health care:

- 5 had some experience working as nursing assistants
- 1 had worked as ambulance driver

Current experience:

- 4 are working as nurse apprentice-worked during nursing program but only sporadically during study.
  - Nurse apprentice job duties increase as the student advances in the program.

Preceptorship placement

- 3 Neonatal intensive care
- 3 Intermediate care
- 4 Intensive care
- 2 Emergency room
Simulation Context

The simulation took place in a mock hospital room in the simulation laboratory on the university campus. The room was large and could accommodate one to two caregivers on both sides of the bed. In the room were wall mounted monitor, suction/oxygen set ups, a bedside table and an over-the-bed table. An emergency crash cart and medication administration cart were assessable to the room. SimMan (Laerdal) is positioned in the center of the room on a stretcher; the usual equipment needed for patient care surrounded the bed (BP cuff, heart monitor electrodes, IV poles, IV pumps, etc). The room was equipped with a video camera and a microphone. The manikin operator was in a separate partitioned room and was not visible from the bedside. Equipment, medication, or any necessary accessories were adjusted depending upon the scenario.

Figure 5. SimMan Monitor and Manikin

Figure 6. SimMan Close Up
Role of the Researcher

The role of the researcher was that of a full participant, as defined by Glesne (1999) initially during the simulations and debriefings. Full participation consisted of "simultaneously functioning as a member of the community and as an investigator" (p. 44). The role shifted to that of participant/observer as defined by Spradley (1980) while reviewing the video tapes. In other words, the researcher was both member of the nursing community as a teacher of nursing and an observer of the activities and the students. As a researcher/faculty member, my role was to facilitate the simulation by providing appropriate responses in the manikin to student’s actions. Typical patient verbal responses from the manikin were preprogrammed in both male and female voices. When the appropriate patient response was unavailable (hadn’t been recorded) the faculty member responded. Some patients were unable to speak or respond. Patient responses were designed to follow the usual illness trajectory but in the event the student’s unexpectedly asked for or acted in an unanticipated manner, the teacher made modifications to the patient’s responses. The manikin was prepared by the researcher before the scenario using previously developed lists of required equipment and supplies.

My role of participation in the community itself included facilitating the discussion and during debriefing, checking that the objectives of the simulation were addressed, and answering questions or clarifying interpretations of what had happened. My participation shaped some of the discussion by presenting or verifying the presentation by group members their explanation of physiological and medication usages. In addition, procedures were clarified. Use of resources, either textbooks or PDAs, was encouraged and group members used other group member’s knowledge and experiences to add to the
discussion. My participation also altered some discussions in that the group used my
knowledge at times, which was a normal occurrence in this naturalistic setting.

Advantages of being a participant/observer were that the flow of the class was not
disrupted, usual procedures and trouble shooting of equipment was known and students
did not have additional anxiety that an outsider researcher might have caused. A
disadvantage was that taking notes was more difficult for the researcher; however, it was
mitigated by having the simulations and debriefing video recorded. A second
disadvantage was the struggle to find a balance between distancing self from the action
and assisting in trouble shooting.

The researcher as full participant interacted regularly with all students in the class as
the two required simulations were part of the normal routine of the class. Nine of the
participants from group three and four were in the researcher’s clinical supervision group.
The researcher’s activities included: development of the pre-activity content module,
development of the scenarios, preparation of patient charts and needed equipment
including medications, operation of the manikin during the scenario, conduction of the
debriefing sessions and post-employment interviews, transcription of the video recording,
and completion of data analysis.

Research Questions

Yin (2006, p. 112) states that research questions can be both descriptive (asking
what happened) and explanatory (asking how or why things happened). In this research
study both aspects were explored through interactions of participants in the debriefing
sessions.
Research questions include:

1. What is the role of simulation as part of the learning process?
2. How does the interaction during and after the simulation contribute to the knowledge base?
3. How does the participation in the simulation prepare students for future roles?

In examining the role of simulation as part of the learning process, (RQ1) the researcher noted the jointly developed knowledge, the degree of common knowledge established, the previous knowledge required and how nursing knowledge was used as discussed by the participants during the debriefings. In analyzing the interactions during and after simulation, (RQ2) the researcher noted what knowledge resulted from the interaction, what roles were needed in the simulation and in practice and how problem solved during the simulation were discussed in the debriefings. For determining whether participation in the simulation prepared students for future roles (RQ3), the researcher identified how prepared the students were to assume the identified roles, how thinking hanged due to involvement in the simulation and how inaccurate information was modified or corrected, resulting from analysis of the discourse during the debriefing.

Methods of Data Analysis

Data analysis from an ethnographic perspective necessitates examining the data for patterns of activity among the members of the culture. Nespor (2006) advises against looking for patterns within the unit of analysis which reduce findings to a simple explanation. Such reductions obscure how the event fits into a larger pattern of explanation and connects or is disconnected from other events. Expanding the pattern of
explanation comes from the fullness of the description of the event; descriptions should be vivid or result in a feeling of having been there. The description should not rely on a single theoretical perspective exclusively but multiple viewpoints to encourage ‘seeing’ broadly.

Nespor encourages the researcher to acknowledge the necessity of any observation as incomplete and incapable of accounting for the whole of anything. Recognition of only partial pattern explanation is likely in that people are in process; individuals bring to any situation varying experiences with differing interpretations, goals, histories, cultures, expectations and desires. Nespor states that “the meaning of field notes are unstable”, and should be open to reinterpretation or reconstruction (2006, p. 300).

Since processes are always in flux, Nespor suggests looking for patterns by noting four sites of observation. First, observe the multiple contexts in which a participant is involved, including larger system or societal policies. Second, look for how the movement of individuals along trajectories and the intersections of time, place and with other persons occur and use the observations to construct written explanatory stories of who, how and what. Third, the placement of any particular process is part of larger events and should also be considered from a distance—past and future influences. Finally, Nespor directs the researcher to compare their explanation with the generally expected pattern for fit, both accommodation and conflict. In comparing the explanation with the usual, the researcher should be question if the explanation fosters acceptance of the dominant paradigm (social, political, and power structures) or challenges given reasoning.

Procedures for further analysis of data were drawn from steps identified by Erickson (2006). The suggested procedures reflect an inductive approach aimed at understanding
the meaning of the interactions and consist of six steps. Step one is to review uninterrupted, the whole event. Each debriefing video was viewed and then transcribed by the researcher. Data analysis was not attempted until all of the videos were transcribed. Recognition of only partial pattern explanation was likely since people were in process, however, participation in the simulation, video recording and debriefing was consistent across the simulations. In addition, event maps of each simulation were produced by the Simman software with researcher comments inserted. Spradley (1980, p. 41) describes social situations as consisting of a place, actors, and activities. The place and actors have been described previously. An event map is a diagrammatic representation of the activities observed. The map serves as a means of identifying what activities took place, when the activities occurred, who was involved, and what was said. Inspecting the map assisted the researcher to separate activities into patterns. Step three, in Erickson’s identified process, is a modification of content analysis. The post employment interviews were also systematically examined. The continuation of the process in step three was used to explore additional points of interest in the activity in step four in which the data were analyzed until all of the research questions are answered.

The validation by participants or review by some of the actors involved in the activity was the fifth step. The participants reviewed the video recorded simulation during debriefing. The final step, step six, was a comparison of the simulation debriefings for representativeness of the transcriptions.

Using an interactional ethnographic approach, the researcher examined the recordings to identify: who could do or say what, when and where, with and to whom, under what conditions, for what purposes, with what outcomes and consequences (Green

85
& Baker, 1991; Castanheira, Green & Dixon, 2007). An examination of language or spoken text within the context of an event is a way to identify "the events and their sequence of occurrence, the meaning of the actions and the resolution or what finally happens" (Merriam, 1998, p. 287).

The recordings served as a means of identifying what activities took place, when the activities occurred, who was involved, and what was said. Inspecting the transcripts assisted the researcher to separate activities into patterns. By analyzing the frequency and variety of messages, Merriam (1998) suggested that categories can be constructed that capture relevant characteristics of the document's content. Categories were constructed by the researcher. The post employment interviews were also systematically examined and categories were constructed. This exploratory process was continued until all of the research questions were answered. Hicks (1995) emphasized that the reading of a text or the construction of a conversion is located within a context or situated practice, and social communicative practices are a dialectic form between speaker/listener and writer/reader.

A portion of a debriefing from a simulated patient care experience, Mr. E, is provided as an example of how the data were analyzed in Table 5. The patient had experienced abdominal bowel resection surgery and was a patient in the intensive unit. Mr. E was on a ventilator (breathing machine) with multiple medical devices (pulmonary catheter, arterial line, nasogastric tube, foley catheter, and intravenous lines) used in his care. Nursing students participated in caring for Mr. E by adopting the roles of registered nurses and performing the care necessary for the patient's well-being. The segments examined reflect a discussion of what participants recalled feeling during the simulation. The segments occurred approximately half way through a 20 minute discussion and
followed descriptions of what had happened in the scenario. Subsections of the dialogue were analyzed using an interactional ethnographic approach.

**Segment Meaning**

The debriefing transcript dialogue was divided into message/action units, interactional units and sequence units (Green & Wallet, 1981; Putney, 1996). Message units are the smallest number of words that convey conversational meaning and action units (message units taken together) convey what is occurring. Boundaries between message units are identified by their contextualization cues. Interactions units define the speakers' part or turn taken in conjunction with other speakers in the dialogue and sequence units describe the overall gist of the conversation. Definitions of terms have been adopted from Putney (1996, 2007).

In analyzing the dialogue, lines one through fourteen, the students responded to the question of what they may have felt during the simulation. E summarized his sense of the simulation process (simulation number seven/eight) by emphasizing the way in which the term responded to the patient cues, using his hand to indicate a rapid sequence of the group knowing what to do and when. S agreed, however, both students backed away from the degree of confidence expressed and possibly wished not to appear too cocky, just having improved capabilities. The overall interaction reflected progress from a previous state to the current time. In line 14 through 21, S tried to quantify her feeling of how much she had learned and establish what she now feels in relationship to her prior knowledge. C tied knowledge learned in the simulation with the previously known information while pointing out that the link was tenuously connected before and had not been recalled.
In lines 35-39, two students disagreed or clashed over their clinical experiences, classroom content and events experienced in a simulation. CZ recalled the shock states discussed in class and in simulations. SC refuted not having had a patient in clinical with septic shock. The teacher/researcher asked for the student to compare the simulated patient with the real person SC provided care. It was not until the dialogue was transcribed into message/action units that the teacher/researcher recognized the emotion offered by S. The meaning from the segment described was more clearly revealed by transcribing the dialogue into massage/action/interaction/sequence units. While participating in the discourse of the debriefing, the meaning being constructed was not as visible until the segment was transcribed and reflected upon. The message unit analysis was used on data in which segment meaning was not readily apparent in table 5 on the following pages.

**Trustworthiness of Qualitative Data**

Lincoln and Guba (1985) transform issues of validity into elements of trustworthiness that can be translated from the quantitative terms of validity and reliability. These terms more readily relate to the type of inquiry conducted in qualitative research. For example, they suggest transforming internal validity to credibility, external validity becoming transferability, reliability as dependability and objectivity to confirmability.

The validation of data (member checking) by participants involved in the activity was conducted immediately following the simulation, after the recording was viewed and during the debriefing. In this research study, the credibility was established through
### Table 4  Dialogue Interactions

<table>
<thead>
<tr>
<th>Sequence units</th>
<th>Interaction units</th>
<th>Actors</th>
<th>Dialogue in message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction of the topic</td>
<td>Calling for feeling states after false start.</td>
<td>S</td>
<td>01. How is it feeling while we are doing simulations?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>02. Can you comment on your person while...</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>03. ...what you felt?</td>
</tr>
<tr>
<td>Overall description of movement from</td>
<td>Reflects his sense of process occurring in the simulations.</td>
<td>E</td>
<td>04. We're starting to get to know what to do.</td>
</tr>
<tr>
<td>previous time to now.</td>
<td></td>
<td></td>
<td>05. ...a little bit you know.</td>
</tr>
<tr>
<td>Agreement, identification of feeling.</td>
<td></td>
<td>SC</td>
<td>08. More on top of things.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>09. Yeah.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>11. Yeah.</td>
</tr>
<tr>
<td>Adds in disclaimer</td>
<td></td>
<td>SC</td>
<td>12. Not all the way though.</td>
</tr>
<tr>
<td>Linking to current time.</td>
<td>Summarizes placement in learning trajectory</td>
<td></td>
<td>13. Still a long way to go.</td>
</tr>
<tr>
<td>Characterizes learning progression.</td>
<td></td>
<td>S</td>
<td>14. Where do you think you are as far as being a senior nursing student?</td>
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<td></td>
<td></td>
<td></td>
<td>15. I wish I was further</td>
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<td></td>
<td></td>
<td>SC</td>
<td>16. but I think in this semester alone.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>17. I have come farther</td>
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<td>18. than I had in the last two</td>
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<td></td>
<td>19. combined</td>
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<td></td>
<td>20. as far as nursing skills go.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>21. I mean I was able to learn so much.</td>
</tr>
<tr>
<td>Tying back</td>
<td>Links simulation experience to previous knowledge</td>
<td>C</td>
<td>22. Yeah, when we're in there,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>23. I think in there we might not know it,</td>
</tr>
<tr>
<td>Sequence units</td>
<td>Interaction units</td>
<td>Actors</td>
<td>Dialogue in message</td>
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<tr>
<td>24. recall it,</td>
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<tr>
<td>25. but when you explain</td>
<td></td>
<td></td>
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<tr>
<td>26. we know we’ve seen it before,</td>
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<td>27. we’ve red it before</td>
<td></td>
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<tr>
<td>28. ..somewhere.</td>
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<td></td>
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<tr>
<td>29. And it comes back.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. So it, oh</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. I don’t want to put words in your mouth.</td>
<td>Names link</td>
<td>E</td>
<td>32. Would it be fair to say it made it more real?</td>
</tr>
<tr>
<td>33. Yeah.</td>
<td>Connects simulation with knowledge</td>
<td>SC</td>
<td>34. Yeah, a lot.</td>
</tr>
<tr>
<td>35. We did septic shock,</td>
<td>Frame clash</td>
<td>C</td>
<td>36. all the shocks</td>
</tr>
<tr>
<td>37. but never saw it</td>
<td>Comparis to actual patient care</td>
<td>SC</td>
<td>38. I got too,</td>
</tr>
<tr>
<td>39. in one of my patients.</td>
<td>Links experience to previous knowledge</td>
<td>S</td>
<td>40. How did simulation compare with your real patient?</td>
</tr>
<tr>
<td>41. Ahh....</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>42. She was third spacing really, really bad.</td>
<td></td>
<td></td>
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<tr>
<td>43. She had low pressure and then the high heart rate...</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>44. she was edematous,</td>
<td></td>
<td></td>
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<tr>
<td>45. like four plus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46. ...weeping</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>47. just weeping and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48. she was in septic shock.</td>
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<td></td>
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<tr>
<td>49. It was pretty bad.</td>
<td></td>
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<tr>
<td>Sequence units</td>
<td>Interaction units</td>
<td>Actors</td>
<td>Dialogue in message</td>
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<td>----------------</td>
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</tr>
<tr>
<td>S</td>
<td>50. Did she survive?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>51. No,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explains feelings</td>
<td>52. but I had two and the other one did...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asked for feelings state</td>
<td>53. but she didn’t.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>54. Mortality rate is 50% when someone has sepsis...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>55. We want to recognize it as early as we can so that treatment can begin.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>56. What else might have been different in her antibiotic orders?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>57. We should have collected cultures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solidifying knowledge</td>
<td>S 58. More than likely she would have been on more than one antibiotic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct Actions</td>
<td>SC 59. Yeah, it...</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>60. she’s septic she needs a lot.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>61. What would they recommend for antibiotics?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>62. You’re right in getting the culture and see what grew but they would start with empirical coverage, a gram negative, a gram positive until...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>63. Until they know...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>64. Right...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prior knowledge</td>
<td>65. How long does it take to grow out?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>66. 48 hours?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>67. Usually there is a preliminary report in a couple of days. But you have to get something started.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>68. But you have to take a culture prior to make sure you didn’t alter it.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>69. That’s right.</td>
<td></td>
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<tr>
<td>Sequence units</td>
<td>Interaction units</td>
<td>Actors</td>
<td>Dialogue in message</td>
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<td></td>
<td></td>
<td></td>
<td>70. OK, anything else with Mrs. Evans?</td>
</tr>
<tr>
<td>Summarizing feelings</td>
<td>Expresses what she felt</td>
<td>SC 71.</td>
<td>I'm glad she made it.</td>
</tr>
<tr>
<td>Positive reflection</td>
<td></td>
<td>E 72.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C 73.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SC 74.</td>
<td>I had some questions on the mega code but now I understand it better.</td>
</tr>
</tbody>
</table>

prolonged engagement, persistent observation, triangulation, checking for direct test of findings and interpretations with sources. Events maps, head notes and field notes were compared with debriefing videotape content in triangulation of the data.

In terms of external validity, Lincoln and Guba (1985) maintain that rich thick description allows readers to determine whether their own settings could result in an attempt to replicate the research in what they call transferability. Merriam (1998) argues that the nature of qualitative research is to explore in depth issues that rely on user or reader generalizability (Merriam, 1998).

Lincoln and Guba (1985) further recognize that researchers may establish dependability and confirmability by using people not involved in the project at hand as auditors. Auditors review the process (dependability) and the product (confirmability) of the research by noting how the records and data were handled and kept to reduce the possibility of fraud. In addition the auditors would review the "data, findings, interpretations and recommendations" of the research and thus establish coherence between the raw data and the analysis performed on that data. In this research project,
faculty member with expertise in qualitative research, committee chair were consulted as auditors. Post employment interviews with available participants were also used to confirm interpretations and recommendations of the research.

Students were asked what was gained from participation in the activity including perceptions, feelings, what was learned and how they made sense of the simulation. In addition, nine of the student participants, who could be located were interviewed several months after beginning work as a registered nurse and asked the meaning gained by participation.

The researcher grouped the transcripts of each scenario/simulation together and compared them within the simulation and across the simulations. The researcher examined the scenarios for the degree to which the each group’s experience in the simulation were typical of one another, different or conflicting.

The data analyzed consisted of portions of debriefings from simulated patient care experiences. Two similar approaches were used to examine segments. Through the first approach (Putney, 1997; Castanheira, et. al, 2007) the researcher used the identification of action units/message units, interaction units and sequence units to explore the segment meaning. The debriefing transcript dialogue was divided into message/action units, interactional units, and sequence units. Message units are the smallest number of words that convey conversational meanings and action units (message units taken together) convey what is occurring. Boundaries between message units were identified by their contextualization cues. Interaction units defined the speakers’ part or turn taken in conjunction with other speakers in the dialogue and sequence units describe the overall gist of the conversation. Definitions of terms were adopted from Putney (1997).
With the second approach to the discourse analysis the researcher investigated the social construction of intertextuality within the group and the meaning made during the debriefing (Bloome & Egan-Robertson, 1993). The notion of intertextuality reflects multiple meanings such as referencing a text in support of an idea, or taking up words or phrases used by others, or making connections by the person reading the text or talking with previous texts or conversations. Intertextuality makes visible the support structures put in place and used in the situation to make meaning or the references for making meaning. A related construct, intercontextuality (Floriani, 1993) was identified as well. Intercontextuality is the linage of actions in one event that are carried out similarly in subsequent activity. While intertextuality illustrates the linking of texts, intercontextuality refers to linking the action people take with text.

The third approach consisted of a thematic analysis related to the research questions, using constant comparative method of data analysis (Merriam, 1998). Through this analysis data were grouped together by a topic of interest realted to each research question. The topic of interest regarding each question became category cover terms and items with each category were further grouped into sub-categories. In addition to forming patterns with categories, the researcher also examined patterns across categories in a contrastive analysis (Putney & Frank, 2008).
Limitations

Agreement on the definition or what constitutes shared cognition is lacking and some readers’ interpretations may differ from the researchers, this would be a limitation not uncommon in all types of research. Limitations of greater importance in this study are based in the design of the study, it is dependent on the participant’s recall and self description if any learning was retained or transferred to an actual emergency case. While it would be ideal, as proposed by Kneebone, Scott, Darzi and Horrocks (2004) that clinical simulation be linked with clinical practice; the linking of clinical simulation and actual emergencies is not possible. The students may or may not be practicing in the clinical area or on the day when an emergency happens. Even if the student did have the opportunity to participate in an actual emergency, revisiting the simulation laboratory for additional practice could not be accommodated within the study. Debriefing immediately following any such event in the clinical area did occur. Formal practice such as certification in advanced cardiac life support (ACLS) does occur after licensure and employment.

My role as a researcher and as a teacher could have either limited or enhanced the readiness of the responses from the students if the students viewed the roles as being conflicted. However, the activity as a usual occurrence in the course or as a part of the study was not graded.
CHAPTER 4

FINDINGS OF THE STUDY

Research Questions

The results are presented in the same order as the research questions were identified. The over-arching questions from the guiding framework asked: what was the role of simulation as part of the learning process; how did the interaction before and after the simulation contribute to the knowledge base; and how did participation in simulation prepare students for their future roles. The data were examined for the contribution made by the group members in discussion during the debriefing sessions. Italicized words identify categories and sub-categories in the integrated presentation of data. Summary tables identifying categories and sub-categories were developed to assist in organization and presentation of the findings. Data Analysis tables are presented at the conclusion of discussion of the research questions (Table 6 & 8).

Research Question One

The initial question asked about the role of simulation as part of the learning process. In examining the role of simulation as part of the learning process, (RQ1) the researcher noted the jointly developed knowledge, the degree of common knowledge established, the previous knowledge required and how much nursing knowledge was used as discussed by the participants during the debriefing.
Jointly Developed Knowledge

As the number of completed simulations increased group members progressed from describing initial anxiety, to focusing on known aspects of the situation and identifying possible actions, to ultimately integrating situational knowledge into newly developed knowledge. For example, group members described initial anxiety during the debriefing of the first simulation, N explained that “we have memorized what to do but we have never had a patient actually stop breathing. To actually have to do CPR” and “at first we were bolstering each other, oh my gosh, what do we do”. D added that the group “didn’t know what else to do:”

In debriefing session what the researcher/observer noted was that during the first simulation, student interaction was initially directed to other classmates, waiting for someone else to act. Whispered conversation was overheard on the video recording that suggested participants were not sure of what should be done, “Should we put on the non-rebreather mask? Do you turn up the oxygen? OK, not breathing”. The student stopped to think and confer with others and both students left the bedside and went to look at the chart. G stated that “I was scared, I didn’t want the patient to crash, with four people in the room trying to help her” and J concurred that he was “kind of nervous at first”. As the simulation debriefings progressed, N described how changes occurred by connecting situational data and prior knowledge into a newly expected behavior, she stated “we started to think, ok… airway, breathing, circulation. What do we do” with “when you said she took Xanax in night shift report, I didn’t really say (to myself) OK, she took Xanax—I need to look at what I do for her assessment for respiratory status. I didn’t
really think like that”. B adds “we got into the physiology of it. Ok, this is happening, so what causes this to increase or decrease”.

In another debriefing (simulation four), N states: “you would think that that was pretty common knowledge but we just weren’t aware of it and I kind of feel...I don’t know...like we waited a long time, she was sitting there not getting any O² for a really long time”. T agreed: “I know, I could see her O² levels just going dunk, dunk, dunk (waves her hands downward)”. L disagreed, “I think I picked up because when we did the first simulation and we were bagging her, her oxygen started to pick up, and I’m thinking, we need to bag her...we did that before and it would work now”. L tied the current situation to the first simulation and shared with the group the information that was applicable between the two.

Students consistently engaged in conversations to confirm knowledge among them. At first they asked what each was thinking, then moved from making tentative suggestions, to sharing recognition of the problem and finally to applying new insights. For example in a simulation five, P described “we had quick responses and knew she was having a reaction. D was talking out loud and let us know what she was doing so we understood”. In the final simulation one group member described his newly formed perspective “I don’t think we were as anxious as the first time you threw a code at us”. A second student (E) commented, “We’re starting to get to know what to do, you know. What we should do...boom, boom, boom”. S replied “more on top of things”.

Researcher observations from field and head notes supported the student’s comments. Tentative questions related to what might be occurring in the simulations...
were replaced by actions that were more timely and verbal descriptions that reflected
more nurse-like language. For example, S and C in the final simulation related a
description of how simulation participation, participating in debriefing, and clinical
experiences meshed, C “I think in there (simulation) we might not know it, recall it but
when you explain, we know we’ve seen it before, we’ve read it before somewhere…and
it comes back”. I asked if it was more real. And S replied “yeah, a lot”. C continued that
“we did septic shock, all the shocks (in theory class) but we didn’t see it” and S added, “I
got to see septic shock in one of my patients, she was third spacing really bad, she had
low (blood) pressure and then a high heart rate. She was edematous, 4 plus….weeping,
just weeping and she was in septic shock”.

During debriefing intertextuality was noted when participants across the
simulations referred to what had happened in previous simulations or nursing
interventions that had been used before and applied in subsequent patient situations. For
example, L thought she identified a patient predicament and recalled actions that had
been helpful previously and applied them in the current scenario. The participants
confirmed that application in the debriefing. References were also made to content being
brought into the simulation from the theory course and clinical experiences.

Common Ground

Participants over the simulations began to clarify their personal understanding of
the situation with other group members by working together and listening to one another
and developing shared understanding such as when G in simulation three states “we
listen to each other, when somebody says something…(group agrees) Ok, let’s work on
it.” And J adds that “everybody was doing something different” as opposed to trying to
all do the same task. In the field notes of prior simulations, the researcher had noted that often all of the students tried to implement the same action. For example, if a medication calculation was needed group members all joined together to do the math, often suspending giving care or if an order was received, most participants moved to implement the order, not continuing individual tasks. However, in one of the latter simulations, the team leader readily assigned tasks and individual group members completed assigned tasks.

**Developed teamwork** was identified as strength of the group, especially in the sharing of tasks and reliance on a group member to contribute what another didn’t know; S asked “was it helpful that P knew about administering blood”? L answered, “Yes, that was very important because I didn’t know” and later L asked what the purpose of assessing the blood sugar was in that the patient was not a diabetic. G replied that the health care provider orders asked for accu-check every hour and P added that if the patient had “liver problems she might have problems generating glucose and processing it”. G commented that “we all know what are strong suits (of other group members)...like I know nothing about the ventilator any more...the first time I saw a ventilator was in ICU and that was it. So when J came in, I was like...I don’t know but you do, you do it”.

In deciding what aspects of the simulation went well in the seventh simulation, the group identified behaviors such as working as a team and knowing what to do but were able to be more specific in their descriptions; J: “I think everyone took a spot and stayed there, and took charge of one thing and I think CPR went well, when one was getting tired, we switched spots”. J continued, “we are getting more comfortable with the
simulations now and kind of our thought process and us working together as a team, seems to be a lot better....we aren’t fumbling around”. L added “it’s been great to see how much more fluid things have gotten”. P described the group’s overall progress as “increasing organized chaos”.

B states that she was “calm watching you guys, you were on top of everything. Wow, they are really doing a good job out there, ....even though you’re in the situation and you think what to do next...One person would think out loud and one person would say something else....it was a synergistic effort”. N linked the effort in the current simulations with future events, “We are going to see codes like this and we can pull it back, pull from this (simulation)”.

J summarized his feeling that there was “a lot more teamwork, skills, and knowledge” or shared content and G added that she saw better “communication, knowing each other’s strengths, asking for help”. D described the group as “not so hesitant and standing around...well, sometimes we stand”. J concluded that “after eight simulations that we have had, I felt I learned a lot from it and I started thinking about the students who haven’t done them throughout the semester...I would like to go see what their first code looked like, compared with our last one. We learned a lot, in the event this (emergencies) happen in our careers we’ll be more ready for it than a dry run”.

Required Previous Knowledge

Group members routinely linked prior knowledge that was necessary to developing ideas and applying their knowledge to the current scenario; B states “we had the knowledge and skill to take care of this patient, we just had to dig for it” and in the same simulation, N reviewed what it meant in remembering if the drug was a “stimulant
versus a depressant, what class the drug is in” and B added, “what are the toxic effects, blood levels” and N interrupted, “to know how long it takes to go through her system”. However, in one instance the group members identified previous knowledge held by group members that was not used in the scenario or errors they had committed. N stated she had participated in blood administration procedures before and she identified elements of the procedure missing from the member actions.

The researcher asked the group to explain what knowledge was used and the supporting rationale for desired actions, S said “you were looking at blood pressure at that point and you had a discussion about positioning...O interrupted “up or down” and S asked G why she wanted to put her up, G responded that “she has an naso-gastric tube and she could aspirate lying down”. J explained that his concern was “I was more along the lines of being able to breathe. I was still worried about the oxygen saturation and I thought maybe lying down...that’s why I was listening to lung sounds...to see if there were any crackles”. The researcher asked P why the student wanted the patient lying less upright, “I didn’t want the head of the bed up too much because I was thinking, well, perfusion...her SPO2 is low and her BP is really low, then sitting up is going to cause pooling and the blood will have a hard time returning to the heart. I thought where she ended up was ok but I think any higher would have added to pooling”.

In answering the question of what might have gone well within a scenario, the group members identified what they could have done. Potential actions were based on prior knowledge; none of the interventions were directly described or suggested in the scenario by the researcher or within the shift report; P states that “neuro checks and
blood sugars” could have been done, J adds the “we could have checked pupils, see if they were dilated, if she could respond”.

M described “even in the scenario now there were things that I thought about from previous week of precepting, just from last Wednesday and Thursday, that I was thinking, oh, we need to make sure we watch for that” and T interrupts, “But also from previous simulations that we’ve had too”. Within the discussion of the same scenario, participants identified actions that should have been done when blood is administered that originated from their previous knowledge; N said “we didn’t have the normal saline”; M added “we didn’t verify”; and N reminded group members “we needed to do vital signs every fifteen minutes”. Consequences of a blood reaction were also described from prior knowledge; L related the back pain compliant could have come from “the kidneys because of the breakdown of the blood, lysis of the red blood cells”. The administration of blood or blood products was a skill required for graduation from the program and content emphasized in the semester curriculum.

Nursing Knowledge Used

Group participant behaviors were grounded in their practice of nursing process. Their usual practices supported their actions as they determined what was happening in each scenario and what clinical decisions were to be made. The researcher observed, in head notes, the presence of a student at the patient’s bedside increased as the scenarios played out or became more patient centered. The bedside student continued speaking with the patient/manikin asking questions, offering reassurance, or providing answers. Remaining with the patient is an expected behavior when significant changes in the patient’s condition occur. Group members increased their expected ‘usual routine’ or
used their nursing knowledge as the number of scenarios increased. Initial patient assessment data was collected with increased regularity, consultation with a health care provider, either a nurse practitioner or physician, occurred earlier in the scenario, and the preparation and organization of the primary nurse student accelerated. The purpose for calling the provider and anticipated, desired response became clearer. The beginning calls lacked any offer of what was desired from the provider and the primary nurse student often presented the incomplete data.

In a different scenario, the group members noted that they had noticed the drop in $O_2$ earlier than in previous scenarios or the participants had progressed in delivering nursing care, SC also added, “we saw the heart rate pretty fast” and did “neuro checks”, E stated “we called the doctor right away”. The researcher commented to the group that “I thought you checked on the patient quite well…you didn’t ignore her, you weren’t just doing thing to her…you asked if she had pain, you used touch to reassure”.

During the final simulation, the researcher asked the group if they had the knowledge and skills needed for the day’s scenario and one group member answered that she thought they did; K stated “looking at you today, I thought you did” and L answered, “I didn’t know all the blood details”. It was pointed out that among the group members the necessary knowledge was available; L commented that “as I understand, that’s the whole point. If you don’t know something, someone else does” and J added that it “helps with us being in different fields (practice areas)”.
Research Question Two

The second broad question was how the interaction during and after the simulation contributed to the knowledge base. In analyzing the interactions during and after simulations, (RQ2) the researcher noted what knowledge resulted from the interaction, what roles were needed in the simulation and in practice and how problem solved during the simulation were discussed in the debriefing.

Knowledge Gained from the Interaction

Interactions during the simulations resulted in increasing cohesiveness in working together and anticipating what another group member knew and could be relied upon to contribute, or teamwork functioning. In addition, participants watched the video recording of the simulation immediately following their participation and compared what they perceived happened during the simulation and what they happened in viewing the simulation.

Team Work Functioning: Functioning as a team developed across the eight simulations. For example, students asked each other what to do in the first simulation. The researcher observed that the time between thinking of what to do and acting on that thought was lengthy in the beginning. In the second debriefing N states “I was thinking what the signs and symptoms were and what was going to happen...you have to think about what could potentially happen, because last week we didn’t”. By the seventh simulation, M relates that talking is one avenue that lessens frustration with not knowing. She states “Talk. I mean if you are thinking something that could be the right thing, just say it out loud”. And researcher added “so share what you’re thinking and then someone can confirm it or say that’s not it”. J identified that “it went better than I
expected it to...as lost as I felt the teamwork really worked. It really helped out...it was nice to have that many nurses with us, in reality we are not going to have that many people”. G disagrees, “if the patient is doing badly we will. If the patient is doing badly they rush (in). She continued that “teamwork worked well today. CPR was good”. D added that “we knew what to do” and that the team “checked all of the patient’s lab work, the signs on the monitor, they were consistent and paid attention to him (patient)”. J responded that the team took “more BP’s more often than we usually do” and G remarked that “someone was always next to the patient”. In the next to the last simulation the center of care had shifted to the patient as the central concern. M summarized participation in simulations as “we knew there was something that was going to be happening, we were anticipating whether or not the patient was going to crash. And it made me more aware with certain patients of what certain signs to look for”.

The team as a functional unit improved as the simulations progressed. The group members began assisting one another in the simulations, either in demonstrating how to accomplish a task or asking if help was needed. The participants acted as resources for other group members much as a more capable other in Vygotsky’s zone proximal development. The degree to which one person stayed on task improved as did the directions to the team from the primary nurse. The participant acting as the primary nurse directed others as needed but by the final simulations, team members identified for themselves needed actions, G stated, “we know what we should be doing, or if one person doesn’t see something going on, they’ll jump on it”.  

106
Comparison Between Perceived Actions and Actions Viewed

Student comments supported the worth of viewing the simulation, during the debriefing. J stated “it really helps to come in here after and watch it over again”. G said it gives her “the whole picture”. J believed that “seeing the timeframe, how we were doing, how we were thinking. That really helps a lot in retrospect to see what we were doing and what we may have missed”.

From the researcher’s perspective, viewing the simulations allowed students to see what others were doing and how the group was distracted by an event or worked together or the competence displayed in handling the situation. L comments that the primary nurse did say the blood pressure was low but I just missed it. J explained what he was thinking, “I tended to get away from the assessment part because I was more worried about critical things that were going on. It was nice that my nurses were very helpful in remembering things that I should have been thinking about at the same time too”.

N identified her feelings during the simulation and how viewing the scenario changed what she then felt; N was a “little..not mad at myself...but ah, Because I can’t figure it out but then I realize now, it was only five minutes...then that’s not bad but during the time you think, gosh, I wish I could get this faster. You want to do it right then and there”. Other participants added that the simulation had gone better than their perception during the scenario; O added that it was more organized, P described CPR as more systematic and two additional members noted correct actions that the group had in fact initiated.

Students sought clarification in the debriefing from each other and from the researcher. J started to relate his perception, “we started to realize...”G interrupted, “we
need this…the temperature we caught on right away. Go check the temp” J continued, “and the accu-check wasn’t done and we double checked that”. G identified that the group recognized the changed patient condition, “as soon as the blood pressure started going down, ...re-prioritize, do I really need to do this accu-check right now.” J commented, “Exactly.” D explained her thinking during the scenario, “I was thinking, my primary concern as getting the insulin drip and naso-grastic tube set up, we need to get that set up and not thinking of getting the assessment done first”. Accuracy of assessments of actions taken was confirmed, either by group members or references to previous knowledge, or newly developed knowledge.

Simulation Roles

Nursing students participated in caring for the simulated patient by adopting the roles of registered nurses and performing the care necessary for the patient’s well being. The roles needed in the simulations and in practice reflected common roles held by nurses in an acute care setting. Roles were rotated among group members by the group members and consisted of the primary nurse, nursing student, nurse co-workers, and occasionally, a family member. The student acting as the registered nurse in the simulation performed the primary role of directing the scenario. The person in that role assigned tasks, interacted with other health care providers, and was responsible primarily for calling in other team members to help.

Primary Nurse Role: During the debriefing group participants described their feeling when they were or were not the registered nurse; G stated that her feelings were better this week and P added that it was because “you weren’t the primary nurse” and “you weren’t scared”. P had been in the role of registered nurse, “I don’t think it was
bad... other than leaving a couple of things out like assessment and neuro checks (said to point out that those were huge issues that had been left out), it was nice to have other people there, to say... hey... help”. D, in another scenario as the registered nurse, commented “it’s very, very different being in the lead. In the past two weeks I was like... well this is fine... where now, I was like....I said at one point, I was just standing there and I just felt clueless. I did not know what to do being in charge”. Another participant (N) described her stress “it was stressful because it wasn’t something that I was familiar with, with the insulin, when you have orders to hang it... it’s just not as familiar”. T replied that practicing “helps us know what questions to ask so that we have some idea”.

The researcher asked how the levels of anxiety were progressing in the fourth simulation and J responded that “in the beginning, I was pretty nervous and I wanted to get an assessment in but I was keeping an eye on the saturation and kept noticing the pulmonary pressure was going down, everything was going way down. And I tended to get away from the assessment because I was worried about critical things that were going on. It was nice that my co-nurses were helpful in remembering things that I should have been thinking about too at the same time”.

By viewing the video recorded simulation, one student was able to see that her perceived view of how she responded changed when the primary nurse role was assumed. Prior to being the primary nurse in a scenario, she stated that she was not nervous or anxious, “I have never experienced a life threatening experience in the hospital but even when I’m doing something new or different of scary, I’ve noticed I don’t feel nervous”. However, dialogue from the video in which the participant was the
primary nurse revealed statements of not knowing ("I haven’t been properly trained on this”, “I don’t know how to use this”, “how do you do that”), explanations for inactions ("I don’t know”, “I’m clueless”), and opinions sought from the group (“do you think a doctor could help us”, “can a doctor help us, I’m clueless”). Tudge (1990) stated that the context of the interaction or the circumstance may change the individual’s development to either “develop or to regress in their thinking” (p. 156). In previous simulations, the student had acted as a resource to others and answered questions asked by other group members. She stated in the debriefing after being the primary nurse, “it’s very, very different being in the lead. In the past two weeks I was like, well, this is fine. Where now I was like, like I said at one point, I was just standing there and I just felt clueless. I did not know what to do being in charge. I think as a student, it’s a really great perspective”.

The ease with which a student assumed the primary nurse role varied among the participants initially. The researcher noted in head notes that the group kept track of who had or had not assumed each of the roles and the roles were rotated. G described her perception of how performing the role of primary nurse changed over the course of a simulations, “it seems like whenever someone is lead that they come in and they start off as lead, but when things get chaotic, it’s like…it seems like the lead person isn’t really delegating things, but you did kind of order them to get the doctor and to get stuff.”

*Nursing Student Role:* The most sought after role was the nursing student. Some participants offered rationale for seeking out the role; D: “I think as a student its’ a really great perspective because I know I shouldn’t know everything…as a precepting student I won’t know everything and as a new grad I won’t know everything. So it just gives that really good perspective”. However, P described her feelings, “well, it’s more of a
personal comment...ah, I felt like I really did, really bad. I kind felt that I got lost in
everything I was doing. I was...Another participant interjects that “you were the student,
you were allowed to” and P follows up, “yeah, thank goodness. I was grateful I was the
student. If I had been the primary nurse today it would have been terrible. I felt really
incompetent...I don’t know why. Most of everything we do, I have a good idea of how
to do it. But I was... what, what do I do? I felt I got lost in the task orientation...what I
was doing. I just forgot about everything else. And then I was anxious, because I knew I
was forgetting about other things”. From the researchers observation, assuming the role
of nursing student was the most familiar to the participants; they all were nursing
students and had been practicing that role for four semesters.

Being distracted by an event such as task accomplishment was a common
occurrence in the simulations. In transcribing the debriefings, the researcher noted that in
some of the scenarios a student or two students became intent on completing a requested
act or task. The distraction precluded the student from responding to additional
situational demands. For example, even though the alarm was sounding indicating a
change in heart rhythm, two students remained focused on initiating IV fluid therapy in
one scenario. In an early scenario, all of the students left the bedside to jointly participate
in a math calculation together. The description by P of being lost in the task is not
uncommon as students or newcomers learn and participate. Green and Wallet (1981)
discussed cohesion in conversations as “thematically tied instructional units and
potentially divergent instructional units (p. 170). The distractions described above were
divergences from care of the patient and took the conversation off track and in some
cases created a feeling, as shared by P, of inadequate performance.
**In Practice:** The participants reported *clinical experiences from their preceptorships*, linked their experiences to events from the scenarios, and discussed the *applicable content* in the debriefings. The participants’ reflections were gathered in the debriefing sessions. In discussion about *preceptorship* G stated “in clinical this week...I know being in ER the last two days has helped me calm down, I’m doing the best I can...I’ve learned to slow it down and not just be in such a rush”. J adds that his preceptor “has helped me out too...like I said, the patient had stopped breathing, and the staff was not concerned one bit about it”… (they took appropriate actions) and “that kept the stress level down a little bit...you realize you do have time to think, that most patients are not going to crash just like that; it’s usually a progressive thing. You can predict where you need to go if you are watching trends”.

D commented that her actions today were based “on remembering yesterday, the nurse I worked with put the non-rebreather mask on when the oxygen saturations weren’t increasing. And that increase them immediately”

The researcher pointed out to the participants of a scenario that events in the simulation scenario and from clinical practice were *linked*; C stated that she thought that “every time we’re doing better”. The researcher asked how what the participants had done in the *simulation related to experiences in their clinical practice or tied back to practice*, C replied that she had helped with a cardiac arrest three times and SC added that she had done compressions when she had participated in the second code she attended. E described the difference however from clinical experience to simulation, “in the ER you are looking around and someone is giving you orders and in this one (simulation) you’re in charge of medications”.

112
In the fourth simulation, B identified how she had grown, “when I walk into a hospital room now and I look at my patient, the monitor stands out…before I was oh, what’s that…I know now what that means and this means. I’m more open to ask questions about…so that I can really understand”. B: “I had a patient that her daughter came running out of the room saying, “my mother can’t breathe, she can’t breathe” and I’m like, oh shoot. Everything in my simulations started to come back”.

In a debriefing, examples of intercontextuality were given by two group members. Intercontextuality is “the linking of cultural practices associated with ways of being or actions taken with text” (Floriani, 1993, Wink & Putney, 2002). SC described her feeling of what she had accomplished, “I wish I was further but I think in this semester alone, I came further that the last two combined. I mean I was able to learn so much more”. C added, “yeah, I think in there (the simulations) we might not know it, recall it, but when you explain, we know we’ve seen it before, we’ve read it before somewhere, it comes back”.

**Problem Solving**

Situation specific problem solving strategies were needed for responding to signs and symptoms of the patient’s condition such as hypotension, abnormal heart rhythms, or diabetic ketoacidosis. The general climate in simulations was one of anticipation of the unexpected, N states “I knew he was going to drop, I was just waiting for it; I knew he was not going to be fine, we wouldn’t be here”.

**Problem solving responses** were to ask another participant their advice either by offering a tentative solution (P: “I was wondering if you would put up the fluids wide open. That’s what I wanted to do”, T: “Me too”.) or by asking a direct question, (D: so
why was the H & H low? J answered "post-operative". "Not knowing the labs at first...we didn't realize it was the H & H causing the problem").

Questions in the debriefing were asked of the faculty member directly as a means of clarifying what had been understood (J: "I guess we missed the off beats", L: "I noticed the point later that it was abnormal, that's abnormal right")?. After the group had viewed the scenario, group members often asked specific questions to confirm their perceptions such as P asking "the dopamine was to fix the vascular problem, to increased the SVR" or J offering his understand of why the simulation didn't end "so you were waiting for us to stop the dopamine because he had had enough, is that one part of why we kept going and he started to get more tachycardia...so that we realize that it was time to cut the dopamine off". Additionally, participants readily identified what could or should have been done such as miscalculating drug dosages, researcher: "how many mcg per minute did I hear"? M: "Seven something". Researcher: "and that was..." M: "totally wrong, I did it wrong. I said she weighed 65 pounds, I should have said 65 kilos" or participating in a code, J said: "I know I was bagging all the time and I should have waited in between...obviously he is not going to get any air during compressions".

Group members also identified and reinforced needed responses to problems; the researcher asked "what else might you have done"? L replied, "She could have reiterated it" and J added "oh, repeated it". Researcher also asked what do you want to be prepared to do. And G answered, "give all the labs, assessments that need to be done...so they can tell you, ok, this is what you need to do". J asked his preceptor "whenever you are in doubt of something, who do you go to? And how do you know everything? She said you ask the charge nurse, the charge nurse and go to the policy and procedure manual".
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<thead>
<tr>
<th>RQ1 Role of Simulation in Learning</th>
<th>Categories</th>
<th>Sub-Categories</th>
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<tbody>
<tr>
<td>Knowledge Development</td>
<td></td>
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<td>Common Ground</td>
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<td>Previous Knowledge</td>
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<td>RQ 2 Contribution Knowledge Base</td>
<td>Interaction Knowledge</td>
<td>Functioning as a Team</td>
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<td>Roles in Simulation</td>
<td>Roles in Practice</td>
<td>Simulation Role Perceptions</td>
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<tr>
<td>Problem Solving</td>
<td></td>
<td>Responses to Problems</td>
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| Initial Anxiety                   | Possible Actions Identified |
| Situational Knowledge            | Integrated into New Knowledge |
| Clarification of Personal Understanding |
| Working Together                 | Listening to Each Other |
| Individual Task Completion       | Shared Content |
| Prior Knowledge                  | Application to Situation |
| Supporting Rationale             | Decision-making |
| Nursing Process                  | Patient Centered Care |
| Nursing Care Delivered           | Functioning as a Team |
| Assessment of Competence         | Patient Status Recognition |
| Simulation Role Perceptions      | Clinical Student Role Perceptions |
| Primary Nurse                    | Links to Simulations |
| Nursing Student                  | Tie Backs to Clinical Practice |
| Asking for Advice                | Offering Solutions |
| During Debriefing                | Clarifying Understanding |
| Identifying Missed Actions       | Reinforced Correct Responses |
|
Research Question Three

The researcher met with participants after each had been employed as a registered nurse for at least two months. The length of time each had been employed exceeded six months in one case only; however, length of employment within those six months was highly variable among participants. Meetings were held with each graduate separately as a result of the time table for starting employment were highly individualized. The conversation was audio taped and the same questions were asked of each participant.

Table 6  Post Employment Interview Questions

Post employment interview questions:

What do you recall as helpful in your practice from simulations?

Did your simulation experiences add to your preparation for work?

What from the simulation or if anything has made practice easier or something that you practiced in simulation made something else easier?

Have you had any real-life experiences that were similar to simulation?

What would you change in simulations now that you are practicing?

Contact was made with nine of the group members and the question asked was how had participation in the simulations prepared the student for future role?

Participant’s responded to questions easily and added examples of work scenarios that supported what and how their answer was applicable to the question. For determining whether participation in the simulation prepared students for future roles (RQ3), the researcher identified how prepared the students were to assume the identified roles, how
thinking changed due to involvement in the simulation and how inaccurate information was modified or corrected, resulting from analysis of the discourse during the debriefing.

**Preparation for Role**

Participation in simulation and debriefing increased *confidence levels*, provided *practice* for role assumption including *communication skills*, and decreased *hesitancy to join in the action*.

**Confidence:** J explained that experienced increased confidence; “it helped a lot, we got in on a code and one of the simulations was a patient coding and it definitely gave me more *confidence* and the information to know what I was doing. I told people afterwards that I was glad I took part in the simulations because it really did increase my knowledge and helped out with me being more confident”. One group member, K stated that although emergency interventions had not been needed on the floor but when certification had been acquired in both pediatric and neonatal advanced life support the participant was already “a step ahead, because you already done it in simulations. So it was not as stressful”. G described “right when we went into our first code I was more comfortable. I felt like it was...I won’t panic as much”. P explained that at work “I feel like I was *confident* enough in my abilities that I could say, you know what ...I want to try it, I want to learn it...I also needed to test my boundaries, if you will, and that was a little bit of a scary thing because I had never been an autonomous licensed professional. I definitely think that for me it gave me more of foundation to say...this is what I’m absolutely comfortable doing and these are things that I need help with or I would like to have somebody with me when I’m doing it. I also learned *confidence*...you know what...granted there are things that we have to be careful of...but it’s ok to make a
mistake while we are in the simulation environment and learning confidence was a big part of that as well for me. All group members either used the word "confidence" or described feeling comfortable, calm, not panicking, not freaking out, or being stressed out.

**Practice:** M thought practicing in "simulations made me more aware with certain patients of what signs to look for...I think the simulations helped me without even realizing it...ok, something is going on with this patient and...the simulations helped me be more aware, to look out for signs that the patient is starting to fail". D thought she benefited from "just dealing with a crisis situation, at some point this patient is not stable anymore, and thinking what do I need to do". N explained that she didn't feel stressed out because "I've had practice or I feel like I have". R suggested that simulations had helped the participant to ask better questions of the preceptor. R had said to her "what exactly am I supposed to do if this happens? And so that helped, I knew to find out...get some specific things" to do. P replied that "I do feel the simulations helped a lot with that...just that practice and being in that situation where critical thinking is so big and I didn't even realize it until now. Learning by doing, for me when I get in a situation it's a time for me to access the knowledge that I have and build on it.

G thought that practice in the simulations motivated me to "know my stuff more, wanting to be...ok, knowing a patient could go in any different route and trying to access and thinking which direction could she or he possible go and to just be prepared'.

**Communication:** R identified practice in communication "was actually a big help and that's a big thing we do...is communicate, even in situations that aren't quite codes, when things are getting tricky. You call over another nurse, so that there are two or three of you,
you’re communicating, repeating things back, so yeah, that is something I’ve seen strongly and I think that was probably a big help” to practice in simulations. M said that she was able “to verbalize more why I think…the simulations helped to be able to call for help…I was able to verbalize more of why I think the patient is definitely changing. On a daily basis, whether it’s something silly or something crucial for a patient, the simulations have helped to be able to talk it over with my mentor”. P thought that “we learned to…throughout the simulations…we learned to talk a lot more because we started out thinking that we need to know this or I have to know this because…it’s all hinging on me and we learned to talk things out….a lot and that was very, very helpful. I think it taught to ask questions more and to be more comfortable in asking questions. Roles are important but team work is even more important, to be able to communicate effectively what roles are because when people don’t understand their role, it’s harder to understand the bigger picture”. N thought that “we did a lot of critical thinking and talking to each other…we do that in the hospital too…it’s like...‘you do this, I’ll do that’, it’s a lot of teamwork, our unit has a lot of teamwork…it helps. Even in our setting with our nurses…there is a lot of communication, everyone is talking, and they don’t keep stuff in, and if they feel something is wrong or they need something…everyone is there to help”. G felt that her participation in simulations “helped me to receive criticism or feedback”.

J found that “Yeah, doing all those simulations, and after knowing how to talk with each other it has definitely helped me to communicate in the setting because…every time there is a code, no matter how ready you think you are for it…you still tend to forget things”
Hesitancy Overcome: M stated “Even prior to the simulations I was hesitant
to...even in clinical to...yes, maybe it was the simulations that gave me...even a small
bit of experience; it made me more confident”. R thought that “the simulations did help
me get over that...sense of just standing there with your mouth open and alarms going
off and whatever vital sign is tanking and what you do about it, I think the biggest help
was...through simulations I got over just standing there when things tanked...conditions
started to change and just to try and think about what I need to do, and when I need to
jump in and start intervening”. P remembered one simulation “all of us just stood
around, the CPR was a disaster. That has been good for me...not only do I need to stop
and collect my thought but once I initiate something...follow through with it. When it
comes to emergency settings, I feel I have been able to take that and remember those
things into pediatric advanced life support (that I did recently)”. K described being ready
to give direction because “when you are doing the simulation and you are the team
leader...You are used to being a team leader and saying ‘OK do this, this and this’. It
does help a lot I think, you have done that before”. D thought she benefited from “just
dealing with a crisis situation, at some point this patient is not stable anymore, and
thinking what do I need to do”.

Changes in Thinking

M said she was “more prone to verbalize the important things. The simulations
made it real...this could happen to a real person. The simulations helped with thinking it
out”. D felt that “it’s mostly being able to observe that something is going wrong here
and what do I need to do at this point. J thought he could more easily recognize and
“learn how to deal with certain issues...like low blood pressure and we do a lot of
Dopamine drips and it helped out a lot. Some nights I’ve had two patients on Dopamine drips. So it’s nice to know with the titrating how to deal with it and low blood pressures”.

P discussed how “in emergencies, there are basic things that I know how to do like the back of my hand and it’s nice to be able to know my resources and build on it as I go. That’s how I learn and that’s how I apply and we got a lot of that during the simulations...we were able to take things from critical care, take things from medical-surgical...what would we do here and apply it and make it work for us. I would say not only did I and the group evolve individually but we did together. We were able to build a team work relationship, a trust relationship and it was great. And because of that we were able to build on each other’s knowledge and learn from each other in that setting”. G the group members learned each others’ strengths and “if somebody started to struggle, than somebody would step right in...like, ‘ok, I think I can figure this out with you’ and our roles were very fluid”. J commented that “the first code, I was really nervous but the second one--I noticed that we needed to get somebody recording, somebody needs to be doing this...and it was definitely easier to do those things...to see what wasn’t being done. Simulations definitely helped out”. G summarized differences in the simulations from coursework were “drugs, what kind of drugs to give somebody, we were always taught what to do for shock and what medicine to give versus in simulations, this is the drug you would give, just knowing off hand, right away” and thinking about “what are you going to do differently” in the debriefing and “looking at the patient”.

121
Modification/Correction of Inaccuracies

“At the beginning of the simulations that was a problem, communication, for some of us...we thought to ourselves and really didn’t say anything out loud...when N would pick up on stuff, I would think to myself...oh, I really should study. Maybe I should study more or been paying more attention” recalled M. G thought corrections were made supportively, “it was like suggestive kind of things...‘hey, why don’t you do it like this’. I remember never feeling bad...like oh she yelled at me or he was screaming at me”. P remembered “in addition to using knowledge that we built on, I learned from students around me, I learned their strengths and they were able to teach me through that. I remember a few times that not only would we ask you and we would clarify but we would also go to our resources. That’s important for me because sometimes, the most frustrating times are when I don’t know my resources or that it is really ok to use them; whether it’s a text book or person. And, I remember several times, I and my group had to go to you and our text as our resource as we debriefed after the simulations”. N noted that “especially with infants, they can’t tell you what’s wrong with them, so you have to...just like simulations, you have to observe and look at everything and try and figure out what is going on. In a simulation when we weren’t communicating with each other at all and we would be doing stuff and get aggravated. We’d watch it and it would be like...if we would freaking just told each other what we were thinking, it would have gone so much faster”. G said the group used each person’s abilities, “All of us were good at certain things and as we went on, we figured out what things were good for most people. And go from there to make the simulation more functional. However, it depended on certain situations, because in certain codes we would bypass that and get
caught up in technical things, like we couldn’t figure out the tubing and all of us would be trying to figure out the tubing...like five people trying to figure out tubing instead of assessing the patient. We talked about it during the simulation and after, hey I really didn’t get that”. K knew “that medication is not my forte...it never has been and you realize calculating medications...yes, I know how to do it but can I do it quickly?”.

Table 7  Data Analysis RQ3

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<th>Data Analysis</th>
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<tr>
<td>RQ3 Preparation for future</td>
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<td>roles</td>
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<td>Role fulfillment</td>
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<td>Increased confidence</td>
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<td>Use other’s strengths</td>
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<td>Use resources for consultation</td>
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<td>Shared thinking</td>
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Summary of Findings

Overall, group members created their own meaning from participation in the simulation and debriefing experiences. As demonstrated in Knowledge Development across the Sessions (Appendix 1), examples of conversation during the simulations heard during the debriefing were used to illustrate group performance over time and

123
across simulations and were created as a means of demonstrating progression throughout the study. In the debriefing session, the simulations were viewed by the group and in that manner talk from the simulation was integrated into the debriefing. The debriefing discussion focused on what events had occurred or had not occurred, feelings experienced during the simulation and implications for future applications of what learning had taken place. In the initial simulation, the participant focus of the simulation was orientation to the simulation environment and learning the function of the equipment. Member roles began as superficial participants; members talked over the patient, paused to discuss equipment use, and asked questions of the simulator operator. In the second simulation, the focus of the group had moved to trying to determine what to do about their patient assessment findings. A patient's changing vital signs were compared to what they knew from their textbooks and previous knowledge held by individual group members. Participants were more engaged with the situation but still adapting to the simulation environment (discussion about really needing to calculate drug dosage). Recognition of possible sources of the patient problem and connections among relative data were made in the third simulation, however, one simulation group experienced significant problems (calculating drug dosages and pump operation) which diverted their attention away from the patient. In the fourth simulation, group members recognized the patient issue by connecting patient status, laboratory data and the need to call health care provider for orders. Connections to post-operative blood loss, either from clinical experience or textbook knowledge, guided their thinking. Struggling with new information and making sense of provider orders disturbed nursing process in the fifth simulation. Initially, some in the group were distracted but another member refocused
participants on the patient and assigned care tasks to members. The group focus in the sixth simulation resulted in early recognition of the clinical situation, a transfusion reaction, and the appropriate interpretations and nursing actions were made. In both the seventh and eighth simulation, the groups focus had deepened and was centered on the patient. Group members were attentive to situational data as evidenced by integration of provider orders with laboratory data and recognition and response to changed heart rhythm. The group collectively responded to the clinical situation and intervened appropriately. Group members relied on their own knowledge, knowledge from clinical experiences and knowledge constructed within and throughout the simulations. Their talk had converted into shared cognition.
CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The study examined the discourse which occurred among students of nursing during videotaped simulation experiences and subsequent debriefing sessions. The discourse was examined to determine if this type of educational intervention could lead to shared cognition.

The analysis of the discourse indicated that participation in the simulations and debriefing. These sessions created a communication forum which encouraged development of shared cognition and scaffolding of concepts in nursing. Much like the description of Vygotsky's zone of proximal development, these participants took up roles beyond their current levels of knowledge development to assist each other in learning these difficult concepts. In other words, participation in the simulations and debriefings created a zone of proximal development which encouraged the development of shared cognition and the opportunity for scaffolding of concepts in nursing.

Participant discourse became more "nurse like" in both the use of professional language when providing care, as well as when describing associated events. During the development of shared cognition, the participants integrated their past experience and knowledge, with experience and information gained in the simulations and debriefings,
and made links to information gained in concurrent coursework and clinical
observations. Intertextuality and intercontextuality constructed among the interactions
contributed to increased depth in a ‘sense of the thinking’ within the domain and
participant common knowledge.

In subsequent discussion, sample discourse and observations of the student and the
researcher, will provide evidence of how the simulations exemplified concepts
underpinning the study, as well as discussion of unexpected findings.

Scaffolding of Ideas

Watching the simulation and debriefing videoed sessions deepened group
members’ knowledge of disease processes, organizational abilities, and communication
skills. Feedback from group members and the faculty member during debriefing allowed
the participant to consider alternatives. The simulations provided an opportunity to
practice delegation and assumption of patient care accountability tempered by practice in
an environment in which costly patient mistakes were permissible. The participants
gained ‘felt’ responsibility when adopting the role of registered nurse. Participation in
simulations and debriefing created a learning context in which the student could practice
the role of registered nurse without jeopardizing patient safety. Learning opportunities in
acute care patient care situations may be comprised when the patient’s health status
changes rapidly. The use of simulation can overcome the difficulty of teaching problem-
solving while delivering nursing care. In simulation, the scenario could be paused,
repeated, or the pace of the delivery of nursing care could be adjusted.
Higher Concept Formulation

Participation in the study resulted in formation of learners’/practice community or a simulated community of practice in which the students engaged in higher concept formulation and adoption. For example, the participants increased their use of formalized terms, were clearer in questioning, and had adopted specialized roles within the simulations. The ability of the primary nurse to provide leadership to the team members improved. Initially, the participant acting as the primary nurse only directed others, apparently not confident in the abilities of others to carry out the appropriate interventions, but by the final simulations team members were confident in each other’s knowledge enough to identify and implement needed actions. Also the students become more skilled in calling health care providers related to changes in the patient’s condition. Improvement was noted in both the organization of information being requested as well as the rationale for the call.

Intertextuality and Intercontextuality

Participants utilized practices learned in early simulations and brought those practices to later patient situations. Intertextuality and intercontextuality were present when participants across the simulations referred to what had happened in previous simulations or referred to nursing interventions that had been previously applied and were applicable to subsequent patient situations. One example was the use of an ambu bag. The ambu bag was used with much fumbling in the first simulation and subsequently, the ambu bag was applied without difficulty in the final simulations.
Learning Community

The simulated community is more than a learning community in that the practice roles were those of a registered nurse and were formulated through sharing knowledge of professional practice. However, aspects of a learners' community were the same; “uses a learning process based on action... scaffold collaboration between learners and ....depends on the teacher” (Henri and Pudelko, 2003, p. 481). Learning communities are time limited such as ending at the completion of a semester or a program. The development of complex functions, practice in emergent patient situations, and acquired meaning were internalized by the learners through their practice within the zone of proximal development. The participants were assisted in their development by their peers, more capable others, and their teacher. Debriefing sessions encouraged reflection on what and how information was interpreted and integrated into practice.

Shared Cognition

Participants voiced they had gained confidence in their abilities by participating in simulation and debriefing while becoming a better communicator and team member. Most of the participants noted that their reluctance to join in activities had diminished. Upon employment, group members were less hesitant to participate in emergencies because they had already participated in similar simulations and could assume a role in the situation. Shared cognition was encompassed by the simulated legitimate peripheral participation of apprentice learning (situated cognition) and distributed cognition mediated across the activities of the group and simulations. The simulations provided students an opportunity to develop an understanding of who was involved, what and how participants behaved and what learners needed to learn to become full participants. The
simulation experience allowed the practice of discourse, and through discussion assisted
the student to gain meaning of the events.

Consequential Progression

Unexpectedly, evidence was found of consequential progressions (Duran &
Szymanski, 1996; Putney, 1997; Putney, Green, Dixon, Duran, & Yeager, 2000) across
the simulations. While Putney (1996, 2007) first expanded the concept of consequential
progression beyond a dyadic situation to be inclusive of all participants across activities
and events spanning an entire academic year in an elementary classroom, this study
further extends the notion to adult learning in the field of nursing education.

Consequential progression is the influence of past discourse upon the
understandings being shaped by the group. The manner in which the progression of
study becomes increasingly more complex is understood by participants is through the
intertextual and intercontextual linkages made by through the discourse. In other words,
through the interweaving of ideas and actions with texts, “what students learned in one
context became consequential for their learning later in another context (Wink & Putney,
2002, p. 141)” In this study the participants used knowledge constructed in previous
simulations/debriefings, internalized that meaning individually and within the group, and
utilized that knowledge in current and subsequent simulations. Earlier collaboration,
either within simulation or in the debriefing, was visible in subsequent simulations and
in post employment practices. As illustrated by the data analysis, the deepening
understandings across the simulations resulted in participants taking more responsibility
and improving in their communications both during the subsequent simulations and
beyond the classroom. As an experienced teacher, progression by the individual in their
knowledge development over the extent of a course would be anticipated. However, predictions of the degree of advancement could not be made in that individual knowledge was not measured directly and was beyond the scope of the study.

Participation in the study was useful in acquiring experiential meaning for scientific concepts. The method of instruction, simulation and debriefing, assisted participants in development and was consequential in their progress as a nurse. "The development of systematic concepts...is supported by social experience in the context relevant to the domain of knowledge" (Panofsky, John-Steiner, & Blackwell, 1990, 253). The simulations assisted the group members in developing their capable participation (Lave & Wenger, 1991). Many of the graduates identified how their participation in simulations had helped them to ask better questions of their work preceptor upon employment. In other words, the participants gained experience in developing shared thinking and practice communicating in conditions of uncertainty or an opportunity to practice informal argumentation (Hagler & Brem, 2008) in the simulations. Participants believed that they were better prepared to begin their nursing careers. Participants in this study identified that they had acquired confidence and competence and their anxiety was lessened. Participants such as M stated that "the simulations helped me to be more aware, to look for signs that the patient is starting to fail. It made me more confident and I was able to verbalize more what I think". J had commented that he had the information to know what I was doing going into a code and wasn’t “thrust into that situation without having any practice". 
Convergence of Shared Cognition

Convergence of Shared Cognition over the Simulations, Figure 7, is a pictorial representation of the development of shared cognition across the simulations and within the groups. Group members in the first simulation were not centered on the patient’s situation as much as orienting themselves to the setting and expectations of simulations. The participants were not in ‘character’ of the nurse or treating the simulation as a real patient experience. The degree to which student’s stayed on task during the provision of care in the simulations improved as the number of simulations increased. At first, the students “left” the patient to consult with various health care workers, rather than discussing their observations and insights with each other. They had not learned to count on the shared knowledge accumulated in the group. Also, in the beginning simulations the participants discourse during the debriefing was directed to the teacher for interpretation/confirmation. For example, J stated that “we missed the off’beats” and D answered, “I noticed the point later that it was abnormal; that’s abnormal rhythm, right? However, as evidenced in the seventh simulation, M announced that she was going to hand the K rider; T questioned her actions and M responded that the orders “say to hang a rider if the K is less than 4 and his is 3.5”. Later in the same simulation, the patient’s condition deteriorated and participants defibrillated and assisted the patient’s respirations appropriately. In the final simulation, G identified that the head of the bed should be elevated since he is intubated. She explained her action using appropriate discourse and integrated clinical guidelines for care into the simulation. This discussion among students may indicate that student’s thinking abilities increase after an increased
number of simulations, and suggests that nursing programs should devote more time to simulated experiences which allows for control of the learning experiences.

The group members in the third simulation were distracted by either drug calculation or IV pump operation. Attention was diverted away from the patient's condition and need for care was sidelined. The divergence from care was recognized during the debriefing when the simulations were viewed by participants. Group members responded appropriately and agreement was reached on their treatment goals in the fourth simulation; their thinking converged on the patient problem. The patient's condition, transfusion reaction, was familiar to group members because the content had been re-enforced at the beginning of the semester. The group members were unfamiliar with the specific patient's disease process in the fifth simulation. The end state of the patient, increased intracranial pressure, was known to group members. The thinking of the groups was diverged and agreement about how to treat the patient among members was not reached. However, the thinking converged in the sixth simulation and cognition remained a shared process in the final two simulations, seven and eight. The group collectively responded to the situations, care was patient centered, and interventions were successful. Group members relied on their own knowledge, knowledge from clinical experiences and knowledge constructed within and throughout the simulations. Their talk had gained shared cognition.

In this study shared cognition developed following communication among subjects and the researcher, after learning the appropriate vocabulary, the professional short hand or word meaning, use of the professional discourse and the externalization of methods of reasoning when responding to a crisis situation. As demonstrated in Table 8 each of the
Table 8  Development of Shared Cognition

<table>
<thead>
<tr>
<th>RQ1 Role of Simulation in Learning</th>
<th>Categories</th>
<th>Sub-Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Development</td>
<td>Initial Anxiety</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Possible Actions Identified</td>
<td></td>
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<tr>
<td></td>
<td>Situational Knowledge</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Integrated into New Knowledge</td>
<td></td>
</tr>
<tr>
<td>Common Ground</td>
<td>Clarification of Personal Understanding</td>
<td></td>
</tr>
<tr>
<td>Shared Cognition</td>
<td>Working Together</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Listening/Talking to Each Other</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Individual Task Compl</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shared Content</td>
<td></td>
</tr>
<tr>
<td>Previous Knowledge</td>
<td>Prior Knowledge</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Application to Situation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supporting Rationale</td>
<td></td>
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<tr>
<td></td>
<td>Decision-making</td>
<td></td>
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<tr>
<td>Nursing Knowledge</td>
<td>Nursing Process</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Patient Centered Care</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nursing Care Delivered</td>
<td></td>
</tr>
<tr>
<td>Interaction Knowledge</td>
<td>Functioning as a Team</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assessment of Competence</td>
<td></td>
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<tr>
<td></td>
<td>Patient Status Recognition</td>
<td></td>
</tr>
<tr>
<td>Roles in Simulation</td>
<td>Simulation Role Perceptions</td>
<td></td>
</tr>
<tr>
<td>Roles in Practice</td>
<td>Primary Nurse</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nursing Student</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clinical Student Role Perceptions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Links to Simulations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tie Backs to Clinical Practice</td>
<td></td>
</tr>
<tr>
<td>Problem Solving</td>
<td>Responses to Problems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>During Simulations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Asking for Advice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Offering Solutions</td>
<td></td>
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<tr>
<td></td>
<td>During Debriefing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clarifying Understanding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identifying Missed Actions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reinforced Correct Responses</td>
<td></td>
</tr>
</tbody>
</table>
categories established in the data analysis contributed to the development of shared
cognition. Responses to problems both during and after simulations added to the
performance of roles in simulation and as well as clinical practice. Knowledge gained
from the interactions, use of previous knowledge and knowledge developed in debriefing
all contributed. Their knowledge held in common, shared cognition, resulted from
intersubjectivity established within the social processes particularly the effectiveness of
the group's communication. The debriefing sessions created a zone of proximal
development in which the participants in their simulated community were reformulating
scientific concepts and deriving meaning from the talk.

This conclusion supports Hicks (1995) description that learning occurs by repeated
participation in meaningful social activity (in this study, the debriefing sessions) and
teaching practices which allow access to the discourse practices of the discipline. In
addition, the findings are reminiscent of Hicks' conclusions of the importance of social
interchange, which she describes as the basis for sense making by the participants and
from which meaning is constructed from daily routines and shared history. The discourse
of the setting informs members of process, values or social practices of the group. Group
members "learn the form of discourse and social activity appropriate within different
settings, each activity has participant structures, learn not only what to say and how to sy
it but also when to it" (p. 66).

Implications for Nursing Education

The use of simulations are gaining prevalence in the curriculum of schools of
nursing, but broad diffusion in curricula needs to occur at an accelerated pace.
Professional knowledge continues to expand beyond the current curricular materials. Thus individuals will need to learn to utilize technological resources and materials to continually update knowledge. Simulation can serve as such a resource aide. Curricula that includes simulation can promote better learning opportunities; particularly for the high risk patient events which takes place only sporadically in the clinical setting. As noted in this study, the use of simulations increased the nursing students' preparation for work, assisted them in overcoming hesitancy, added to their knowledge and use of nursing technical terminology, and contributed to the overall enhancement of instruction in the profession.

**Subsequent Curricular Revisions**

Since completion of this study, changes in the curriculum of the researcher's school of nursing already have been incorporated. For example, in terms of eliciting performance, we increased the number of simulations within each semester and throughout most aspects of the curriculum. The final semester now includes seven simulations as opposed to two. The initial simulation experience occurs within the first week of the semester during the orientation to the course. Participation in an additional six simulations takes the place of a 12 hour clinical day. All the simulations take place on one clinical day and involve the students within the clinical section (no more than eight students), the assigned clinical instructor and the simulator operator. The additional simulation opportunities allow the clinical instructor to provide additional guidance while offering more connection between current instruction and prior and current knowledge through the additional feedback gained in the debriefings. The timing that students receive their patient assignment for the simulation experience also has changed.
the assignment is now e-mailed to the student the day before the simulations to allow the student to prepare for care. In addition, a clinical instructor guide was developed which includes medications and treatments typically ordered by a health care provider in response to the primary nurse’s communication request. The guide provides the instructor with usual treatment options. By limiting the choices, this change allows the simulator operator to assemble the necessary equipment and/or medications for use by the students.

Another change in the curriculum is related to the active participation by all students taking the course. In the research study, group membership was small enough for all participants to assume an active role in the simulation. When an entire clinical group, eight students attend, the number of active roles needed is exceeded. Subsequently, observer roles have been instituted in which three to four students take an active role while the additional students observe and record their perceptions. All group members then review the videotaped simulation and debrief as a group. Not only does this result in active participation by all students, but also allows for the observing students to become engaged in the simulation as evaluators, which contributes to the shared cognitive potentials.
Recommendations

Within the study, learning activities and discussion provided the student the opportunity to engage in higher concept formulation and adoption. The experiences occurred in what Vygotsky would have described as a zone of proximal development because of the collaborative presence of their peers and their teacher/researcher. Participation in the study was useful in acquiring experiential meaning for scientific concepts or construction of a personal scaffold of learning. The method of instruction, simulation and debriefing, assisted participants in development and was consequential in their progress as a new nurse graduate/employee. The time spent in simulations accelerated the new graduates preparation to practice or participation capabilities. Graduates spoke of increased confidence and the ease in gaining certification (NALS, PALS). Agencies employing nurses expect graduating students to have experience in providing life saving skills associated with emergencies.

Simulation experiences contributed to the new graduates capabilities and should be incorporated into the customary coursework of the curriculum. The simulation and debriefing were valuable in hastening participation and lessening hesitancy in acting. This research study used concepts proposed by Lave and Wenger (1991) related to giving access to the “newcomers” to the profession and community of learners’ (Henri & Pudelko, 2003). Students of nursing and then new graduates entering a practice arena spanned the space between being a member of a learning community and a community of practice by participating in a simulated community. Emergency situation simulation experiences were developed which provided students an understanding of who is involved, what and how participants behave and what learners need to learn to become
full participants. In addition, investigation of collaborative discourse and argumentation could lend support developing “clearer picture” (Nussbaum, 2008; Hagler & Brem, 2008; Lu & Lajoie, 2008) of what and how students learn.

The aim of the activity during the study was to prepare the student via simulated practice to participate successfully in the shared thinking of the health care team during an actual code. The researcher found that it would be helpful to ‘redo’ the scenarios for participants when errors in reasoning had occurred. Some participants voiced the desire to implement what had been discussed in debriefing and experience enactment of the appropriate nursing interventions.

Limitations include the fact that thinking that was sampled focused only on emergency practices. It was not verified through observation if participants retained or transferred knowledge to actual emergency cases. Development of expertise was not anticipated, in that deliberate practice over many years, is necessary prior to mastery. Formal practice such as certification in advanced cardiac life support (ACLS) does occur after licensure and employment. My role as a researcher and as a teacher was not a limitation or in conflict. The activity was not graded and was a usual occurrence in the course. The participants freely asked for additional feedback, practice advice and the combined role allowed me to see the benefits of more practice in a great number of simulations.

Future Research Potentials

While this study explored the role of simulations in the development of shared cognition in nursing education, other possible studies could be generated beyond the current findings. For example a similar study could be conducted by altering the number
of simulated patients cared for at one time by the students. This could afford nurse educators insight into more meaningful feedback on prioritization of care. Dual assignments will be better accepted if the simulation approximates real life demands, thereby increasing the perceived usefulness of the exercise for the student.

A study in which a survey instrument is developed to measure the perceived effectiveness of simulations and debriefings across multiple sites and schools of nursing could result in more information related to successful implementation of simulation curricula. Along the same lines, instrumentation could be developed to evaluate nursing programs that involve simulation curricula.

Measuring individual knowledge acquisition with the use of simulations would also add to the knowledge base for schools of nursing. In addition to information on the use of simulations during the course of the program, several opportunities for additional research exist related to expanding how shared cognition impacts the new graduate and their work preceptor. Future study might follow how new graduate and preceptor relationship assists or hinders the newcomer in development of common knowledge.

Greater insight could be gained by following the participants into their first year of practice and subsequently involving the participants as consultants into scenario development. Actual experiences could be recreated allowing new graduate to problem solve care dilemmas encountered in practice. At the same time, researchers could examine the notion of nursing identity, just prior to becoming new graduates and following up in the first year to better understand when and how that identity has developed.
In addition, new graduates have limited experiences with rapid response teams in their clinical practice and simulation scenarios built from research videos could provide practice on how and when to call for help. Instructional conversations in debriefings might benefit the senior nursing student and the new graduate in maximizing benefits for patients.

Future research study includes continued exploration of shared cognition by following new graduates and their work preceptor into the development of common knowledge. Greater insight could be gained by following the participants into their first year of practice and involving the participants as consultations into scenario development. Altering the number of simulated patients cared for at one time by the student could afford nurse educators insight into more meaningful feedback on prioritization of care. In addition, investigation of how instructional conversations could benefit the senior nursing student and rapid response team members are of interest.
APPENDIX I

EXAMPLES OF CONVERSATIONS DURING SIMULATIONS
# Knowledge Development

<table>
<thead>
<tr>
<th>Simulation Event</th>
<th>Focus</th>
<th>Actions</th>
<th>Talk during the Simulation</th>
<th>Divergences</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONE Respiratory Arrest</td>
<td>Noted drop in oxygen saturations</td>
<td>Should we put on the mask? do you turn up the oxygen all the way?</td>
<td>Left bedside to check chart</td>
<td>Should we stop bagging her?</td>
</tr>
<tr>
<td></td>
<td>Discussion of mask use</td>
<td>What do we do, how do you put up the bed?</td>
<td></td>
<td>So what are we going to do to get the BP up?</td>
</tr>
<tr>
<td>TWO Hypovolemic Shock</td>
<td>Placed non-rebreather mask on patient</td>
<td>What do you guys think? I have no idea</td>
<td></td>
<td>He’s having coffee ground stuff coming our of this NG tube, he is having some wheezes, which means--I don’t know what that means</td>
</tr>
<tr>
<td>Focus</td>
<td>Actions</td>
<td>Talk during the Simulation</td>
<td>Divergences</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Assessing patient, trying to determine what to do</td>
<td>Fumbling looking for BP cuff</td>
<td>(Orders received)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recognition of vital signs changing</td>
<td>Assessed patient, discussed with each other actions</td>
<td>T: someone start some Dopamine P: Dopamine is in there, Ok student nurse–math J: add a non-re-breather mask T: we’re going to pretend, there is nothing to really calculate it G: places non-breather mask on patient P: (turns up 02 liters) D: do we really need to calculate it?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adapting to simulation</td>
<td>J: yes, 4mcg/kg K: (looks on bag for concentration), it’s 250cc with 400mg of Dopamine K: it 100cc contains 100mg (incorrect) P: no, 1600 mcg per cc OK, you were here for this, you select channel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simulation Event</td>
<td>Focus</td>
<td>Actions</td>
<td>Talk during the Simulation</td>
<td>Divergences</td>
</tr>
<tr>
<td>------------------</td>
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</tr>
<tr>
<td></td>
<td>Math calculation completed.</td>
<td>D: OK 12 ml/hr</td>
<td>K: no, you put the plastic in first</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IV tubing finally inserted into pump and medication running</td>
<td>P: my pt died, why would he have a heart rate but not pulse?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initiation of IV vasopressor and medication calculation and medication titration</td>
<td>IV medication started titrated.</td>
<td>G: we need a blue clamp IV tubing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>D: I don't know, it confuses me</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient assessment of VS breath sounds, bowel sound, pulses</td>
<td></td>
<td>M: ah, look at her feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>N: maybe we should call for help</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>T: hi. (nurse on floor)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simulation</td>
<td>Simulation Event</td>
<td>Focus</td>
<td>Actions</td>
<td>Talk during the Simulation</td>
</tr>
<tr>
<td>------------</td>
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<tr>
<td>THREE</td>
<td>DKA Sepsis, foot ulcer</td>
<td>Recognition of possible source of infection</td>
<td>Discover foot wrapped, inspect foot</td>
<td>N: Do your feet hurt?  Pt: yes.</td>
</tr>
</tbody>
</table>
|            |                  |       |         | N: what happened to your foot?  
|            |                  |       |         | P: there is a sore on the one foot  
|            |                  |       |         | L: have you been doing foot checks  
|            |                  |       |         | Pt: when I think of it  |
|            |                  |       |         | Fever found  |
|            |                  |       |         | Lab work checked, elevated WBC  |
|            |                  |       |         | M: Dr., we have a patient who is DKA, her HR is 122 and respirations are 29  
|            |                  |       |         | Dr: is the insulin running?  
|            |                  |       |         | M: yes, it’s running at 7ml/hr  
|            |                  |       |         | Dr: how about the BP  
|            |                  |       |         | M: it’s running right now, it’s 80 over 30  
|            |                  |       |         | Dr: go ahead and start a Dopamine drip, 5 mcg/kg  
|            |                  |       |         | N: how you feeling?  
|            |                  |       |         | Pt: funny  
|            |                  |       |         | NH: funny?  
|            |                  |       |         | LR: can you describe what you mean by funny?  
<p>|            |                  |       |         | Pt: I feel nauseous  |</p>
<table>
<thead>
<tr>
<th>Simulation Event</th>
<th>Focus</th>
<th>Actions</th>
<th>Talk during the Simulation</th>
<th>Divergences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementing treatment</td>
<td>Students are not at the bedside, calculating drip rate</td>
<td>N: do you feel like you're going to throw up? Pt: I just did a minute ago</td>
<td>(students are calculating drip rate for dopamine) (pump issues)</td>
<td></td>
</tr>
<tr>
<td>Trouble using pump</td>
<td></td>
<td>N: are you going to throw up again? Pt: I think I could</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOUR Transplantation of liver</td>
<td>Connections/integration of data</td>
<td>Started patient assessment, called health care provider for status change, reported lab work, orders received</td>
<td>Dr: what’s her H&amp; H? GV: hold on just a second, H is 7.9 and Hct is 28 Dr. D: give her 1 unit of packed red blood cells J: tachycardia too, I increased the fluids a bit</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(setting up the dopamine, NS) (consulting drip rate, 3 people)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patient assessed, provider consulted orders</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

148
<table>
<thead>
<tr>
<th>Simulation</th>
<th>Simulation Event</th>
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<th>Actions</th>
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</tr>
</thead>
</table>
| **FIVE**   | HCP              | Struggling with | J: BP is getting sky high  
K: I know, she is going to die  
J: let me know what you guys need, somebody needs to come check the patient, G | | |
|            | New information and making connections among data | Some of participants leave bedside, calculate drip rates, however on group member refocused on patient and assigns tasks | G: Mrs. Elks, how are you feeling?  
J: what's her respiratory rate, she's not breathing very well (checking pulses, Mrs. Elks are you still with us?) | | |
|            | Patient assessed VS, noted orders for transfusion | | We have to figure out what the rate is  
T: start low and go slow  
G: you have to divide the amount by four hours  
J: 63ml per hr, what's the drip factor?  
G: 10 drops per ml.  
T takes BP  
G: her BP is very low, I'm going to call the Dr  
G: | |
| **SIX**    | Transfusion Reaction | Attention to policy/procedure | Vital signs taken血 hung | Pt: Oh, my back hurts  
G: your back hurts? | |
## Knowledge Development

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Transfusion Reaction</td>
<td>D: do we slow the infusion rate or stop it?</td>
<td>G: stop it</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turning policy into nursing actions and making clinical decisions to stop blood transfusion</td>
<td>Transfusion stopped</td>
<td>T: should we take her temp again?</td>
<td>J: when we did our blood at the hospital it was very 15 minutes</td>
<td>T: its right before you start, at 15 minutes and then if it's ok, it's 30 min</td>
<td>D: is your back still hurting?</td>
</tr>
</tbody>
</table>
### Knowledge Development

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<tr>
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</thead>
<tbody>
<tr>
<td>SEVEN</td>
<td>V Tach, V Fib</td>
<td>Prevention if early intervention</td>
<td>Patient centered intervened correctly</td>
<td>T: good job, student</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N: extreme tach, we are hanging his K now, his BP is going down, his respirations are going up—so some kind of shock</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M: what did you say about his shock?</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N: no, isn’t he still... isn’t he kind of... oh, it must be Vtach, guys</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T: let’s call the physician</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>N: OK</td>
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</tbody>
</table>

- Recognized rhythm
- Recognize V Tach, treat
- Successful resuscitation
- Initiated treatment

<p>| | | | | |</p>
<table>
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</thead>
<tbody>
<tr>
<td>M: I’m going to hang a K rider</td>
<td>T: K rider? K is ok though</td>
<td>M: no, orders say to hang a rider if the K is less than 4 and his is 3.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pt: feeling weak</td>
<td>M: heart rate is 40, BP is decreased, heart rate increased slightly</td>
<td></td>
<td></td>
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Pt: feeling weak
M: heart rate is 40, BP is decreased, heart rate increased slightly
## Knowledge Development

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</tr>
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<tbody>
<tr>
<td>EIGHT</td>
<td>Asystole</td>
<td>Prevention if early intervention</td>
<td>Asystole, checked responsiveness</td>
<td>M: call a code</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Started resuscitation</td>
<td>Crash cart brought to bedside, board placed and ambu in use, CPR started, AED applied</td>
<td>T: counting, switched, intervention responsiveness</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AED cycled, M: Epi given, 1mg</td>
<td>Intervened correctly, patient assessed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Successful resuscitation</td>
<td>Successful resuscitation</td>
</tr>
</tbody>
</table>
APPENDIX II

DEFINITION OF CONCEPTS
<table>
<thead>
<tr>
<th>Author</th>
<th>Concept</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fischer, 2000</td>
<td>Distributed Cognition</td>
<td>Distributed cognition is the work of groups of “minds in interaction with each other and minds interacting with tools and artifacts” (p. 8). Tools or artifacts support the group’s functioning by providing an externalization of the mental process performed by the group. The information needed by the group is possessed across the individuals; no one person may have all of the information necessary but the “required knowledge...is distributed between the mind and the world” (p. 8).</td>
</tr>
<tr>
<td>Edwards &amp; Mercer, 1987</td>
<td>Intersubjectivity</td>
<td>The points at which common knowledge is being created, p. 84.</td>
</tr>
<tr>
<td>Wink &amp; Putney, 2002</td>
<td>Intersubjectivity</td>
<td>The act of constructing common (mutual) meaning between speakers, p. 151.</td>
</tr>
<tr>
<td>Lave, J. 1991</td>
<td>Shared Cognition</td>
<td>Shared cognition is a process of becoming a member of a sustained community of practice. Through the process of legitimate peripheral participation common, shared, knowledgeable skill gets organized.</td>
</tr>
<tr>
<td>Witt, S. 2007</td>
<td>Shared Cognition</td>
<td>Shared cognition is defined as the appropriate use of symbol systems, methods of reasoning, vocabulary, and word meaning of the professional nurse in discourse.</td>
</tr>
<tr>
<td>Author</td>
<td>Concept</td>
<td>Definition</td>
</tr>
<tr>
<td>-----------------</td>
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<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Lave &amp; Wenger, 1991</td>
<td>Situated Cognition</td>
<td>Learning occurs as the person participates in the ongoing activities of the community (legitimate peripheral participation). As the practices of the community change, so does the learner (apprenticeship learning) changes. The learner, the situation, the teacher, and the cultural tools could not be separated artificially for study. The fulcrum of situated cognition is on the activities of the community and the ongoing interactions in which the newcomer participates.</td>
</tr>
<tr>
<td>Wertsch, 1991</td>
<td>Social Language</td>
<td>SL is a way of speaking that is characteristic of a particular group in a particular sociocultural setting. Steps: identify the particular social language, specify how sl reflect as well as create particular sociocultural setting: understand how specific ways in which mental functioning is tied to situational practice through social languages.</td>
</tr>
</tbody>
</table>
APPENDIX III

SOCIAL/BEHAVIORAL IRB - EXEMPT REVIEW

APPROVED AS EXEMPT
This memorandum is notification that the project referenced above has been reviewed by the UNLV Social/Behavioral Institutional Review Board (IRB) as indicated in Federal regulatory statutes 45CFR46.

PLEASE NOTE:
Attached to this approval notice is the official Informed Consent/Assent (IC/IA) Form for this study. The IC/IA contains an official approval stamp. Only copies of this official IC/IA form may be used when obtaining consent. Please keep the original for your records.

The protocol has been reviewed and deemed exempt from IRB review. It is not in need of further review or approval by the IRB.

Any changes to the exempt protocol may cause this project to require a different level of IRB review. Should any changes need to be made, please submit a Modification Form.

If you have questions or require any assistance, please contact the Office for the Protection of Research Subjects at OPRSHumanSubjects@unlv.edu or call 895-2794.
BIBLIOGRAPHY


163


165


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Committee Member, Dr. Peggy Perkins, Ph.D.
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