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CURIOSITY AND SELF-DIRECTED LEARNING READINESS

AMONG A SAMPLE OF BACCALAUREATE NURSING STUDENTS

A Dissertation

SUBMITTED TO THE GRADUATE FACULTY

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By
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CURIOSITY AND SELF-DIRECTED LEARNING READINESS
AMONG A SAMPLE OF BACCALAUREATE NURSING STUDENTS

A DISSERTATION APPROVED FOR THE DEPARTMENT OF
EDUCATIONAL LEADERSHIP AND POLICY STUDIES

BY

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CHAPTER I

Introduction

Problem Statement

Curiosity and self-directed learning are two important concepts in

psychological and adult education literature (Jennet, 1992; Rossing, 1978;

Tremblay, 1992). Some authors have associated them in various ways

(Guglielmino, 1977/1978; Jennet, 1992; Knowles, 1975; Rossing, 1978; Tough,

1981; Tremblay, 1992). For example, Knowles (1978) assumes that self-directed

learning increases with age, while others (Ellis, Koran, & Koran, 1991; Long,

1983; Rossing, 1978) have raised the possibility that curiosity may decline with

schooling. Andragogy (Knowles, 1978) which emphasizes self-directed learning,

is central to much of nursing education. Unfortunately, empirical research

beyond the identification and measurement of curiosity and self-directed

learning has neglected the study of the relationships between them.

Purpose of Study

The association of curiosity and self-direction has not been explored

empirically. Therefore, the purpose of this study was to determine the

relationship between curiosity and self-directed learning readiness in a sample

of adult learners. Specifically, the study addressed two problems. The

association between curiosity and self-directed learning readiness was

determined. Then the association among nursing students' educational level, curiosity and self-directed learning readiness was examined through the use of data obtained from baccalaureate nursing students enrolled in three different levels of the program: sophomore, junior, and senior.

<div align="center">Significance of the Problem</div>

Much has been written about the need for the adult to be engaged in lifelong learning (Cross, 1981; Jennet, 1991; Nolan & Nolan, 1997a; Rossing, 1978). Learning how to learn has been a focus in the literature and considered necessary for adults to respond to changes in their professional lives (Jarvis, 1987; Long & Barnes, 1995).

This study should contribute to adult education knowledge, particularly the theoretical knowledge of self-directed learning and epistemic curiosity. Results should contribute to the understanding of the learning process. Since curiosity has been related to intrinsic motivation to learn, a better understanding of this construct would contribute to a greater knowledge of self-directed learning.

Practical applications of this study are likely. Should curiosity be associated with self-directed learning, then ways to sustain, or increase curiosity will enhance self-direction of the learner. As conceptual conflict is central to epistemic curiosity (Berlyne, 1962; Rossing, 1978), ways to use conceptual conflict in a learning situation to strengthen deep-processing of information should be beneficial to adult learning and teaching. Finally, improved

instructional strategies to promote self-directed learning can result from a better

understanding of meta-cognitive control processes (Long, 1992).

CHAPTER II

Review of the Literature

Self-Directed Learning

Development of self-directed learning literature has been substantial over the past two decades (Long, 1997). This observation has been supported by others (Brockett & Hiemstra, 1991; Candy, 1991; Long & Redding, 1991). Along with the popularity of the topic, conceptual and definitional difficulties have emerged (Long, 1991). Four conceptualizations of self-direction in learning have been presented by Long (1997): sociological, technique, methodological, and psychological. These conceptualizations provide a useful framework and perspective to approach self-directed learning.

Self-directed learning has been defined various ways. Knowles (1975) defined self-directed learning as

> a process in which individuals take the initiative, with or without the help
>
> of others, in diagnosing their learning needs, formulating learning goals,
>
> identifying human and material resources for learning, choosing and
>
> implementing appropriate learning strategies, and evaluating learning
>
> outcomes. (p. 18)

This definition reflects the technique concept as described by Long (1997). The methodological concept includes strategies such as distance education, computer simulations, and programmed instruction.

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Long's definition provides a psychological perspective as he stated that self-directed learning is "a cognitive process that is dependent on meta-cognitive behavior such as attending, focusing, questioning, comparing, contrasting, etc. that are personally controlled or managed by the learner with little or no supervision by a powerful other" (Long, 1992, p. 12). Brookfield (1986) referred to self-directed learning in cognitive terms as an internal "change in consciousness" (p. 47). Long (1997) wrote that the psychological aspects of learning are the most challenging and powerful and the other concepts are of limited use without this concept.

Allen Tough's research has been important for theory and practice development in self-directed learning. Long (1997) referred to Tough's contributions to self-directed learning as the sociological conceptualization (independent mode).

Tough's Learning Projects

Houle's study reported in The Inquiring Mind (1961/1993) provided a foundation for Tough's research. Houle's research included in-depth interviews with 22 participants, both men and women. Each interview was structured by an instrument with questions that addressed the following six points:

1. Do continuing learners possess any particular characteristics which make them different from other people?

2. What were the factors that lead them to become continuing learners?

3. What has been the history of their continuing education in the past?

4. How much education are they now undertaking and of what kinds?

5. How do they think society views continuing education?

6. How do they themselves view it? (p. 83)

His study focused on adults as continuing learners and why they engaged in learning. Participants were varied in their purposes and values of continuing education. He identified three subgroups (Houle, 1961/1993):

1. *Goal-oriented* learners "use education as a means of accomplishing fairly clear-cut objectives" (p.15).

2. *Activity-oriented* learners "take part because they find in the circumstances of learning a meaning which has no necessary connection, and often no connection at all, with the content or the announced purpose of the activity" (p. 15-16).

3. *Learning-oriented* learners "seek knowledge for its own sake" (p. 16). Houle suggested that learners should not be rigidly assigned to the subgroups, and that the subgoups be used to understand and assist educational guidance. Participation in learning was often precipitated by a critical incident. Houle recommended further examination of adults' selection and participation in learning activities.

Tough's research with adult learning projects contributed to adult learning theory. His research revealed data about the assistance and resources adults use, how they learn, and how they organize and structure the acquisition of knowledge, i.e. self-teaching (Knowles, 1979).

Tough began his study of adult learning projects in 1963 at the University of Chicago as part of a research project assigned by Houle (Tough, 1981). He stated that an

individual may decide to act as his own teacher, and assume the primary responsibility for planning, initiating, and conducting the learning project.

Such behavior can be called self-teaching and the person learning in this manner can be called a **self-teacher**. (Tough, 1981, p. 3)

Forty adults, both men (n = 21) and women (n = 19), ranging in age from 23 to 60 years, were interviewed. All were college graduates and met the following two criteria for inclusion in his study: (1) adults who were deliberately engaged in efforts to learn some knowledge or skill for a minimum of eight hours during the previous year, and (2) adult learners who were responsible for planning, controlling, and supervising the entire learning project (Tough, 1981). The study included forty adults who participated in interviews and completed questionnaires relating to twelve learning tasks. Subjects were asked to respond to the frequency, duration, difficulties encountered, assistance obtained and any assistance desired when engaged in learning projects.

Tough developed twelve teaching tasks and used them to provide structure his interviews. Inquiry occurred in the following order:

1. Decide about a suitable place.
2. Consider or obtain money.

3. Decide when to learn, or for how long.

4. Choose the goal.

5. Decide how to achieve the goal.

6. Obtain or reach people, books, and other resources.

7. Deal with lack of desire for achieving the goal.

8. Deal with dislike of the necessary activities.

9. Deal with doubts about success.

10. Estimate level of knowledge and skill.

11. Deal with difficulty in understanding some part.

12. Decide whether to continue after reaching some goal. (Tough, 1981,

p. 26-28)

The most common tasks identified from the study were: deciding

activities, obtaining resources, estimating level, and choosing the goal. These

tasks were accomplished by almost all subjects. Over half of the subjects

performed the tasks of deciding about place; dealing with difficult parts and

dislike of activities; doubts about success; and deciding whether to continue. All

subjects performed a minimum of six tasks.

Sixty-six adults were studied in 1970 by Tough (1979) and his colleagues

at the Ontario Institute for Studies in Education. The study focuses on specific

populations: blue collar workers, lower end white collar workers, school

teachers, politicians, professors, and women with preschool children. The study

emphasized how important and how common learning projects were. He

reported an average of 8 learning projects annually, an average of 700-800

hours during the preceding year, and an average of 90 hours for each project.

Tough defined learning projects in the 1970 study as "a series of related

episodes, adding up to at least 7 hours. In each episode, more than half of the

person's motivations is to gain and retain certain fairly clear knowledge and skill,

or to produce some lasting change in himself" (1979, p. 2). Application of

knowledge and skill was a common motivation and curiosity, puzzlement, or

desire for knowledge itself were less common motivators.

Adult learners were found to frequently spend as many as 700 hours

annually at learning projects and may invest more than 2000 hours in learning

episodes (Tough, 1971). He identified the benefits of engaging in learning

projects as enhancing self-esteem, experiencing pleasure, and pleasing or

impressing others (1971, p. 48).

Tough (1979) compared adults' learning efforts to an iceberg. Eighty

percent of adult learning projects are planned by the learner and only 20% (the

tip of the iceberg) are professionally guided. The 80% below the surface has

implications for practice and services and deserves attention. Also interested in

knowing more about adult learning was Malcolm Knowles whose work promoted

the study of andragogy in adult education and addressed the visible surface of

the iceberg.

Andragogy

Although the concept of andragogy did not originate with Knowles, he has

been credited with popularizing it in modern adult education (Candy, 1991; Darbyshire, 1992), and has been called "the personification of andragogy" (Bard, 1984, p. X). In 1967, Knowles (1984) was introduced to the term andragogy by Dusan Savicevic, and later initiated the use of the term in 1968 to describe a theoretical framework of adult learning.

Knowles (1978) credited Eduard C. Lindeman with building the modern theory of adult learning in 1927. Discussion of andragogy is not complete without consideration of pedagogy. Knowles (1978) defined pedagogy as the "art and science of teaching children" (p. 27), and andragogy as "meaning the art and science of helping adults learn (later extended to the art and science of helping people learn)" (Knowles, 1986, p. 41). Knowles (1995) recommended that andragogy and pedagogy not be thought of as dichotomies but used appropriately as needed by the learner as the situation demands. In fact, flexibility in application is a major advantage of andragogy.

Assumptions of andragogy are based on the concept of the learner, the role of experience, readiness to learn, orientation to learning and motivation to learn. Knowles (1978) listed four assumptions of andragogy:

1. As a person grows and matures his self-concept moves from one of total dependency (as is the reality of the infant) to one of increasing self-direction.

2. As an individual matures he accumulates an expanding reservoir of experience that causes him to become an increasingly rich resource for

learning, and at the same time provides him with a broadening base to

which to relate to new learnings.

3. As an individual matures, his readiness to learn is decreasingly the

product of his biological development and academic pressure and is

increasingly the product of the developmental tasks required for the

performance of his evolving social roles.

4. Children have been conditioned to have a subject-centered orientation

to most learning, whereas adults tend to have a problem-centered

orientation to learning. (Knowles, 1978, p. 55-58)

Knowles (1978) wrote that it is the fourth assumption that has significant

implications for curriculum design for adults. Later, Knowles (1986, 1995) added

the fifth assumption:

5. Children and youth have been conditioned by their school experience

to rely on extrinsic motivators--pressure from parents, teachers, and the

grading system. Although adults respond to some extent to extrinsic

motivators (wage increases, job promotions), their deepest motivation

comes from such intrinsic motivators as increases in self-esteem,

responsibility, creativity, and self-fulfillment. (Knowles, 1986, p. 41-42)

He later added intrinsic motivators such as recognition, improved quality of life,

higher self-confidence and self-actualization (Knowles, 1995).

Knowles (1977) discussed assumptions of andragogy and pedagogy and

remarked that in andragogy, movement away from dependency towards self-

direction is highly valued and facilitated by the teacher. He noted that adults have demonstrated an extreme tendency toward dependency when they enter anything called education. Although these adults are highly self-directed in all other facets of their lives, they are highly conditioned to being dependent in an educational program. He recommended educators become proactive in the process of orienting adult learners to self-directed learning.

Pedagogical approaches tend to maintain dependency, whereas andragogical approaches can include learner dependency when appropriate for the learner with the commitment to move towards self-direction. Knowles predicted that "by 2020, all learning—from elementary school through post-graduate education—will be used only for highly technical, didactic instruction. Most facilities will be workrooms where materials and other resources are produced for self-directed learning" (Hatcher, 1997, p. 37).

Long (1997) credited Knowles with the technique concept that allows the learner to formulate goals, procedures, resources, and evaluation while engaged in group learning that characterizes most school settings. Perhaps this technique is most apparent in Knowles' development of the learning contract. The learning contract is based on the assumptions of the andragogical model discussed previously. It structures an independent learning experience for the learner but allows for flexibility to include others such as teachers, supervisors, mentors, or groups. The learning contract defines the learner's objectives or goals, includes resources and strategies to meet the objectives, establishes a time frame for

completion, specifies the evidence necessary for goal accomplishment, and how the evidence will be evaluated. The role of the teacher changes from one of information giving to facilitating the self-directed learning experience. The learner, thus, assumes both an active and responsible role in the process. Evaluation may be negotiated between the learner and facilitator as a climate of mutuality and collegiality is established (Knowles, 1986). Knowles (1978) named contract learning as the most valuable tool he has used in adult education. Knowles' contributions to adult education have been substantial, especially in andragogical theory and self-directed learning.

Long (1990) wrote that caution must be exercised when interpreting the work of Knowles and Tough as being the same thing because they differ in sponsorship of the activity. Knowles wrote about institutionally sponsored activities whereas Tough described personally controlled learning activities. Other procedures such as goal setting, resource identification, and the evaluation process were similar.

Andragogy has not escaped scrutiny in the literature. Brookfield (1986) remarked that Knowles' assumptions of andragogy are merely assumptions and cannot be interpreted as empirically based theory. The appropriateness of learner-centered learning in formal settings has been controversial (Merriam & Cafarrela, 1991). These authors contended that although the andragogical model has received much attention, it has not been used in practice for adult learning in formal settings and remains instructor directed.

An assumption of andragogy is that the maturing adult demonstrates readiness to learn secondary to developmental tasks. Based on this assumption, research efforts to measure self-directed learning readiness have been reported.

<u>Self-Directed Learning Readiness Scale</u>

Guglielmino's Self-Directed Learning Readiness Scale (SDLRS) was among the first attempts to measure self-directed learning, (Guglielmino, 1977/78) and subsequently became the most widely used scale. This instrument was developed as her doctoral dissertation. It was originally designed for high school, college, or graduate students who would be engaging in an academic self-directed learning project. The SDLRS-A primarily was designed for its predictive and diagnostic value as well as a way to measure effectiveness of a self-directed learning activity.

Development of the SDLRS included the use of the Delphi technique with an expert panel comprised of 14 authorities in self-directed learning. Criteria for items selected for the SDLRS includs a rating of the item as an essential, necessary or desirable characteristic of a self-directed learner (Guglielmino, 1977/1978).

Forty-one items were used in the original instrument administered to traditional and nontraditional college students, high school students (juniors and seniors), and adults participating in continuing education ($\underline{N}$=307). Reverse items were used to avoid response set. Factor analysis originally yielded 13 factors and application of the Kaiser-Guttman rule procedure yielded eight

factors. Those factors were: openness to learning opportunities, self-concept as an effective learner, initiative and independence in learning, informed acceptance of responsibility for one's own learning, love of learning, creativity, positive orientation to the future, an ability to use basic study skills, and problem-solving skills. She included the item "I have a lot of curiosity about things" when she developed the Self-Directed Learning Readiness Scale. Curiosity loaded on the following factors: (1) self-concept as an effective learner, (2) love of learning, and (3) creativity (Guglielmino, 1977/1978, p. 60-70).

Based on the results of this study, a definition of a self-directed learner emerged:

> one who exhibits initiative, independence, and persistence in learning; one who accepts responsibility for his or her own learning and views problems as challenges, not obstacles; one who is capable of self-discipline and has a high degree of curiosity; one who has a strong desire to learn or change and is self-confident; one who is able to use basic study skills, organize his or her time and set an appropriate pace for learning, and to develop a plan for completing work; one who enjoys learning and has a tendency to be goal oriented. (Guglielmino, 1977/1978, p. 73)

Guglielmino judged the instrument to be reliable with a reliability estimate of .87 (Cronbach's alpha). She recommended future validation studies. Revision of the scale began immediately following her dissertation. One limitation of the

study was that the instrument uses self-rating of traits and abilities. She

suggested that "the SDLRS should be combined with measures of achievement

in a subject matter area (where necessary), motivation to perform the specific

learning task, and intellectual power for the specific learning task" (Guglielmino,

1977/1978, p. 77).

Following the initial study, the instrument was revised and has emerged to

a 58 Likert-type item instrument known as the SDLRS-A. Guglielmino (1989)

also has developed the adult basic education form (SDLRS-ABE) to

accommodate adults with low educational attainment. Since her dissertation, the

SDLRS has become the most frequently used instrument to measure self-

direction in learning (Pilling-Cormick, 1995).

Along with this popularity, the instrument has also become a subject of

scholarly debate (Confessore, 1991). The validity and reliability of the instrument

has been challenged, most strongly by Field (1989) who challenged the

methodology of the study and stated the "scale is structurally unsound and

invalid" (p. 125). Others, however, have supported the SDLRS as being reliable

and valid (Guglielmino, 1997; McCune, Guglielmino & Garcia, 1990; Long &

Agyekum, 1984; Long & Walsh, 1992).

Guglielmino (1989) responded to Field's criticism of her methodology.

She defended the Delphi technique as a means to arrive at a consensus of

experts, not to select items. Also, the expert panel would not be subject to

introspection as Field implied because of their experience with self-directed

learners. One purpose of her study was to arrive at a definition of the self-directed learner, therefore, no a priori definition guided the study. Guglielmino also defended the use of the reverse items because all except one had item-test correlations of .30 or greater. Guglielmino concluded that "Field's criticism is not constructive; in fact, he is ready to dismiss the SDLRS, even though his own data fail to support his conclusions" (1989, p. 239).

An extensive abstract review to categorize the use of the SDLRS (Walker & Long, 1997) revealed that the majority of the abstracts deal with instrument relation concerns and instrument design and development. Prediction of participation and persistence; and promotion of readiness were the two other categories emerging. The SDLRS has been a springboard for self-direction in learning research and has support for being a reliable and valid instrument.

Self-Directed Learning and Nursing Education

Self-Directed Learning in Nursing Schools

Several schools interested in self-directed learning or having self-directed learning in their curriculum were identified in various countries. Common threads found were: (a) a paradigm shift from the nursing training and apprenticeship model to an educational model, (b) an increasing need for both skills in learning to learn and commitment to lifelong learning, and (c) adult learning theory guiding courses to meet social change. The concept of critical thinking and problem-solving skills as valuable and recommended competencies for professional practice were consistently mentioned in almost every publication

with reference to self-directed learning

A current curriculum focus in the nursing education literature is development of critical thinking skills not only in the United States, (Kataoka-Yahiro & Saylor, 1994; Maynard, 1996; Melander & Roberts, 1994), but internationally (French, Anderson, Burnard, Holmes, Mashaba, Wong, & Bing-Hua, 1996), in New Zealand (Stodart, 1994) and the United Kingdom (Cholowski & Chan, 1995; Cust, 1995; Stanton, 1994). Skills in critical thinking are essential for nursing judgement as well as for competence and safety in practice. The skills are needed in response to a health care system that is rapidly changing in the United States (Kataoka-Yahiro & Saylor, 1994), and to increasingly complex nursing problems (Cholowski & Chan, 1995).

Critical thinking has been an outcome criterion for baccalaureate nursing program accreditation since 1992 in the United States (US), (Kramer, 1993; Mathews & Travis, 1994). Because of a lack of consensus in the literature (Kataoka-Yahiro & Saylor, 1994; Maynard, 1996), this mandate has challenged nurse educators to (a) define critical thinking, (b) develop strategies to cultivate critical thinking, and (c) struggle with outcome assessments of critical thinking in curricula. Critical thinking is often identified with the concept of problem-solving. Kramer stated "While problem solving may be viewed as a form of critical thinking, the focus of critical thinking may be broader than seeking a solution to a presenting irritant or problem" (1993, p. 406-407). Curriculum development in nursing schools reflect attitudes valuing both self-directed learning as an

educational strategy, and self-direction of the learner.

Since registered nurse (RN) students returning to school for their baccalaureate degree have usually experienced traditional programs that promoted learner dependency (Larisey, 1994; Long & Barnes, 1995), they experience some difficulty in transition to courses incorporating adult learning principles. To address this problem, a self-assessment project provided a foundation for learning in two U.S. programs for RN students (Larisey, 1994), and generic baccalaureate nursing students (Melandner & Roberts, 1994).

Curriculum changes are evident also in the United Kingdom. New courses were planned for the United Midlands College for Nursing and Midwifery (Stanton, 1994), and the Lakeland College of Nursing and Midwifery (Pulsford, 1994). These schools changed their curriculum in response to the shift from technical training to a diploma in higher education and professional qualification. The Council for National Academic Awards (CNAA) states that diploma level courses include higher level knowledge and should foster learner self-awareness, self-direction and independent judgements (Pulsford, 1994). Lakeland College of Nursing and Midwifery introduced liberal studies into the Common Foundation Programme of the Project 2000 course (Pulsford, 1994). The curriculum was designed to broaden students' education and students contracted for the liberal study activities they chose.

In New Zealand (Stodart, 1994), polytechnic nursing schools were required to incorporate a specific number of hours committed for self-directed

learning to demonstrate independent learning activities. Stodart (1994) wrote that students are given problems and are expected to become student-directed, set objectives, locate and select resources, and evaluate their activities. This process is to be facilitated and guided by their teacher, or tutor.

To meet the need caused by rapidly changing health care reform, nursing education and practice must keep abreast of the changes. Akin and Fagin (1993) recommended more adult educational approaches to accommodate the need for an increase in graduate level advanced nurse practitioners. The PEW Health Profession Commission Report (1993) for 2005 mandated lifelong learning for practitioners.

Global perspectives in nursing education are becoming more desirable as there is a need to provide international exchange programs and credit transfers (French et al., 1996). These authors reported a movement towards principles of self-directed learning being included in curriculum. French et al. (1996) advocated further research to include "the collation of an international baccalaureate nursing curriculum database and the analysis of its database for common core curriculum and the nature and diversity in curriculum" (p. 600). In response to curriculum efforts, actual courses based in self-directed learning were identified in the literature.

Courses in Self-Directed Learning

Most courses that include self-directed learning are found in the US literature followed by the United Kingdom, Canada, and Australia. Nursing

education differs among these countries, however, common goals of lifelong learning and self-direction in learning are shared. These commonalities prompted exploration of these educational systems. The identified literature was predominately non-investigative.

Five categories or types of courses using self-directed learning techniques were identified: core theory courses, elective courses, core clinical courses, independent study courses, and distance learning courses. These categories are not mutually exclusive. One illustration of this observation was that most independent study and distance learning courses incorporated essential theoretical and/or clinical content. Elective courses predominately included clinical experiences, but not exclusively. Core theory courses were found to include psychomotor and cognitive nursing skills. Electives and independent study courses were not always program requirements. Noteworthy variations in self-directed learning techniques were found among the nursing courses. One conflicting observation concerning the ownership of control for independent study courses was found (Lethbridge, 1988; Daly & Jones, 1988).

Some confusion exists among the meanings and approaches to independent study courses. An independent study course was designed to meet the needs of registered nurse students in rural areas of New Hampshire (Lethbridge, 1988). According to Lethbridge, independent study is closely related to self-directed learning in the literature. A different meaning was found for nursing education. Independent study was defined by the American Nurses

Association Council on Continuing Education as "occurring when the learner

does not have control over learner variables that relate to the formulation of

goals, but is master of the environment and in charge of the learning pace"

(Lethbridge, 1988, p. 183). In contrast, independent study at Marycrest College

in Iowa "is defined as a program of study with topics or problems chosen by the

student, with approval of the department concerned, and with supervision of a

faculty member" (Daly & Jones, 1988, p.231).

Some degree of learner control was common to all of the self-directed

learning techniques. Levels of responsibility differed, however. Nursing faculty

were found to either structure or facilitate learner experiences.

Diverse self-directed learning methods, strategies and techniques were

reported in nursing courses. Included were learning contracts, learning plans,

objective writing, experience negotiating, learning packages (workbooks,

worksheets, handbooks), self-instructional or programmed modules, and

computer tutorials. These self-directed learning techniques were also found not

to be mutually exclusive. For example, procedural elements such as student

involvement in objective writing, experience negotiating, resource selection, and

method of evaluation occurred in most learning contracts and learning plans.

Since these include elements of the learning contract, these techniques have

been grouped to form the category of modified learning contracts. Choice of

learner pace was mainly found in methods such as self-instructional or

programmed modules, learning packages, and computer tutorials. Courses are

organized by the dominate self-directed learning techniques, strategies, or

methods used and are reported below.

Learning Contracts

Learning contracts were employed in various clinical experiences: a

Native Canadian first year nursing course (Brose, 1988), a medical-surgical

nursing course (Richardson, 1987), post-basic nursing courses in England

(Akinsanya, 1987), and senior-level nursing courses (Dyke, 1986; Peterson &

Dyke, 1986; Clark, 1990). Richardson (1987) stated that the use of the learning

contract is "likely to provide individualized learning, promote self-direction, and

lifelong learning and teach students how to cope with change in a rapidly

evolving technical society" (p. 206). Akinsanya stated that contracts are

grounded in the andragogical principle that "learning becomes relevant to the

acquisition of knowledge for practice" (1987, p. 27). An important process

element for both parties in developing contracts is negotiation. Negotiation

empowers the learner to assume more responsibility to develop goals,

objectives, a plan and activities to meet the objectives, and a plan for evaluation.

These contracts varied in learner control, depending on the constraints of the

program. Akinsanya (1987) wrote that contracts are written and signed formal

agreements. Opportunities for re-negotiation are essential for success

(Akinsanya, 1987; Dyke, 1986; Peterson & Dyke, 1986; Richardson, 1987).

Favorable comments concerning the value and usefulness of learning

contracts were found by nurse educators (Akinsanya, 1987; Brose, 1988; Kuhn

& Fasano, 1984). Faculty evaluations indicated that learning contracts (a) provided a variety of educational opportunities; (b) supported clinical practice; (c) were flexible; (d) assisted in communication and interpersonal skills; (e) were less threatening to the student; and (f) involved the teacher with visits to the clinical settings (Akinsanya, 1987). Brose (1988) reported (a) a zero attrition rate after eight months, (b) improved communication, writing and reading skills, and (c) an enhanced self-concept of the student. Easier transition to the professional nurse role and more student ownership were described (Kuhn & Fasano, 1984).

Some problems included: (a) students found the explanation of contracting as time consuming (Richardson, 1987); and (b) students were reluctant to record identification of their needs for fear of evidence of failure (Brose, 1988). Learning contracts were generally found to enhance self-directed learning, however, Clark's (1990) findings suggested differently. Clark (1990) reported self-directed learning readiness scores and clinical performance as higher for the traditionally-taught nursing students and lower for those students who used contracting.

Modified Learning Contracts

Modified learning contracts included a minimum of one of the processual elements as identified by Knowles (Byrne, McKnight, Roberts, & Rankin, 1989; Majumdar, 1992): objective writing, negotiation of learning experiences and resources, and/or student participation in the evaluation process and outcomes. The learning plan included these elements but was not signed like the contract.

Majumdar defined the learning plan as

> an agreement between student and teacher spelling out in detail what the
>
> student will learn (objectives), how this will be accomplished (strategies),
>
> and within what period of time, the evidence which the student will submit
>
> to show that he/she has accomplished his/her objectives, and how this
>
> evidence will be evaluated (1992, p. 93).

Learning plans were used in the following courses: (a) a Canadian clinical
teaching skills course for registered nurse (RN) students (Byrne et al., 1989); (b)
an obstetric course in England (Howkins & Tinson, 1991); (c) liberal study
courses in England (Pulsford, 1994); and (d) upper level acute care and
practicum courses at the University of Southern Indiana (Melander & Roberts,
1994).

Students wrote their clinical learning objectives and negotiated their
learning experiences in (a) a British elective course (similar to the American
nurse internship) while registration was pending (Grant, 1987); (b) a nurse
anesthesia elective course in at the South Carolina College of Nursing
(Hollarbach & Hilton, 1989); and (c) a senior year independent study at
Marycrest College in Iowa (Daly & Jones, 1988). Students wrote their own
learning objectives as the major self-directed learning activity in an elective
junior and senior baccalaureate nursing oncology nursing course (Mooney &
Dudas, 1987). Based on student needs or goals, students in a graduate nursing
course in mircoteaching (Baker & Nishikawa, 1992) and an elective nursing

informatics course (Lawless, 1993) chose their learning experiences. Students participated in self-evaluation in a registered nurse baccalaureate interpersonal skills course (Baker, 1986; Farley & Baker, 1987).

Positive student and faculty evaluations occurred for the modified learning contract. Students reported the following: (a) gain of nursing role insight (Daly & Jones, 1988; Lawless, 1993; Mooney & Dudas, 1987); (b) improved job preparation, confidence, and management and teaching experience (Grant, 1987); (c) enjoyment of learning (Baker & Nishikawa, 1992); (d) increased comfort in clinical teaching (Byrne et al., 1989); and (e) a positive attitude towards interpersonal skills (Baker, 1986, Farley & Baker, 1987).

Faculty reported student gains in experience in a field of interest and therefore a decrease in the gap between theory and practice (Grant, 1987; Hollarbach & Hilton, 1989). Improvement in interpersonal skills were reported (Baker, 1986; Farley & Baker, 1987). Positive long-term outcomes included: (a) students continued to attend professional meetings; and (b) graduating seniors planned to practice oncology nursing (Mooney & Dudas, 1987).

Self-Instructional or Programmed Modules

Learner control of time, pace, resources, and environment was evident in the use of self-instructional or programmed modules. These modules used combinations of learning packages, learning packets, handbooks, workbooks or computer technology (interactive videos, tutorials). Less opportunity for learner control was evident with the self-instructional or programmed module techniques

than for the self-directed learning techniques previously discussed. These

modules generally require less faculty supervision (Haukenes & Halloran, 1984)

and thereby provide an opportunity to reduce faculty workloads or allow an

increased student enrollment with no increase in faculty size (Urick & Bond,

1994). Seminars with faculty and other students and learning modules were

strategies used in place of lecture in a course titled "Nursing in Primary Health

Care" in Chicago (Davis & Pearson, 1996).

According to Goldrick, Appling-Stevens, and Larson (1990), programmed

instruction was self-managed learning and learner-centered. The teacher

functioned as a resource person and facilitator (Logue, 1984). Faculty, however,

designed the objectives and content for the student.

Distance Education

Distance education is another method of self-directed learning. Learning

environments can be controlled with distance education. Lewis and Farrell

(1995) presented a distance education program available through California

State University that was based on self-directed learning principles. Course

materials were designed; resources developed; pace of learning was learner

controlled; and the role of the teacher was facilitative and collaborative. In order

to participate, the student needed to have access to a computer with a modem,

and a television with either a VCR or cable vision. Technological changes have

influenced course design to allow for more learner control in pace, timing, and

environment. Unfortunately, students may have limited experience or financial

resources to use these technological methods.

Learning Packages, Workbooks, and Handbooks

Learning packages alone were used in (a) orthopedic clinical courses in England (Wickenden, 1988); (b) basic clinical nursing courses in Australia (Gibbons, 1984); (c) anatomy and physiology courses England (Logue, 1984; Prosser, 1986); (d) a senior "Care of the Acutely Ill Adult" course (Lewis & Tamblyn, 1987); (e) Canadian psychomotor skills courses (Love, McAdams, Patton, Rankin & Roberts, 1989); and (f) a graduate nursing course in urinalysis skills (Mast & Van Atta, 1986). Gibbons (1984) described the practicum learning packages as "a compilation of planned learning experiences, devised to lead the student in the acquisition of knowledge and understanding through the medium of an educationally structured framework" (p. 38). A handbook for psychomotor skills courses in the US (Haukenes & Holloran, 1984), and workbooks for registered nurse students in New Hampshire (Lethbridge, 1988) were used.

Self-instructional modules including both computer tutorials and learning packages were used for (a) teaching basic nursing skills (Urick & Bond 1994); (b) distance education basic nursing and midwifery courses in England (Holland, 1990); (c) a distance learning "Managing Care" program in England (Hinchliff, 1990); and (d) an infection control course (Goldrick et al., 1990).

Computer Based Instruction

Computer based instruction was also used by nursing students for an undergraduate nursing course (Ross, McCormick, Krisak, & Anand, 1985), and a

University of California graduate research course (Holzemer, Slaughter,

Chambers, & Dulock, 1989). The instruction was individualized for group

interests and backgrounds to strengthen learning. Course development included

workbooks for the theory component and clinical experiences arranged with local

preceptors who were visited by faculty members. Students were expected to take

responsibility for their experiences. Students have been successful in program

completion with this independent study (Lethbridge, 1988).

Evaluation of Self-Instructional or Programmed Modules

Positive comments about the value/usefulness of self-instructional or

programmed modules included: (a) students, faculty, and the clinical staff

reported learning packages as being effective in bridging theory to practice

(Wickenden, 1988); (b) students viewed the experience as challenging and they

liked being in control (Urick & Bond, 1994); (c) grades were satisfactory and

students were more responsible (Logue, 1984; Prosser, 1986); (d) skills were

performed competently (Haukenes & Halloran, 1984); (e) over 80 percent of the

students were satisfied with the tutorials (Love et al., 1989); (f) students who

participated in computer based instruction were superior on achievement and

attitude measurements (Holzmer et al., 1989); and (g) posttest scores were

significantly higher (Goldrick et al., 1990).

Problems were noted (Prosser, 1986; Love et al., 1989) in studies of self-

instructual modules. Packages were both time consuming, expensive and

required adequate library sources; and students requested more structured

laboratory experiences (Love, et al., 1989).

Courses including self-directed learning reflect the conceptualization described as technique and methodological by Long (1997). The majority of the published items were not research studies, but at best are characterized as reports, descriptions, and methods to promote self-directed learning and adult learning styles.

Investigative and Non-Investigative Characteristics

Non-investigative literature dominated the literature review, although recently there did appear to be a trend in more investigative literature being published. The increase in investigative reports is the result of efforts of journal editors to support the movement of advancing the nursing profession through research. Of the investigative reports reviewed, the majority were published in journals from the United States, with a noteworthy number from the United Kingdom.

Dissertations

Dissertations focused on self-directed learning included the following categories of subjects: (a) generic nursing students in various levels and programs, (b) registered nurse students, (c) the combination of generic and registered nurse students, and (d) the combination of nursing students and nursing faculty. Most of the populations appeared to be convenience samples as the schools or universities were located in the same state as the university referenced. Variation was also noted in the categories of research interest.

Three main categories of research interest relating to self-directed learning were identified: (a) effects on students' learning, (b) learner characteristics and (c) methodology.

Effects of teaching strategies and methods based on self-directed learning principles were the most common area of research interest (Baker, 1986; Clark, 1990; Keegan-Ferretti, 1991; Murphy, 1989; Wickenden, 1988). Outcomes of learning were estimated by changes in test scores, performance and/or performance scores. Results of these studies generally support the implementation of self-directed learning strategies or methods but not comprehensively.

Baker (1986) estimated cognitive learning, attitudinal reaction and change in behaviors, and found that RN students who received self-management training for interpersonal skills demonstrated (a) a positive attitude towards these skills, and (b) maintenance of the skills better over time than the control group who received training only. In contrast, Clark (1990) found that nursing students who received traditional teaching methods scored higher in clinical performance and self-directed learning readiness than the students who used the learning-contract.

Keegan-Ferretti (1991) found that nursing students who had learner control (control of pacing and opportunity to practice) with an interactive video program on intravenous therapy had the highest percentage (95%) of mastery. Murphy's (1989) findings suggested although all nursing students demonstrated

concept learning and retention, students who received learner advisement with a critical care computer-based adaptive instructional lesson demonstrated greater levels of concept learning and retention than those who had learner control or adaptive control. Murphy commented that these results were different than prior studies and recommended replication with similar and larger samples.

Wickenden (1988) used a case study approach with techniques of illuminative evaluation of a self-directed learning scheme and concluded that the learning package developed for the clinical area was effective in application of theory in practice. Research on learner characteristics was the second in frequency.

Although not the primary focus of the dissertations, two authors (Clark, 1990; Wickenden, 1988) also assessed student learning characteristics. Wickenden reported that students' motivation and inquisitiveness increased. In addition to clinical evaluation scores, Clark's investigation included the use of Guglielmino's SDLRS and Kolb's learning style instrument. Inferential statistics of multiple linear regression, Chi-Square and ANOVA were used to reveal the following results: (a) higher SDLRS scores and clinical performance scores, and (b) highest SDLRS scores and clinical scores for the Accommodators.

One dissertation was based on methodology. Cedargren's (1987) dissertation focus was the development of a scale to assess beliefs about locus of control and how they related to professional role, health and self-directed learning. Factor analysis was used to identify factors and establish content,

construct and criterion validity. One way analysis of variance and the Scheffe post hoc procedure were used to determine relationships. Results included a difference in scores according to class rank for locus of control beliefs concerning self-directed learning, professional role, and health.

Non-Dissertation Investigative Literature

The remainder of the investigative literature presented similarities to the dissertations/thesis. These studies included generic, graduate or RN nursing students, nurse educators and/or patients. The majority of the subjects were generic baccalaureate nursing students.

Various research tools and methods were used to collect data. Qualitative methods were most frequently used. These methods included: questionnaires, surveys, logs, diaries, interviews, nomination technique, and panel review. Effectiveness of self-directed learning approaches were often determined by (a) pretest and posttest score changes or posttest scores, and/or (b) measures of clinical performance. Structured instruments were used for quantitative studies. Combinations of both quantitative and qualitative methods were found.

Student and teacher-centered preferences

Preferences of teaching methods was an area of focus of research interest in the non-dissertation investigative literature. Coutts and Cohen (1983) reported that nursing students preferred independent studies to conventional teaching methods in developing nursing process skills. Goldrick et al. (1990)

reported student preference for programmed unit of instruction. Students who participated in a psychomotor skills laboratory were found to value being able to learn with a preferred style. Wiley (1983) reported that nursing students who preferred low structure benefited more from self-directed learning teaching than those who preferred high structure.

In contrast, others (Burnard & Morrison, 1992; Nolan & Nolan, 1997a; Sweeney, 1990; Turunen, Taskinen, Voutilainen, Tossavainen, & Sinkkonen, 1997) found that nursing students preferred a teacher-centered approach in the classroom and lecturers preferred a student-centered approach. Both students and teachers preferred a teacher-centered approach in Sweeney's (1990) study using Boydell's Degree of Learning-Centeredness Scale. Nolan & Nolan (1997a) modified Boydell's scale and administered it to two groups: (a) those students at the beginning of their nursing education, and (b) those students six months into the program. Results included that students (a) valued an open and collegial relationship with their educators, (b) valued an open and flexible approach and, © preferred teacher control, especially early in their nursing education. The third finding was not consistent with self-directed learning theory. The authors commented that if student learning is truly student-centered, then students should theoretically be able to choose their preference for control. These students were enrolled when Project 2000 changes had been implemented.

When compared to social work students, Turunen et al. (1997) found that nursing students had a greater preference for teacher-centered learning.

Registered Nurse students were found to prefer more teacher direction

(Viverais-Dresler & Kutschke, 1992). Thompson (1992) cautioned nurse

educators against blindly adopting the adragogical approach for nontraditional

nursing students, regardless of their age or experience. Developmentally, these

nontraditional students may be at a lower level as a student than the generic

nursing student.

Preferences for teacher-centered teaching learning can perhaps be

explained by reviewing Knowles (1980). He recommended that self-directed

learning may not be appropriate for all early learning situations, and that adults

need structure in all forms of education, especially when human lives are at risk.

Knowles stated his belief that "direct didactic instruction is appropriate,

especially when learners are being introduced to totally new and strange

learning territories" (1980, p.97). Perhaps it is the underlying need to preserve

human life and health that limits a student's ability to engage in student-centered

learning.

Student and faculty perceptions

Student and faculty perceptions were also a frequent topic of research.

Byrne et al. (1989) reported positive changes in RN students' perceptions of

their clinical teaching abilities. Although nurse teachers reported self-directed

learning approaches as most frequently used, third year nursing students

perceived them as least effective with learning the biological sciences

(Courtenay, 1991). Nursing students related experiential learning to the clinical

setting whereas nurse teachers perceived experiential learning in reference to school or college activities (Burnard, 1992).

Janhonen (1991) found a lack of congruence between nursing instructors' public stance and actual didactic teaching based on andragogy. Although the nurse instructors claimed concepts of self-directed learning as having guided their practice, responses indicated actual implementation was not performed. Sweeney (1990) reported that nursing students perceived first level nursing courses to be highly teacher-centered even though the climate was predominately learner-centered. Teacher and student relationships were perceived by the students as formal.

Two studies included faculty surveys of self-directed learning approaches utilized in nursing schools. Dear and Bartol (1984) survey of 40 baccalaureate nursing programs in the Southern US indicated "a wide variation in both perceptions and practices of independent study within contemporary education" (p. 243). Decker (1990) surveyed twenty-five directors of nurse midwifery programs. Data analysis revealed (a) combinations of mastery learning programs in 19 programs, (b) traditional curriculum in five programs, and (c) competency-based and traditional curriculum in one.

Responses to self-directed learning

Several researchers reported favorable student responses following self-directed learning approaches (Logue, 1984; Richardson, 1988; Robertson & Bellinger, 1989; Ryan, 1993). Brose (1988) reported a decrease in attrition rate

(0%). Increases were reported in student (a) confidence (Brose, 1988; Grant, 1987), (b) communication skills (Brose, 1988; Byrne et al., 1989), and (c) motivation and responsibility (Prosser, 1986).

Variable results were found when self-directed learning approaches were evaluated. No significant differences of knowledge outcomes were found with samples who experienced a self-directed learning approach and those who experienced traditional approaches (Farley & Baker, 1987; Lewis & Tamblyn, 1987; Love et al., 1989; Parfitt, 1989). These results suggest that the self-directed learning approaches may be as effective as traditional approaches. Some authors commented that other methods should be included to balance teaching/learning approaches (Logue, 1984) and that learning styles need to be considered (Laschinger & Boss, 1989; Lewis & Tamblyn, 1987; McAdams, Rankin, Love, & Patton, 1989).

Significantly different scores favoring self-directed learning methods were found (Goldrick et al., 1990; Ross, McCormick, Krisak, & Anand, 1985). Although the majority of the researchers did not find measurable differences in scores; positive attitudes towards interpersonal skills and skill maintenance over time were reported (Farley & Baker, 1987). Parfitt (1989) reported improvement in problem identification, nursing intervention planning, and application of theory.

Learner characteristics

Learner characteristics were also a research focus. Oddi was concerned with instrument development of the Oddi Continuing Learning Inventory (OCLI)

to identify self-directed learners and to estimate personality characteristics of self-directed learners (1986; 1988). Oddi commented that "despite its long history in nursing, the concept of self-directed learning is poorly understood" (1988, p.180) and recommended future research. The initial study demonstrated reliability of the OCLI and that it may be used to identify self-directed learners. Comparisons of graduate students in law, adult education and nursing revealed that graduate nursing students had the highest mean scores on the OCLI and were more self-directed in learning (Oddi, 1988). The OCLI was determined to have an internal consistency of .87, a test-retest reliability of .89, and results that indicated validity (Oddi, 1986).

O'Kell (1988) found the majority of nursing students (70%) to have active learning styles of the Diverger or Accommodator and significantly lower SDLRS scores than the Converger or Assimilator. A decrease in successive annual SDLRS scores was found and O'Kell stated that nursing education has not placed emphasis on self-directed learning development. Linares (1989) stated many "RN students may have experienced a rigid, authoritarian approach to learning and are not familiar with being self-directed in the context of formal education" (p. 355). Following teaching of the self-directed learning process (Wiley, 1983), nursing students did not have an overall gain in SDLRS scores. Wiley suggested that a longer time may be needed for adjustment to the self-directed learning process.

MacFarlane and Hart (1995) conducted a descriptive, retrospective study

to evaluate the effectiveness of an independent learning experience for senior

baccalaureate nursing students. Description of the study was very brief. The

learning experience was based on self-directed learning principles. Over three

years, 67 recent graduates were sent a questionnaire to evaluate their

experiences. The study provided a source of self-directed learning benefits.

Stanton (1994) conducted a study of the teaching staff at the United

Midlands College for Nursing and Midwifery in the United Kingdom. The shift to

the diploma level of higher education required that faculty be qualified and

experienced in methods to facilitate self-direction. In 1990, Stanton developed a

questionnaire with open and closed ended questions. Faculty were asked to

rank items as to how important each one was in demonstrating a course's

academic level. Findings included: (a) only 3 teachers had taught in higher

education; (b) respondents rated curriculum planning, student selection, and

learning outcomes as the most important aspects of a course; and (c) there was

an incongruence between major aspects considered important by the Council for

National Academic Awards (CNAA) and the teaching staff. The CNAA expects

teachers to (a) demonstrate higher intellectual skills than the diploma students;

(b) have a research base for their teaching; and (c) use educative approaches.

Respondents did not acknowledge CNAA expectations in the survey. Although

the "CNAA states that courses at diploma level should promote critical self-

awareness, self-direction and encourage independent judgements by the

learners" (p. 20), study participants ranked theoretical and clinical assessments

as least important. Stanton (1994) recommended that teachers be educated in self-directed learning and andragogy to effectively develop curriculum and academic judgement. She suggested a staff development program of monthly one-day workshops.

Barnes (1995) combined qualitative and quantitative research methods to assess nursing students and nursing teachers perceptions of self-directed learning. Five aspects relating to curriculum were asked on a self-administered questionnaire. The curriculum areas of objectives, content, teaching methods, assessment, and learning preferences were included and Jarvis's 1992 model of self-directed learning was tested. The study was strengthened by the use of stratified samples and random selection from each group. Results indicated that there was a tendency towards other-direction in learning and that self-directed learning was mostly a teaching method. Although this study was conducted in the U.K., there are some similar issues with self-directed learning in nursing education in the U.S. The similarities include: (a) restrictions set forth by the governing nursing bodies and statutes; (b) restricted available time for self-directed learning resulting from increasing time used for theoretical content to produce an educated professional; and (c) social and political changes resulting in a diminishing professional educated workforce. These external constraints limit opportunities for learner autonomy and learner choice in the formal nursing education setting.

Learning Styles

Student nurse learning styles were a research interest (Cavanagh, Hogan, & Ramgopal, 1994; Cavanagh, Hogan, & Ramgopal 1995; DeCoux, 1988; Lasinger & Boss, 1989; O'Kell, 1988; Sherbinski, 1994). O'Kell (1988) studied the relationships between learning styles and SDLRS. Knowledge of an individual's learning style were recommend to assist in determination of learning strategies. The Kolb Learning Style Inventory was used by several authors (Cavanagh et al., 1995; O'Kell, 1988; Sherbinski, 1994). The Honey and Mumford Learning Styles Inventory was used by others (Cavanagh et al.,1994). Although slight, the divergent learning style was more predominate than other styles found with RN students in Great Britain (Cavanagh et al., 1995). However, graduate nurse anesthesia students who had been in the program for a year or more predominately preferred the assimilator and converger learning styles (Sherbinski, 1994). The reflector style (careful and cautious) was most common for diploma in higher education RN student nurses (Cavanagh et al., 1994). Learning environments can influence learning styles and caution must be exercised in assigning consistent approaches for all experiences (Cavanagh et al., 1994). O'Kell (1988) found that learners with concrete learning styles preferred traditional teacher-directed learning and those with abstract learning styles preferred self-directed learning. Determination of learning styles has potential value to assist both the nursing faculty and the nursing student to develop strategies for learning and instruction to maximize learning.

Self-Directed Learning Readiness Scale in Nursing Education

Guglielmino's Self-Directed Learning Readiness Scale (SDLRS) is the most frequently used instrument to measure self-directed learning in nursing studies. Self-directed learning readiness has been a research interest (Dixon, 1993) and dissertation topic in continuing education for nurses (Graeve, 1987; Hanford, 1993; Katherein, 1981; Middlemiss, 1989; Moore, 1987; Palumbo, 1990; Savoie, 1979, Skaggs, 1981; Verhey, 1993).

Research findings in nursing education have variable findings concerning age, educational preparation, ethnicity, and the SDLRS. Although O'Kell (1988) found no relationship between SDLRS and age, Linares (1987) and Alspach (1991) found that age was positively associated with higher SDLRS scores.

Equivocal findings occurred for the type of nursing student. SDLRS scores actually decreased with subsequent years of training in one program (O'Kell, 1988). O'Kell stated that "more emphasis should be placed on the development of self-directed learning skills" (1988, p. 202). As a group, senior baccalaureate nursing students scored higher than the "mean" SDLRS scores (Alspach, 1991). When compared to other nursing students, those nursing students who held a bachelor's degree in a non-nursing field had higher SDLRS scores than both the traditional and the RN nursing students (Alspach, 1991). One study (Linares, 1989) reported that Caucasian and Black students scored higher on the SDLRS than Hispanic students. No relationships were reported for sex or marital status (Alspach, 1991).

Findings regarding effects of curriculum and self-directed learning strategies were inconsistent. No curriculum components were identified to account for positive changes in SDLRS posttest scores (Malin, 1985). In contrast, prior instruction or opportunities in self-directed learning had no significant effect on SDLRS scores (Alspach, 1991). Wiley (1983) reported a gain in SDLRS scores for students who preferred low structure after a self-directed learning experience, but opposite scores were noted for those who preferred high structure. Graeve (1987) reported a positive relationship between SDLRS scores and the number of hours spent on self-directed learning projects.

Academic achievement findings varied in relationship to SDLRS scores. Alspach (1991) and Murray (1987) reported a positive relationship with the grade point average (GPA), however, no relationship was reported by Crook (1985) and O'Kell (1988). Course grades were positively associated with SDLRS in one study (Davis & Pearson, 1996), but no significant relationship in other studies (Crook, 1985; Russell, 1990; Savoie, 1979).

Models to Facilitate Self-Directed Learning

Some authors proposed a variety of models to facilitate self-directed learning. Eight models were described as follows: (a) hypothetico-deductive model of clinical problem-solving (Cholowski & Chan, 1995); (b) clinical teaching associate model (Melander & Roberts, 1994); (c) Reflexive Model for mentoring/coaching (Baldonaldo & Clayton, 1995); (d) Competence Validation model (Loving, 1993); (e) interpersonal epistemological curriculum model

(French & Cross, 1992); (f) open learning model (Paley, 1986); (g) partnership

model for student supervision (Selvin & Lavery, 1991); and (h) a cooperative

model (Nolan & Nolan, 1997b). The first model related to learning and clinical

problem-solving, and the remaining models related to faculty/student

relationships, curriculum and communication.

Cholowski and Chan (1995) compared two clinical problem-solving

models; the hypothetico-deductive model (HDM) and the knowledge-driven

model (KDM). The HDM promotes the notion of self-directed learning and allows

the student to assess their own learning needs and seek the necessary content

knowledge for the task. The processes were viewed as generalizable and the

model has provided a framework for the emerging use problem-based learning in

nursing education. The KDMs "are based on the assumption that students

typically try to understand new information on the basis of existing knowledge"

(Cholowski & Chan, 1995, p. 149). After careful review of the current educational

research, Cholowski and Chan (1995) suggested that critical thinking skills have

the best chance of developing when content knowledge is rich and elaborate,

therefore favoring the KDM.

Melander and Roberts (1994) presented a clinical teaching associate

(CTA) model which represents a triad: the student, the nursing faculty member,

and a staff nurse (professional practitioner). Clinical teaching associates were

oriented to the teaching role of facilitating the development of clinical judgement

and decision making. Nursing faculty were described as interactive in the

learning process. The triad concept was also described in the literature from the United Kingdom (Phillips, 1994). In the United Kingdom, the clinical mentor description was similar to the CTA. The suggested role for the nurse teacher was to expand to a facilitative role of a personal nurse tutor whose role would be to guide the student towards meeting both educational goals and personal goals. This planned and formalized system would encourage the student to become more independent and self-reliant.

Baldonaldo and Clayton (1995) proposed a Reflexive Model to serve as a guide for teachers who serve as a mentor or coach in the academic or work environment. The model was designed to facilitate the self-directed learner or protégé in (a) identification of learning needs, (b) developing goals and learning strategies, and (c) methods of evaluation. The reflexive model allows for flexibility to accommodate a need for the teacher to change to the mentor or coaching mode. Baldonaldo & Clayton, (1995) suggested that mentors and coaches be used "in individualized learning packages or programs" (p. 393).

Loving (1993) conducted a qualitative study using a grounded theory approach. Twenty-two baccalaureate students were selected by purposive sampling techniques. Students were interviewed using an unstructured interview guide. Questions were asked to determine how students defined clinical judgement and how they learned clinical judgement. The competence validation model was developed. Competence validation was identified as the core category with two educational contexts; evaluation and learning. Students were

more likely to foster a learning-centered attitude when they perceived faculty assistance to be other than evaluative. Self-directed learning appeared to be hindered when evaluation context perceptions were perceived by the students. Nolan and Nolan (1997b) proposed a cooperative model that allowed for student input but the burden rested within faculty to provide structure to the sequence and order of learning, especially during the early stages of nursing education. Although problems were noted with self-directed learning, considerably more benefits were reported.

<div align="center">Benefits of Self-Directed Learning</div>

Most frequently mentioned benefits from self-directed learning were socialization efforts towards professional role development. The assumption of learner responsibility positively contributed to improved accountability and assertiveness. Improved problem-solving skills, flexibility, creativity, integration of theory to practice, improved student autonomy, and opportunities for reflection were frequently mentioned. Learner benefits of improved motivation, self-awareness, and confidence were reported. Favorable responses to the advantages of freedom of choice and the ability for the students to pursue their own interests were evident. Skill development for lifelong learning and enhanced continued learning were presented as benefits (Lewis & Farrell, 1995; Stodart, 1994). Jarvis (1987) defined lifelong education as "any planned series of incidents at anytime in the lifespan, having a humanistic basis, directed towards the participant's learning and understanding" (p. 50). Favorable student learning

outcomes demonstrating improvement in knowledge and skills were reported.

Jarvis (1987) and Richardson (1988) discussed the benefit of students' ability to cope with change more effectively. Teachers who practiced reflection in action with self-evaluation were able to manage the change process better (Richardson, 1988). Satisfaction for assisting students to pursue interests (Richardson, 1987) and increased faculty enthusiasm (Kuhn & Fasano 1984) were mentioned. Green (1994) reported that the use of self-assessment strategies positively influenced self-esteem and psychological health. Self-assessment meets the "criteria of being valid, reliable, practicable, fair and useful to students" (Green, 1994, p. 298). Self-esteem was enhanced if feedback from nurse teachers was constructive and honest (Phillips, 1994). Students were reported to have (a) greater confidence in their abilities (Phillips, 1994), (b) more responsibility for their learning (Lairsey, 1994; MacFarlane & Hart, 1995; Phillips, 1994), and (c) feelings of satisfaction and empowerment (Davis & Pearson, 1996).

Self-directed learning meets an adult's need for independence, increases knowledge retention, and creates involvement in the learning process (Lairsey, 1994; MacFarlane & Hart, 1995). Enhanced autonomy (MacFarlane & Hart, 1995); improved leadership skills (Lewis & Farrell, 1995); strengthened interpersonal skills (Green, 1994); and development of professional practice standards (Green, 1994; MacFarlane & Hart, 1995) were observed when self-directed learning was facilitated. Some problems were reported in the literature.

Problems Reported

Problems were identified for both faculty and students. The most frequently mentioned problems concerned faculty time commitments (Barnes, 1995; Phillips, 1994). Release time was suggested as a way to cope with the time problem. Students were reported to have spent more time in activities of reading as opposed to listening (Logue, 1984).

Faculty were mentioned as either part of the problems or having problems. Mast and Van Atta (1986) commented that faculty demonstrated a lack of preparation and understanding of self-directed learning concepts. Some faculty (Courtenay, 1991; Ryan, 1993; Stodart, 1991) remarked that faculty were unskilled in helping students become self-directed learners. Bell and Bell (1983) mentioned that teachers lacked information of how to evaluate self-directed learning. Faculty mourned the loss of classroom competency and faculty motivation was decreased (Brubaker, 1990). Conflict was a problem when disciplinary or counseling functions were assumed by the personal tutor (Phillips, 1994).

Crotty (1989) remarked that there is a lack of encouragement in nursing education for faculty to participate in continuing education to develop new roles and skills necessary for the facilitator role. Glen and Hight (1992) observed that since "the nursing profession is often viewed as a rigid, traditional cultural setting" (p. 417), self-direction is not as likely to be permitted to prosper.

Difficulty of adaptation to facilitator role was discussed (Elkan &

Robinson, 1993; Richardson 1987; Stodart, 1994). Problems with role confusion in teacher and/or teachers were indicated (Bell & Bell, 1983; Richardson, 1988; Ryan, 1993; Selvin & Laverly, 1991). RN students who were accustomed to the dependent role were thought to have difficulty with readiness for self-directed learning (Price, Swartz, & Thum, 1983). However, Byrne et al. (1989) reported clarity of roles.

Psychological discomfort related to issues of self-direction was reported for both faculty and students. Teachers complained of insecurity (Prosser, 1986), loss of self-confidence (Richardson, 1988), increased stress (Brubaker, 1990), and increased anxiety (Coutts & Cohen, 1983). Increased student anxiety with the assumption of more responsibility in the learning process were reported frequently. Students reported feelings of uncertainty (Coutts & Cohen, 1983; Stodart, 1994), incompetence in practice skills (Elkan & Robinson, 1993); insecurity (Gibbons, 1984; Iwasi, 1987; Richardson, 1987), non-acceptance by the clinical staff (Peterson & Dyke, 1986), ambivalence (Loreno & Drick, 1990), stress (Brubaker, 1990), and/or being threatened (Howkins, 1991). Students also reported loneliness (Brubaker, 1990; Logue, 1984), inability to be objective about themselves (Green, 1994) and boredom (Logue, 1984). Some students perceived the process to be too complex and cumbersome (Richardson, 1987) or expressed difficulty with adjustment (Lairsey, 1994).

Ryan (1993) commented that students were not well equipped or prepared to participate in self-directed learning. Dyke (1986) and Gibbons

(1984) remarked that students' procrastination was a problem with assignments as was learner passiveness (Cust, 1995; Larisey, 1994). Financial costs in development of resources were mentioned as an issue of concern (Hengstberger- Sims & McMillan, 1993; Holland, 1990; Lewis, 1986). Although difficulties were reported, the general disposition was optimistic and that problems could be minimized. Strategies could be developed to socialize faculty and students to self-directed learning, and clarify role expectations.

Observable Trends

Nursing education publications in self-directed learning have been relatively consistent over time with only a slight recent decrease. Although there might appear to be a slightly lessened interest in self-directed learning in nursing education, scanning of the literature of self-directed learning in nursing did not reflect a decreased interest. A coarse scanning of the publications on self-directed learning in nursing and continuing professional nursing education revealed an abundance of interest in the topic. A thorough review of this literature would be instructive. Speculatively, more interest in self-directed learning in continuing professional nursing education reflects discussions in this review concerning the need for nursing students to develop the skills to become self-directed and lifelong learners in their professional lives. Learning, problem-solving, and critical thinking skills are necessary for coping, surviving, and demonstrating competence the rapidly changing work environment and role expectations of the profession. This current review addressed this trend.

Growing global concerns, common interests and goals were more evident. One article (French et al., 1996) reflected a diverse international collaboration between nursing faculty authors from the countries of China, the United States, England, Australia, and South Africa. These authors have initiated an attempt to develop a global perspective for nursing students who need preparation for practice in diverse and interdependent nations. The qualitative analysis of baccalaureate nursing curriculum documents from different continents was designed to generate theory.

International and transcultural nurse education have become more prevalent recently with the changing global society. Although self-directed learning was not specifically discussed, the authors mentioned that principles of andragogy and pedagogy must be re-evaluated in the context of world-wide adoption. The paradigm shift of the trained practitioner to an educated nurse is an emerging theme. Significant results relating to principles of self-directed learning were: (a) lecture was the most common teaching/learning method and did not facilitate student-centered learning, and (b) students did not often engage in self-evaluation. Lewis and Farrell (1995) discussed the worldwide major nursing role transition towards interdependence with a focus on health care.

Efforts to address goals of Project 2000 in the United Kingdom were evident (Elkan & Robinson, 1993; Green, 1994; Phillips, 1994; Pulsford, 1994). Literature has focused on plans to implement higher educational standards

versus nursing training model by the year 2000. More recent discussions in this review centered on the problems of implementation (Nolan & Nolan, 1997a). Efforts to decrease gaps between theory and practice were addressed in more detail as they related to the educational and service perspectives. Educationalists promote psychological, interpersonal, and communication skills while basic physical and manual practice skills are the concern of the service practitioners (Elkan & Robinson, 1993). Educationalists' goals included the student being able to manage the challenges of rapid change.

Student learning has been designed to embody principles of self-directed learning in both practical and academic spheres. Phillips (1994) suggested that one way to incorporate the self-directed learning into Project 2000 courses was to allow for more individualized tuition with both mentors and personal tutors. This recognized need is congruent with the development of the faculty/student relationship and communication models discussed.

In keeping with Project 2000, Green (1994) suggested that application of self-assessment strategies would enhance the focus on student-centered approaches. Historically, higher education assessment models have been primarily authoritarian, unilateral, and teacher-centered. Green commented that self-assessment may be limited by the professional statutory requirements. Self-assessment encourages reflection and allows for formative evaluation.

Conclusion

Evident in this literature review of self-directed learning in nursing education is the strong influence of contemporary learning theory found not only in the United States, but in the United Kingdom, Australia, Canada, Finland, and New Zealand. In addition, there has been an international nursing faculty collaborative effort (French et al., 1996) to explore curriculum similarities and differences in order to develop a core international baccalaureate nursing curriculum for the future. Broadening the literature review to include self-directed learning in professional development and continuing professional education would more accurately reflect self-directed learning in nursing as a profession.

Globally, nurses are challenged with a reduction in resources, burgeoning technology, problems of increasing complexity, and a shift in the nursing education paradigm. Nurse educators are thus faced with challenges to prepare the nursing student to cope with these conditions. Implementing adult learning theory, particularly self-directed learning in formal nursing education, has been recommended and often demonstrated as an effective strategy to produce a competent and safe professional nurse who is committed to self-directed learning.

Curiosity

Historically, the concept of curiosity was developed primarily by D.E. Berlyne. His early research efforts began in 1947 when he investigated exploratory behavior. His research and publications contributed to behavior

theory and drive-reduction theory (Berlyne, 1960, p. vii-viii). Berlyne (1954)

developed terminology to describe different types of curiosity such as perceptual

curiosity and epistemic curiosity.

Perceptual curiosity, common to both animals and humans, was

described as the sensory perception of some unfamiliar feature about an

ordinarily familiar situation (Berlyne, 1954). The drive of perceptual curiosity is

reduced by exposure to the stimuli. Epistemic curiosity, specific to humans,

involves a drive reduced by knowledge rehearsal. Later, Berlyne wrote that

> A state of high drive induced by conflict traceable to disharmonious
>
> symbolic processes constitutes epistemic curiosity. This is a condition
>
> that can be relieved by the acquisition of knowledge and that therefore
>
> leads to epistemic behavior, which includes directed thinking. (1965,
>
> p. 254)

Berlyne's theoretical discussions entail descriptions of stimuli and

responses as they relate to curiosity. Berlyne expanded Skinner's concept of

"thematic probes" to include all stimuli (verbal, non-verbal, internal or external)

which generate thought, whether verbal or non-verbal in content. According to

Berlyne (1960), a question asked by either oneself or an external agent can

arouse curiosity. A question serves as both a cue-stimulus and a motivational

stimulus. Conflict is an intervening variable fitting between stimulus and

response.

Conflict is central to curiosity and arises when there is interference

between a thought or perception and past experience. Arousal of curiosity

occurs if the situation is perceived as surprising or novel but has some

intermediate degree of familiarity present. The degree of the conceptual conflict

determines the strength of the epistemic curiosity (Berlyne, 1962). He further

elaborated that "degree of conflict is, in its turn, assumed to increase with (1) the

number of competing response-tendencies, (2) their total absolute strength, (3)

their nearness to equality of strength, and (4) their degree of mutual

incompatibility" (Berlyne, 1962, p. 27).

Curiosity theory development by Berlyne (1957) included research with

undergraduate psychology students who participated in experiments that

included responses to tachistoscopic exposures to visual figures. Incongruity,

surprisingness, relative entropy (uncertainty), and absolute entropy were found

to increase curiosity significantly. **Incongruity-conflict** was aroused by

incompatibility of previous stimulus patterns; and **surprise-conflict** was aroused

when expectations from previous stimulus patterns were not confirmed. Later

research with children (Berlyne & Frommer, 1966) added to the theory of

epistemic curiosity. More questions were elicited by children when they

encountered novel, surprising, and incongruous items.

Berlyne's last work, Curiosity and Learning, was unfinished at the time of

his death in 1976 (Rotto, 1994). Although no longer popular, Berlyne's

behavioral stimulus-response theory transcended time. In his latter years,

Berlyne's work, more strongly associated with motivational theory, possessed a

stronger cognitive emphasis. Rotto referred to Berlyne as a grand visionary and commented that since his death that there "has been a near total subsumption of curiosity by the motivational psychologists, particularly those concerned with intrinsic motivation. Where intrinsic motivation and learning are discussed, curiosity and motivation become nearly one and the same" (Rotto, 1992, p. 740).

Motivational Theory

Curiosity is a concept related to motivation in learning. Bruner (1968) noted that survival of the individual and species is dependent on curiosity; and he said "Curiosity is almost a prototype of the intrinsic motive" (p. 114). Deci and Ryan (1982) described three motivational states: (a) intrinsically motivated, (b) extrinsically motivated, and (c) amotivated.

Intrinsic motivation represents the motivational state when there are no external rewards and the learners direct their own learning. The activity itself is thought to be rewarding and is based on the human need to be "competent and self-determining" (Deci & Ryan, 1982, p.1). Curiosity and exploration were identified as examples of intrinsic motivation. Individuals who are working towards an external reward (money, grades, status, approval, deadlines) or focusing on a desired outcome are extrinsically motivated. Their involvement with the activity is less and learner control is lost. Passive and non-responsive learners are labeled amotivated and tend to experience helplessness. These three motivational states may be experienced by adults and children alike, depending on the experiences.

Intrinsic motivation was found to decrease when extrinsic factors controlled the learning activity while choice, orientations toward autonomy, and active learning enhanced intrinsic motivation. Maw (1971) wrote that he believed that there can be no extrinsic motivation and that all motivation is internal or intrinsic. There are, however, external rewards or reinforcements representing extrinsic incentives. Csikszentmihalyi (1977) commented that extrinsic rewards require high levels of human energy and resources, and intrinsic rewards include satisfaction as the reward.

Other authors (Amabile, Hill, Hennessey, & Tighe, 1994) investigated intrinsic and extrinsic motivation using the Work Preference Inventory. Their findings included evidence that intrinsic and extrinsic motivation are not dichotomous but may be synergistic in their effects if they operate together. Based on the results of their study, they identified four types of motivational orientations: dual, intrinsic, extrinsic and unmotivated. This classification differs from that of Deci and Ryan (1982) with the addition of the dually motivational state. Amotivation and unmotivation are similar in meaning.

Difficulty in defining intrinsic motivation and intrinsic reward was expressed by Berlyne (1971). He discussed intrinsic motivation in terms of needs of the brain and threats to its functioning. Information to the brain is a primary concern and collation occurs with information processing. Collation involves comparison and synthesis leading to acceptance or rejection of items. Berlyne maintained that "variables like novelty, complexity, surprise, and

ambiguity are central to motivation" (Berlyne, 1970, p. 190). He named curiosity as a motivational condition dependent on exploration based on uncertainty and conflict. He maintained that curiosity is not related to diversive exploration which includes activities that are stimulated (a) by the need to be entertained, or (b) when the external environment is perceived as dull, monotonous and boring. Rather, intrinsic motivation encourages specific exploration, asking questions, critical thinking, openness to new ideas and experiences, and problem-solving.

Rossing and Long (1981) have defined curiosity as intrinsic motivation to learn as opposed to motivation of extrinsic form. It was suggested that adults become more goal and reward directed (extrinsic) as they mature. These authors studied curiosity with the view that curiosity (intrinsic motivation) operates with extrinsic motivation in the adult. Conceptual conflict may occur in the form of surprise which represents a dissimilarity between expectations and actual information or previous experience. Surprise has been reported as a powerful epistemic curiosity-arousing form of conceptual conflict. Gradually, more studies have been published on curiosity in adults (Bynum & Seaman, 1993; Camp, Dietrich, & Olson, 1985; Camp, Rodrique, & Olson, 1984; Olson & Camp, 1984; Swan & Carmelli, 1996). Interest has received considerable attention.

The role of interest in the learning process has been described as an intrinsically motivating factor (Berlyne, 1960; Deci & Ryan, 1982; Duffy, 1974; Nenniger, 1992; Rossing, 1979; Tobias, 1994). Various definitions of interest

have recently been proposed and are presented below. Frick (1992) defines

interestedness as "a feeling of interest occurring *prior* to learning an outcome of

an event" (p. 113); whereas interestingness occurs after an event. Hidi and

Anderson (1992) make a distinction of two types of interest: individual and

situational. They describe individual interest as generated rather slowly over

time and is enduring. Situational interest is generated by an event in the

"immediate environment and consequently, may or may not have lasting effects

on personal interest and learning" (Hidi & Anderson, 1992, p. 216). These two

types of interest are not described as mutually exclusive, but are thought to be

interactive.

Nenniger (1994) addresses the relationship of cognition and motivation in

the learning process. While recognizing the importance of cognitive components

in academic learning, he asserts that interest, or content-oriented motivation,

plays an important mediating role. Nenniger relates the original conceptual

development of content oriented motivation to Berlyne's description of collative

stimulus properties.

Development of interests remains unclear (Frick, 1992; Hidi &

Anderson,1992; Tobias, 1994). Interest has been associated with prior

knowledge (Frick, 1992; Tobias, 1994), value and emotional feelings (Tobias,

1994). Research evidence suggests a strong and linear relationship between

interest and prior knowledge, however, much of interest is not explained by prior

knowledge (Tobias, 1994). Frick (1992) maintains that too much or too little

background information or unexpectedness decreases interest.

Curiosity Materials

Rossing (1978) explored Berlyne's theory of epistemic curiosity among adult learners. The basic framework for his study was Duffy's (1974b) design of psychological experiments. Duffy investigated the relationships of surprise and extrinsic value with curiosity among high school students. Rossing modified Duffy's design by (a) increasing the number of psychological experiments from 8 to 10, (b) limiting psychological experiments to human subjects, and (c) changing the rating scales from 5 categories to 9 points with only end points labeled. Rossing identified age, sex, verbal ability, and subject-matter interest as trait (predictor) variables. The desire to know was the criterion variable. Surprise (conceptual conflict) and perceived (extrinsic) value were the situational (predictor) variables. The materials are subject specific and are not designed to measure a general curiosity trait.

The instrument has two sections. The first section contains instructions for rating the experiment descriptions with an example. Subjects were asked to rate their interest in psychological research experiments. Ten psychological experiments were described.

Section two contains the rating scales. Rating scales for surprise and perceived value are in the first part. Subjects are instructed to respond to these before completing the second part, the desire to know scales. In order to counter balance across subjects, the order of rating surprise and perceived value was

reversed, and the sequence of experiments were randomly designed. Following the scales, the subjects were asked three questions for the purpose of maximizing the study's validity. The subjects were asked whether (a) the experiments were confusing or difficult to understand, (b) materials were completed without interruptions, and (c) an event occurred to affect the accuracy of responses. Curiosity materials were piloted with 10 adult subjects and self-administration was determined as acceptable.

Rossing (1978) expressed caution for interpreting the ratings of strength of the desire for further knowledge as a measure of epistemic curiosity in this study. Ratings of perceived value indicated that some extrinsic usefulness of the information was perceived and contributed to ratings of desire for further knowledge. Thus, in the strictest sense, "one cannot assume that desire for knowledge is a consistent measure of epistemic curiosity" (Rossing, 1978, p. 94). The correlations of surprise/curiosity and usefulness/curiosity test the relative importance of intrinsic and extrinsic motivation in adult learners.

Related Curiosity Research

Curiosity literature has been dominated by childhood and developmental theories (Ellis, Koran, & Koran, 1991). Contributing to this body of literature is Maw's (Maw, 1971; Maw & Maw, 1965) extensive studies of curiosity in children. Some authors (Duffy, 1974a; Ellis et al., 1991; Rossing, 1979) have suggested that curiosity has been negatively associated with schooling.

Duffy (1974b) studied secondary school students. He found that the more

cognitively advanced the subject was, the more capable they were to ask questions and relate "the material to their existing conceptual systems" (p. 110). He concluded that motivation to express curiosity was "determined by a combination of intrinsically and extrinsically motivated needs to reduce uncertainty, while the capacity to do so is influenced by the individual's ability to relate to present and past experiences to each other (Duffy, 1974b, p. 111). Curiosity in adults has become a research interest for the past two decades.

Rossing and Long (1981) discussed the adult's tendency for resistance to change and the tendency to explain away new information based on prior beliefs, values, experiences and information. This publication was based on Rossing's (1978) dissertation on epistemic curiosity. Curiosity was measured by the curiosity experiment inventory described previously. In this study, surprise was viewed as an intrinsic motivational source while perceived value was identified as an extrinsic motivational source. A high positive correlation was found between perceived value and the desire to know. Although the correlation between surprise and the desire to know was positive, it was weaker. A significant negative correlation was computed for only one subject. This study included 79 adults enrolled in either adult education classes or credit courses with ages ranging from 21 to 52 years. Findings supported the view that "the motivational strength of curiosity is greater in adolescents than in adults but are in no way proof of such an assertion" (Rossing & Long, 1981, p. 33).

A subsequent study compared curiosity measures. Olson and Camp

(1984) conducted a factor analysis of several commonly used curiosity measures in adults. Results suggested a General Curiosity factor present with Spielberger's State and Trait Curiosity Inventories, the Melbourne State and Trait Personality Questionnaires, the Ontario Test of Intrinsic Motivation (OTIM) Specific Curiosity subscales, and the Academic Curiosity Scale. These authors suggested "that any or all of these scales can reasonably be employed as a general curiosity measure" (p. 496).

Camp, Rodrique, and Olson (1984) replicated Rossing's and Long's study using a sample ($\underline{N}$ = 100) of almost equally divided groups of young (25-35 years), middle-aged (45-55 years) and older adults (65-75 years). They modified the Curiosity Materials and labeled them the Experiment Descriptions Inventory (EDI). Results from their pilot study indicated that older subjects had (a) difficulty understanding the nine point scales, and (b) experienced confusion regarding the separations of surprise and perceived value from the desire to know scales. They used three point rating scales and the three scales were completed after each description.

Findings (Camp et al., 1984) from the study included a significant positive relationship between desire for knowledge and perceived value with the total population of participants ($\underline{r}$ = .81, $\underline{p}$ < .01), the young adults ($\underline{r}$ = .91, $\underline{p}$ < .01), and the middle aged adults ($\underline{r}$ = .67, $\underline{p}$ < .01). The relationship was not significant for the older adults ($\underline{r}$ = .45, $\underline{p}$ > .05). There were no significant relationships for any adult groups between desire to know and surprise ($\underline{r}$ = .21, $\underline{p}$ > .05). These

participants also responded to the OTIM assessing measures of specific curiosity. Results included no differences in the age level effects ($F_{(2, 97)}$ = 1.55, $p > .20$). Diversive curiosity was significantly related to age, however. Younger adults experienced more arousal when bored or faced by monotony. The authors concluded that it should not be expected that older adults should be less curious or interested in learning new information than younger adults.

Camp, Dietrich and Olson (1985) studied the relationship of curiosity and uncertainty in 60 adults equally divided into three age groups: young, middle-aged, and older. A word frequency test developed by Boykin and Harackiewicz (1981) was used to measure curiosity, uncertainty, and information retention. Additionally, the OTIM was used to measure trait-curiosity. Results showed a significant relationship between uncertainty levels and curiosity among all age groups. There was no significant age effect on the measure of curiosity (OTIM) or for the recognition of target items. This study did not support the stereotype of the older adult being less curious.

More recently, Carscaddon, Poston, and Sachs (1988) reported their study of 73 undergraduate students ranging in age from 17 to 47 years. Two research instruments were used: (1) the Problem Solving Inventory, developed by Heppner and Petersen in 1982; and (2) the State-Trait Personality Inventory, developed by Speilberger in 1979. These instruments were administered to investigate the relationship of problem-solving appraisal and state-trait variables of anxiety, anger and curiosity. Results suggested that trait curiosity was the

most reliable predictor of problem-solving appraisal.

Other studies have explored curiosity with older populations (Bynum &

Seaman, 1993; Daffner, Scinto, Weintraub, Guinessey, & Mesulam, 1994; Swan

& Carmelli, 1996). Bynum and Seaman (1993) found that intellectual curiosity

was the most powerful motivator for participation in learning for adults over 50

years of age (third-age learners) in retirement programs. A modified version of

the Reasons for Participation Scale was used to estimate intellectual curiosity as

a component of motivation to participate. Daffner et al. (1994) measured

curiosity by exploratory eye movements in response to novel, complex and

incongruous visual stimuli among healthy elderly subjects (mean age = 71.6

years) and middle-aged subjects (mean age = 42.2 years). These authors

concluded that curiosity "can be well preserved in older individuals" (p. 374).

This study differed from the other adult curiosity studies with a focus on novelty-

seeking behavior.

Swan & Carmelli (1996) reported a positive association in survival over a

5-year period in a older population of men (mean age = 70.6 years), and women

(mean age = 68.6 years) with state curiosity as measured by Spielberger's

State-Trait Personality Inventory. These authors speculated that state versus

trait curiosity was a better predictor of survival because state-curiosity

represents " a more accurate portrayal of an older person's response to novel

situations such as participation in a research study" (Swan & Carmelli, 1996,

p. 452). Additionally, their findings suggested that reduced curiosity may be an

early sign related to abnormal aging of the central nervous system.

Berlyne's theory of curiosity guided these research studies. The above studies support the idea that adults are indeed curious learners. When perceived value and surprise were estimated with the desire to know, however, there was support for the hypothesis that adults are more extrinsically motivated. Older adults (Camp, Rodrique, & Olson, 1984) did not appear to be as extrinsically motivated as younger and middle-aged adults.

A review of the literature revealed that curiosity is not a unitary construct (Boyle, 1989; Duffy, 1974a; Langevin, 1971; Olsen & Camp, 1984; Voss, 1984). Curiosity has been described as a cognitive style (Arnone, Grabowski, & Rynd, 1994), a cognitive trait (Terenzini, Springer, & Pascarella, 1993), a personality trait (Day, 1971; Langevin, 1971; Olsen & Camp, 1984) a state (Berlyne, 1960, 1962, 1965; Boyle, 1989; Carscaddon, Poston & Sachs, 1988), and an attitude of the ego (Nersessian, 1995). Boyle (1989) reported that empirical evidence supports the usefulness of a state-trait model for curiosity research. State curiosity is "situationally sensitive to transitory fluctuations in curiosity levels" (p. 176). Trait curiosity, a more enduring personality characteristic, reflects a general capacity to feel or experience curiosity. It is presumed that those who exhibit the trait will experience more curiosity situations or states.

<u>Self-Directed Learning and Curiosity</u>

Specific references were found to specifically link curiosity and self-directed learning for adults. Houle (1961/1993) wrote that a master teacher will

deepen curiosity and stimulate the student's desire to learn more. According to

Tough (1971), satisfaction of curiosity or puzzlement were reasons a person

may anticipate a learning episode. Tough (1979) stated that numerous learning

projects start with "a question, a feeling of puzzlement or curiosity, or just a

general interest in a certain body of subject matter" (p. 39). Guglielmino

(1977/1978) included a high degree of curiosity as part of being a highly self-

directed learner in her concept of self-directed learning readiness .

Arousal of curiosity in adult learners is found in recommendations of

several authors (Beidler & Beidler, 1993; Edman, 1991/1992; Kramer, 1991;

O'Dea, 1993; Reid, 1991). With the exception of Duffy (1974a) and Reid (1991),

however, few specific strategies to promote curiosity have been suggested. Reid

(1991) suggested teaching strategies to include vital curiosity so knowledge

would appear open ended and connections to other pieces of knowledge

enhanced. Although designed for children, Duffy's (1974a) implications for

teaching have some practical application for adults.

These descriptions are as follows:

> 1. Subject matter can be taught in such a way as to arouse perceptual
>
> and conceptual conflict, and this can be utilized on an incentive for
>
> learning;
>
> 2. Children can be trained in question-asking as a skill, so that their
>
> knowledge-seeking proficiency is increased;
>
> 3. Measures can be taken to raise children's general curiosity-level, or

they can be taught in a manner appropriate to their existing level. (p. 49)

O'Dea (1993) suggested that teachers should view themselves as professionals whose central mission is to engage students in their interest and curiosity. Beidler and Beidler (1993) suggested college professors arouse their students' curiosity to motivate them. Edman (1991/1992) recommended that a goal of an honors program at a local college was to raise students' levels of curiosity. Kramer (1991) commented that teaching and learning are enhanced if the learner is curious and genuinely interested. Kramer stated that "Curiosity is probably as impossible to crate as energy" (p. 185) and encouraged college teachers to examine their own curiosity in efforts to stimulate curiosity for the student. Considering Long's (1997) definition of self-directed learning as a cognitive process comprising deep processing of information, then the following section, which includes discussion of strategies to enhance this process, lends value to the conversation. Critical thinking, curiosity and self-directed learning were companions in the nursing education literature, especially the last decade.

Self-Directed Learning, Critical Thinking and Questioning

Critical thinking and self-directed learning were found to be linked often in the literature (Cholowski & Chan, 1995; Cust, 1995; French et al., 1996; Little & Ryan, 1988; Loving, 1993; Mathews & Travis, 1994; McMillan, 1989; Reynolds, 1994; Stanton, 1994; Wink, 1993). Cognitive, rather than psychomotor abilities, have more recently have been linked with the professional nurse (Kataoka-Yahiro & Saylor, 1994). Loving (1993) stated that both motivation and

cognition are integral in developing critical thinking skills and nurse educators must support their development. Several authors suggested strategies such as encouragement of deep processing and questioning to enhance critical thinking skills.

Stanton (1994) stated that encouragement of deep processing is important to develop critical thinking. Ideas that are processed deeply are more likely to be remembered (Cust, 1995). Self-questioning was identified as one learning strategy to enhance active learning and deep-processing of information. Students who are able to take control of their learning environment, persist in spite of difficulties, are both curious and self-regulating (Cust, 1995).

Malek (1986) suggested the following principles of questioning: ask questions that move from the simple to complex and pace the questions according to the students' readiness and cognitive exercise. Field (1987) recommended that nurse educators assist nursing students in expert decision making by the inclusion of "techniques for enhancing discrimination across observations and events, judicious questioning which helps the learner establish relationships between events, simulations, ward rounds, and connecting with a clinical mentor" (p. 570).

Nurse educators must assess the environment and determine its appropriateness for questioning (Miller & Malcolm 1990; Wink, 1993). Miller and Malcolm (1990) recommended an environment where the student can engage in uncertainty and risk-taking without compromising patient safety or experience

fear of failure. Questions may cause the student to feel threatened or frightened

if the questions are too high-level or the teacher is perceived as an interrogator

(Wink, 1993). Modeling of critical thinking has been suggested as a strategy to

develop critical thinking (Brookfield, 1987, p. 87). Modeling of questioning by the

expert to the novice "would prompt the linking of clinical data with relevant

content knowledge and the formation of new integrated schema" (Cholowski &

Chan, 1995, p.151). Eventually, the questioning would become student-

generated and the student would abandon surface processing and achieve a

higher level of conceptual activity.

The California Critical Thinking Disposition Inventory (CCTDI) (Facione,

Facione, & Sanchez, 1994), was recently developed by a Delphi Panel for the

practice of nursing. Factor analysis of the CCTDI generated seven dispositional

subscales, one of which is inquisitiveness that measures "one's intellectual

curiosity and one's desire for learning, even when the application of the

knowledge is not readily apparent" (p. 346). This instrument supports the notion

that curiosity is indeed a valuable disposition for the professional nurse to

engage in learning.

Summary of the Literature

Self-directed learning literature was reviewed and included discussions of

the origins of research about the topic by Houle and Tough. Knowles'

perspectives of andragogy in adult learning theory has been a major contribution

to self-directed learning. Self-directed learning has evolved over the past twenty

years to different conceptualizations (sociological, technique, methodological

and psychological) that have led to some confusion of the topic (Long, 1997).

Examination of the nursing education literature in the United States and

other countries revealed the existence of a substantial volume of interest in self-

directed learning, both investigative and discursive. The high value placed on

the student becoming self-directed in both nursing education and nursing

practice was common to all publications. This competency is thought to give the

nursing student the proficiency to cope with the complexities and shifting

paradigms of health care delivery and nursing practice.

Addressing the need to become self-directed in learning, authors

mentioned various techniques, strategies, and methods to promote self-directed

learning. Evaluation of the interventions revealed some conflicting evidence.

Student and faculty preferences for teaching-centeredness, sponsorship of the

activity, learning styles, learner characteristics, and readiness for self-directed

learning influenced the effectiveness of the interventions. Preparation for the

self-directed learning activity was found to be influential for both the student and

faculty. To address the need for preparation, authors' suggestions and

recommendations for improvement were extensive. Despite some equivocal and

negative findings, tenacity persists to improve strategies, techniques and

methods to promote self-direction in the learner.

Curiosity, similar to self-directed learning, was not found to be a unitary

construct. Berlyne's theoretical and research efforts provided notable

contributions to the literature for the study of curiosity. Since Berlyne's death, curiosity, emphasizing a cognitive focus, has been associated with motivational theory. The literature review revealed abundance for studies of curiosity in children, however, studies with adults were less numerous. Measurement strategies to capture the construct varied.

Strategies to promote curiosity generally were found to be vague in the adult learning literature. Studies and discussions of curiosity were not found in the nursing literature except when linked with cognitive focuses of critical thinking, deep processing and questioning. Frequent references were made associating self-directed learning and curiosity, however, no empirical evidence was found to support the association.

CHAPTER III

Research Design and Methodology

Conceptual Framework

The review of literature suggests the theoretical possibility that curiosity

and self-directed learning readiness may be associated. The association,

however, has not been determined definitively by empirical study. Furthermore,

there is little reason, based on empirical data to assert at this time, that two

elements of curiosity, the desire to know and the perceived value, are

differentially associated with self-directed learning readiness. The relationship of

the two types of curiosity with self-directed learning may not be the same. It is

assumed that these two different kinds of curiosity may influence learning-

teaching in different ways. Literature supports the notion that self-directed

learning may develop with age. It is less clear, however, if curiosity declines with

age. Based on Knowles' assumption that self-directed learning increases with

age and experience with the use of self-directed learning activities; and if

nursing education promotes self-directed learning readiness by curriculum

design, the study of nursing students at different levels of academic levels is

desirable. Accordingly, subjects were be obtained from a baccalaureate nursing

program.

Two data collection instruments, Guglielmino's self-directed learning

readiness scale (SDLRS) and Rossing's curiosity materials, were used. The data

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were subjected to appropriate statistical analysis and the 3 hypotheses as noted below were tested.

Hypotheses

Based on the literature review, a relationship between curiosity and self-directed learning readiness may exist. Yet the empirical evidence is insufficient to support directional hypotheses. Therefore, the three non-directional hypotheses, stated below in the null form, were tested using the alpha level of .05 for rejection.

Ho1. There is no significant relationship between students' mean desire for knowledge score and students' mean SDLRS score.

Ho2. There is no significant relationship between students' mean perceived value score and students' mean SDLRS score.

Ho3. There is no significant relationship between students' mean perceived value score and students' mean desire for knowledge score.

Assumptions/Limitations

One assumption and two limitations were identified for this study. The assumption is:

1. Subjects were honest when completing the SDLRS and curiosity materials and responded accordingly to the best of their ability.

The following limitations were identified:

1. Conclusions and findings of the study have limited generalizability because of the nature of the sample selection and characteristics of the sample.

2. Since the information elicited was self-rating, it does not necessarily

reflect on manifestations of subjects' behavior.

Definitions of Terms

Terms used in this study fall into two categories; conceptual and

operational. The critical terms are derived from the work of Guglielmino

(1977/1978) and Rossing (1978).

Conceptual Definitions:

Intrinsic motivation. "Motivation that inheres in the knowledge-seeking

process" (Rossing, 1978, p.57).

Extrinsic motivation. "Motivation to acquire knowledge that will serve to

satisfy needs which lie outside the knowledge-seeking process" (Rossing, 1978,

p.58).

Epistemic curiosity. "An intrinsic motivational state induced by conceptual

conflict that activates and directs behavior whose function is to build up symbolic

knowledge which reduces the conflict" (Rossing, 1978, p.58).

Curiosity is the intrinsic desire to seek knowledge.

Self-directed learning is "a cognitive process that is dependent on meta-

cognitive behavior such as attending, focusing, questioning, comparing,

contrasting, etc. that are personally controlled or managed by the learner with

little or no supervision by a powerful other" (Long, 1992, p.12).

Self-directed learning readiness scale is "a measure of an individual's

current level of readiness to engage in self-directed learning" (Guglielmino,

1989, p. 236).

Operational Definitions:

Nursing student is a person enrolled in an accredited baccalaureate nursing program.

Academic achievement is defined as the cumulative grade point average (GPA) based on a 4.0 scale determined at the completion of the last semester.

Ethnicity is defined as membership in one of the two categories identified in this study: Caucasian and minority.

Sex is the biological category of male or female.

Age is the subjects age in chronologic years determined from their last birthday at the time of the completion of the questionnaires.

Marital status is the category of single, married or divorced at the time of the completion of the questionnaires.

Self-directed learning readiness. The score an individual makes on the Guglielmino SDLRS-A instrument (Guglielmino, 1977/1978).

Subject-matter interest. "The rating a subject records on the rating of interest in psychological research, taken before the subject reads any of the experiment accounts" (Rossing, 1978, p. 58).

Familiarity. The rating of subject records on the rating of familiarity with reading reports of psychological research.

Surprise. The sum of ratings recorded by a subject on the 10 experiment surprise ratings (Rossing, 1978, p. 58).

Perceived value. The sum of ratings recorded by a subject on the 10 experiment value ratings (Rossing, 1978, p. 58).

Desire for knowledge. The sum of ratings recorded by a subject on the 10 experiment-desire for knowledge ratings (Rossing, 1978, p. 58).

Experiment surprise. "The mean of ratings recorded by all subjects on the surprise rating of a specific experiment account" (Rossing, 1978, p. 58).

Experiment value. "The mean of ratings recorded by all subjects on the perceived value rating of a specific experiment account" (Rossing, 1978, p. 58).

Experiment knowledge desire. "The mean of ratings recorded by all subjects on the desire for knowledge rating of a specific experiment account" (Rossing, 1978, p. 59).

Curiosity. "Rated desire for further knowledge about an experiment" (Rossing, 1978, p. 59).

Instrumentation

Self-Directed Learning Readiness Scale

Guglielmino's Self-Directed Learning Readiness Scale (SDLRS-A) was used to measure the variable self-directed learning readiness (Guglielmino, 1977/1978). The scale has 58 items with a Likert format and requires self-reporting.

Curiosity Materials

Rossing's (1978) curiosity materials were used to measure curiosity. Demographic and biographical data were collected with these materials.

Variables

Curiosity (desire for knowledge) and perceived value are the primary variables measured using Boyd Rossing's curiosity materials. Surprise, familiarity, and subject-matter interest were also used. The instrument was developed based on a Likert (continuous variable) Scale for measurement. This scale facilitates the use of statistical measurements.

The second variable is self-directed learning readiness measured by Guglielmino's Self-Directed Learning Readiness Scale (1977). Other variables of interest include levels of classification of the student in a nursing program, and academic achievement as measured by student grade point average (GPA). Demographic and biographical variables of age, sex, marital status and ethnicity are also examined.

Research Design

The research design of this study is a one time, static group. Correlational methods were used to determine if the variables of primary interest (value, desire for knowledge and self-directed learning readiness) are related. All of the variables were examined. The dependent variables included curiosity scores and SDLRS scores. The independent variables included the student classification in the baccalaureate nursing program and demographic information such as sex, marital status, and age. Pearson-moment correlation was used to test the three null hypotheses. Analysis of variance (ANOVA) and multivariate analysis of variance (MANOVA) were used to examine the

differences among levels. Pearson-moment correlation was used to examine the association of age, familiarity, surprise, interest, and GPA with perceived value, desire for knowledge, and self-directed learning readiness.

The SDLRS and the curiosity materials were varied in order by randomization to eliminate any carry over effects. Curiosity materials were varied in sequencing. Half of the materials had the reverse order of the experimental descriptions to control for fatigue in responses. The sequencing of surprise and perceived value ratings were also reversed to reduce the carry-over effects.

Population and Sample

The sample for the study consisted of nursing students enrolled in a baccalaureate nursing program. Upon successful completion of the program requirements, students are awarded a bachelor's in science in nursing degree. The nursing program is accredited by the National League of Nursing. The institutional setting is in a coeducational public comprehensive regional university in a south central state. The university is accredited by North Central Association of Colleges and Secondary Schools and has approximately 14,000 students. The university offers both undergraduate and graduate degrees and traditional curricula are used in the majority of the programs. The university is in a large metropolitan area that primarily serves nontraditional students with a minority of students residing on campus.

The sample is comprised of a heterogenous group of preprofessionals

with a blend of traditional and nontraditional baccalaureate nursing students. All students are enrolled in the nursing program's course work. Junior, senior, and senior/career ladder students met the admission GPA requirement of 2.5 points. Sophomore students met the newer program admission GPA requirement of 2.75 points. The nursing program values and encourages student self-direction.

This study includes different levels of nursing students in the nursing program. These different levels are thought to represent developmental and curriculum differences. Each level increase has the expectation that the student will become more self-directed in learning and strategies are included in the courses to promote self-directed learning. Strategies and methods such as reflective journals, student selected topics for scholarly and research paper, seminars directed by students, and clinical site selection are used in course work. In addition, computer assisted instruction is used in some courses.

Career ladder senior students have input for clinical site selection, clinical objectives, and preceptors. Faculty negotiate these items with career ladder students. The learner choices are designed to acknowledge the career ladder students' experience and advanced learning needs. The career ladder student has had experience in practice as either a registered nurse (RN) or a licensed practical nurse (LPN).

Clinical evaluation for the generic students is teacher-centered with limited input from the student. Some junior clinical faculty have students participate in self-evaluation of their clinical performance. One item on which

students are evaluated at the completion of each clinical course was on evidence of their self-direction in learning.

All students participate in the theory portion of courses in the curriculum at the school where the study is conducted. Theory sections of the courses use the traditional didactic approach. Course grades are based on a combination of theory and clinical scores. Theory grades are determined by performance on examinations and scholarly papers in some courses. Clinical grades are assigned by the clinical faculty with varying input from the student and/or preceptors.

A convenience sample and cross-sectional design is used in this study. Cross-sectional designs have the advantage of being practical and economical (Polit & Hungler, 1987), however, differences between groups may result from cohort differences rather than passage of time. This limits the ability to make causal conclusions.

All students enrolled in a nursing course in the 1997 spring semester were asked to volunteer for the study. All volunteers were asked to complete the research materials on their own time and return them within a week. A total of 201 nursing students were invited to participate. One problem anticipated was the unequal numbers in each group (54 sophomores, 76 juniors, and 71 seniors). According to Borg and Gall (1989, p. 240-241), an alpha of .05 should be reasonable with correlational studies with larger samples.

Data Collection Procedure

Sophomore, junior, and senior students were asked to volunteer at the end of a class period on March 31, 1997. Career ladder senior students were not required to attend class on that date, so these students were contacted by telephone, and arrangements were made to deliver the packets to them. Students were informed that the study was about adult learning. Confidentiality was emphasized. A very brief description of the materials was given. Students were told that agreement for participation would include permission to obtain their most recent GPA from university student records. Students were asked to accept a packet if they wished to participate, and a total of 181 students accepted research packets. Upon agreement to participate, students were requested to sign the consent form and complete the packet materials.

The biographical data sheet, Guglielmino's Self-Directed Learning Readiness Scale adult version (SDLRS-A), and Rossing's curiosity materials were distributed. Students were asked to take the materials home and complete them at a time when they would not be interrupted for approximately one hour. Students were asked to bring the completed materials to the classroom on April 7, 1997, or directly hand them to the researcher during office hours. Students were told to return their packets if they later chose not to participate. Students were offered the following for participation: (1) senior nursing students were awarded leadership points, and (2) all students were given pizza during their lunch break the day the materials were returned.

The majority of the completed packets were returned at the end of the first week ($\underline{N}$ = 131, 73.4%). This number seems to have been affected by a scheduled exam for the sophomore students during the class period the packets were to be returned. As a result, students were informed that packets would be accepted for another two weeks and the researcher would return to the classroom on a weekly basis to collect the completed packets. At the end of the third week, a total of 170 completed and usable packets had been returned. The overall response rate was 85% of the 201 students. The highest response rate was from the seniors (99%), followed by the juniors (79%), and then sophomores (74%). Grade point averages were added to each of the 170 completed subject's packets and individual scores were computed from the questionnaires to analyze the data with descriptive and inferential statistics.

CHAPTER IV

Presentation of Findings

Findings and discussion of the findings as they relate to the purpose of this study are presented in this chapter: examination of possible relationships between self-directed learning readiness and curiosity. The study is based on non-randomly selected students from a public regional comprehensive university. One hundred seventy subjects completed and returned two questionnaires: Guglielmino's Self-Directed Learning Readiness Scale (SDLRS-A) and Rossing's curiosity materials. A response rate of 85% was obtained. Individual scores were computed from the questionnaires and matched to their demographic and academic record data. Cumulative grade point averages were obtained from university academic records.

Categorical, ratio and interval data were analyzed with descriptive statistics. The null hypotheses were analyzed with inferential statistics. SYSTAT 6.0 for Windows (1996) was the statistical software program used for data analysis. Results of the data analyses and findings of this study are presented in the next section.

Findings

Findings are reported in this section under several headings in the following order: descriptive findings for categorical and non-categorical variables, additional descriptive findings, and hypotheses findings.

Descriptive Findings: Categorical Variables

Frequency distributions of the categorical variables are presented in

Table 1. There are many more females in the sample (86%) than males. The

great majority of the participants are Caucasian (89%), followed in frequency by

African American and Asian participants (4.7% each). Two Hispanics and one

Native American student participated in the study. Almost half of the participants

are single (50.6%), followed in frequency by married participants (38.8%), and

divorced participants (10.6%). The majority of the participants are classified in

the senior educational levels, followed by juniors and seniors. Career ladder

students enrolled in senior level classes are classified as senior students. Age of

the participants range from 19 to 55 years and almost half of the participants are

in the 19 to 25 year age group.

Descriptive Findings: Non-Categorical Variables

The descriptive statistics for the non-categorical variables in the total

sample are in Table 2. The descriptive statistics include number of cases,

minimum, maximum, median, mean, standard deviation, skewness and kurtosis.

Participant grade point averages range from 2.28 to 4.00 points on a 4.00

point system, with a mean and median of 3.19 points. Scores for familiarity

(possible range 1 to 4) with psychological experiments range from 1 to 4 points

with a mean of 2.75, a median of 3.00, and a standard deviation of 0.74. Scores

for subject-matter interest (possible range 1 to 9) in psychological experiments

range from 1 to 9 with a mean of 5.94, a median of 6.00, and a standard

Table 1

Categorical Variables Frequency Distribution

Categorical Variables		Subjects N = 170	%
Sex	Male	24	14.1
	Female	146	85.9
Ethnicity	Caucasian	151	88.8
	African American	8	4.7
	Native American	1	0.6
	Hispanic	2	1.2
	Asian	8	4.7
Marital Status	Single	86	50.6
	Married	66	38.8
	Divorced	18	10.6
Educational Level	Sophomore	40	23.5
	Junior	60	35.3
	Senior	70	41.2
Age	19-25	80	47.0
	26-35	57	34.0
	36-55	33	19.0

deviation of 1.75. These scores are higher than the midpoint of 5 and represent

a higher than average interest for this sample.

The three measures of curiosity: surprise, perceived value, and desire for

knowledge, each have a possible range in scores from 10 to 90. The mean score for surprise for all experiments is 46.54 with a median of 48, and a standard deviation of 12.74. Perceived value scores for all experiments range from 10 to 90 with a mean of 50.68, a median of 52.50, and a standard deviation of 16.37. Desire for knowledge scores range from 10 to 90 with a mean of 57.10, a median of 58, and a standard deviation of 14.22.

The SDLRS scores of the study participants range from 166 to 276 with a mean of 232.86, a median of 234, and a standard deviation of 20.92. Possible SDLRS scores range from 58 to 290. An outlier with the value of 166 was identified but was not removed because of the exploratory nature of the study. The lower hinge of the SDLRS boxplot is 218 and the upper hinge is 247.

Table 2

Descriptive Statistics for Non-Categorical Variables (N = 170)

Variables	Min.	Max.	Mdn	M	SD	Skewness	Kurtosis
Age	19.00	55.00	26.00	28.42	7.72	1.14	0.56
GPA	2.28	4.00	3.19	3.19	3.90	-0.03	-0.64
Familiar	1.00	4.00	3.00	2.75	0.74	0.16	-0.67
Interest	1.00	9.00	6.00	5.94	1.75	-0.44	-0.34
Surprise	22.00	79.00	48.00	46.54	12.74	0.19	-0.45
Value	10.00	90.00	52.50	50.68	16.37	-0.34	-0.43
Desire	10.00	90.00	58.00	57.10	14.22	-0.62	0.66
SDLRS	166.00	276.00	234.00	232.86	20.92	-0.17	-0.21

Additional Descriptive Findings

Further analyses were conducted to explore sample differences. T-tests were performed to compare sex and ethnicity to GPA, curiosity scores, and SDLRS scores. ANOVAs were performed comparing marital status and level of education to GPA, curiosity scores, and SDLRS scores. A MANOVA was performed to comparing level of education to SDLR and the curiosity measures of perceived value and desire for knowledge. The results are presented below.

T-tests for differences between the means were performed to compare age, SDLRS scores, curiosity scores, and GPAs of female participants to those of male participants. The results of the t-tests are reported in Table G1. Significant differences exist between sex and (a) age ($\underline{t}$ = 2.64, $\underline{p}$ = .009), and (b) familiarity with psychological experiments ($\underline{t}$ = 2.41, $\underline{p}$ = .017). Men are older ($\underline{M}$ = 32.3) than women ($\underline{M}$ = 27.8). Male participants reported being more familiar with psychological experiments ($\underline{M}$ = 3.1) than female participants ($\underline{M}$ = 2.7).

Ethnicity varies within the sample, however, the majority of participants are Caucasian. Other ethnic groups represented (in descending order of frequency) are African American, Asian, Hispanic and Native American. Based on the small numbers in some groups, the minority groups were combined for statistical analysis, thus there are two categories: Caucasian and minority. No significant differences exist between the ethnicity categories when t-tests were performed comparing age, SDLRS, curiosity scores, and GPA. T-test results are

reported in Table G2.

Analysis of variance tests were computed for marital status and the non-categorical variables, and results are in Table F. Findings are significant for two variables: age, $F_{(2, 167)} = 18.04$. $p = 0.00$; and GPA, $F_{(2, 167)} = 3.00$, $p = 0.05$. Single participants are younger ($M = 24.82$) than married participants ($M = 31.38$) and divorced participants ($M = 31.7$). Divorced participants have significantly higher ($p = .04$) GPAs ($M = 3.37$) than single participants ($M = 3.13$) as determined by the Tukey HSD post hoc method.

Career ladder students ($n = 11$) were combined with the senior level category for statistical analysis based on two rationales. The first rationale for combining the groups is based on results obtained when comparing the two groups by t-tests. No statistically significant differences for age, ethnicity, GPA, curiosity measure scores or SDLRS scores are found. These results are in Table G3. The second rationale for combining the groups is based on an interview conducted with the faculty member who is responsible for coordination and supervision of the career ladder students. The faculty member judged that the curriculum requirements of the career ladder students are more similar than dissimilar in the nursing program. For example, although the career ladder students have more choice than generic students in selecting clinical sites and scheduling clinical rotations, they are expected to meet the same course and program objectives.

Descriptive statistics by educational level are in Table 3. The descriptive

Table 3

Descriptive Statistics by Educational Level

Variables	Educational Level					
	Sophomore (n = 40)		Junior (n = 60)		Senior (n = 70)	
	M	SD	M	SD	M	SD
Age	26.80	7.08	28.40	7.85	29.37	7.90
GPA	3.26	0.42	3.17	0.34	3.18	0.40
Familiar	2.58	0.68	2.78	0.78	2.81	8.72
Interest	5.68	2.02	6.15	1.62	5.93	1.70
Surprise	46.68	13.95	47.73	12.88	46.25	11.96
Value	53.33	14.84	53.23	17.05	46.95	16.11
Desire	61.10	11.98	59.15	15.88	53.60	13.01
SDLRS	230.73	19.70	236.38	23.40	231.06	19.19

statistics include the number of cases, the means, and standard deviations. Mean age increases proportionately with the level of education. GPA is highest for the sophomore participants (M = 3.26) and lowest for the junior participants (M = 3.17). Familiarity with psychological experiments increases with the level of education. Subject-matter interest in psychological experiments is highest for the juniors (M = 6.15) and lowest for the sophomores (M = 5.68). Mean surprise ratings are slightly higher for the juniors (M = 47.73) and lower (M = 46.25) for the seniors. Perceived value scores and desire for additional knowledge scores

decrease with the level of education. The SDLRS scores are highest for the junior participants and lower for the senior and sophomore participants.

Analysis of variance (ANOVA) tests were performed comparing SDLRS scores and curiosity measures with level of education. Results are reported in Table 4. In addition, multivariate analysis of variance (MANOVA) was performed to determine interaction effects of the primary variables of interest: SDLRS scores, perceived value scores and desire for knowledge scores with level of education. The results are significant with a Wilks' Lambda F value of 0.924 (6,330), $p = .041$.

Results of the ANOVA tests reveal the existence of significant differences among the levels between two curiosity variables: desire for knowledge, $F_{(2,}$ 167) = 5.29, $p = .006$, and perceived value $F_{(2, 167)} = 3.11$, $p = .047$. Desire for knowledge scores are significantly lower for seniors than for sophomores (8 points, $p = .01$) and juniors (6 points, $p = .03$) as determined by Tukey's HSD multiple comparison post hoc method. Although senior participants score lower than sophomores and juniors for perceived value (6.34 vs. 6.25 points, respectively), Tukey's multiple comparison post hoc test revealed no significant differences to exist ($p = .07$ vs. $p = .19$, respectively) among the groups. The results of the hypotheses testing are presented next.

Table 4

ANOVA Tests: Grouped by Educational Level (N= 170)

Variable	Source	SS	DF	MM	F	p
Familiar	Level	1.72	2	0.86		
	Error	89.90	167	0.54	1.60	.20
Interest	Level	5.56	2	2.78		
	Error	512.73	167	3.07	0.91	.41
Surprise	Level	170.43	2	85.22		
	Error	27253.78	167	163.20	0.52	.59
Value	Level	1626.35	2	813.18		
	Error	43662.49	167	261.45	3.11	.10
Desire	Level	2036.28	2	1018.14		
	Error	32135.02	167	192.43	5.29	.00
SDLRS	Level	1154.68	2	577.34		
	Error	72787.93	167	435.86	1.32	.27

Inferential Statistics: Hypotheses

The data analysis for each null hypothesis are presented below. An alpha level of .05 was used for rejection of the null hypothesis. Results are shown in Table 5.

Hypothesis 1: There is no significant relationship between students' mean desire for knowledge score and students' mean SDLRS score.

The Pearson correlation statistic was used to determine the level of significance of the relationship in null hypothesis 1. A positive (r = .211) and significant (p = .006) correlation exists between students' desire for knowledge

scores and students' SDLRS scores. Consequently, rejection of the null

hypothesis suggests the alternate hypothesis that desire for knowledge is

positively associated with self-directed learning readiness.

Hypothesis 2: There is no significant relationship between students' mean

perceived value score and students' mean SDLRS score.

The Pearson correlation statistic was used to examine the level of

significance of the relationship in null hypothesis 2. A positive and significant ($r =$

.231, p = .002) correlation exists between students' perceived value scores. As a

result, rejection of the null hypothesis suggests the alternate hypothesis of a

positive relationship between perceived value and self-directed learning

readiness.

Hypothesis 3: There is no significant relationship between students' mean

perceived value score and students' mean desire for knowledge score.

The Pearson correlation statistic was used to determine the level of

significance of the relationship in null hypothesis 3. A positive (r = .605) and

significant (p = .0000) correlation was found to exist between students'

perceived value scores and students' desire for knowledge scores.

Consequently, rejection of null hypothesis suggests an alternate hypothesis:

perceived value is positively associated with self-directed learning readiness.

Table 5

Correlations of SDLRS, Desire for Knowledge, and Perceived Value

Variables	r	p
Desire & SDLRS	.211	.006
Value & SDLRS	.231	.002
Value & Desire	.605	.000

Additional Findings

Additional tests were computed for the following two reasons. First, given the nature of this exploratory study, multiple correlations and multiple regression analyses were performed for the variables of age, GPA, curiosity measures and self-directed learning readiness to examine potential relationships. Second, results reported in similar studies of curiosity in adults (Rossing, 1978; Camp et al., 1984) are compared and contrasted to further examine relationships of surprise, perceived value, and desire for further knowledge in adult learners.

Correlations

The main focus in this study is the association and differences among self-directed learning readiness, perceived value, and desire for knowledge, however, other variables were examined. The results of Pearson correlation statistics applied to the other variables are in Table 6. No outliers were identified using Hadi outlier identification detection method following the computations of

correlations. Statistically significant relationships existing among variables other than those examined in the tests of the three research hypotheses are presented below.

Table 6

<u>Correlation Matrix</u>

Variables	Age	GPA	Familiar	Interest	Surprise	Value	Desire	SDLRS
Age	1.00							
GPA	0.05	1.00						
Familiar	0.14	-0.05	1.00					
Interest	0.16*	0.14	0.31**	1.00				
Surprise	-0.18*	0.04	-0.16*	0.036	1.00			
Value	0.04	0.05	-0.01	0.32**	0.16*	1.00		
Desire	-0.03	0.06	-0.04	0.27**	0.31*	0.61**	1.00	
SDLRS	0.23**	0.16*	0.28**	0.33*	-0.12	0.23**	0.21**	1.00

** p < .01   * p < .05

Six statistically significant positive associations found among multiple variables and curiosity measures are as follows:

1. Subject-matter interest in psychological experiments and age are positively associated (r = .16, p = .04).

2. Subject-matter interest in psychological experiments and familiarity with psychological experiments are positively associated (r = .31, p = .00).

3. Subject-matter interest in psychological experiments and perceived

value of the experiments are positively associated (r = .32, p = .00).

4. Perceived value of the experiments and the surprise of the experiment accounts are positively associated (r = .16, p = .03).

5. Desire for knowledge and interest in psychological experiments are positively associated (r = .27, p = .00).

6. Desire for knowledge and surprisingness of the experiment accounts are positively correlated (r = .31, p = .00).

Two statistically significantly negative associations among multiple variables and curiosity measures are as follows:

1. Suprisingness of the experiment accounts is negatively associated with age (r = -.18, p = .02).

2. Suprisingness of the experiment accounts and the familiarity with psychological experiments are negatively associated (r = -.16, p = 04).

Although not significant, surprise is negatively associated with self-directed learning readiness (r = -.12, p = .11). Four statistically significant positive associations between self-directed learning readiness and other variables are as follows:

1. Self-directed learning readiness and age are positively associated (r = .23, p = .00).

2. Self-directed learning readiness and GPA are positively associated (r = .16, p = .04).

3. Self-directed learning readiness and familiarity with psychological

experiments are positively associated ($\underline{r}$ = .28, $\underline{p}$ = .00).

4. Self-directed learning readiness and interest in psychological experiments are positively associated ($\underline{r}$ = .33, $\underline{p}$ = .00).

Multiple Regression Analysis

The correlation matrix includes numerous significant zero order correlations among the study variables. To further explore the associations of the variables, multiple regression analyses were performed with desire for knowledge and SDLRS selected as dependent variables.

Stepwise forward multiple regression analysis was performed to examine the strength of the associations between the independent variables of age, GPA, subject-matter interest, familiarity, surprise, and perceived value on the dependent variable of desire for further knowledge. Results , shown in Table 7, indicate perceived value is the best predictor of desire for knowledge among the independent variables. Perceived value, thus, explains more than one-third of the variance in desire for knowledge. An increase in R^2 of .004 occurs when surprise is added to the equation. Perceived value, in combination with surprise explains approximately .4 of the variance in desire for knowledge. It is noteworthy that the variables that met the entry criteria are situational variables resulting from the stimulus materials. The trait variables of age, GPA, subject-matter interest as defined by Rossing, and familiarity failed to meet the entry criteria (alpha = .05) and were removed from the model. The overall model is highly significant as determined by the ANOVA test.

Table 7

Stepwise Multiple Regression of Independent Variables on

Desire for Knowledge (N = 170)

Variable	B	SE B	Beta	R	R^2	R^2 Increment
Constant	21.06	3.85	.00			
Value	0.50	0.05	.57	.605	.366	
Surprise	0.23	0.07	.21	.640	.409	.004

R = .64 R^2 = .41   adjusted R^2 = .40

$F(2,167)$ = 57.86, p = .00

Note. Forward stepwise with Alpha-to-enter = .05 and Alpha-to-remove = .05. Variables not meeting entry criteria: Age, GPA, Familiarity, Interest

A stepwise forward multiple regression analysis was performed to examine the influence between the independent variables of age, GPA, subject-matter interest, familiarity, surprise, perceived value, and desire for knowledge on the dependent variable, SDLRS. The results, shown in Table 8, indicate subject-matter interest as having the highest correlation (r = .333) with SDLR. Subject-matter interest alone explains 11 percent of the variance in SDLRS. Addition of familiarity, age and desire for knowledge increased the multiple regression coefficient (R) by .107, and the squared multiple R by .07. In combination with subject-matter interest, the three additional variables account for less than .20 of the variance in SDLRS. Familiarity, age and desire for

knowledge add little to the association other than the variance they share with

subject-matter interest. GPA, surprise, and perceived value did not meet the

entry criterion (alpha = .05) and were removed from the model.

Table 8

Stepwise Multiple Regression of Independent Variables on SDLRS (N = 170)

Variable	B	SE B	Beta	R	R²	R² Increment
Constant	175.73	9.62	.00			
Interest	2.37	0.93	.20	.333	.111	
Familiar	5.62	2.11	.20	.380	.144	.030
Age	0.46	0.19	.17	.412	.170	.026
Desire	0.25	0.11	.17	.443	.196	.026

R = .44   R² = .20   adjusted R² = .18

$F(4,165) = 10.08$, p = .00

Note. Forward stepwise with Alpha-to-enter = .05 and Alpha-to-remove = .05.
Variables not meeting entry criteria: GPA, Surprise, Value

Comparison of Curiosity Studies

The curiosity measures used in this study are primarily based on

Rossing's (1978) study. Examination of findings of this study with others

(Rossing, 1978; Camp et al., 1984) may contribute useful information for the

empirical knowledge of curiosity. This study is compared to Rossing's (1978)

study in two ways: (a) the methodologies are compared, (b) then the

relationships of surprise, perceived value, and desire for further knowledge are compared.

<u>Comparison of methodologies.</u>

The majority of the participants in both studies reported no difficulty in understanding the experiment accounts, however, fewer participants in this study reported difficulty than in Rossing's study (6.5% vs. 16%, respectively). Thirteen of the participants in this study reported difficulty with only one experiment, seven with 2 experiments and one with 3 experiments. Similar to Rossing's study, participants in this study reported the most difficulty with the sixth experiment ($\underline{n}$ = 9) and the seventh experiment ($\underline{n}$ = 5). Results are in Table H2.

Both groups of participants reported similar interruptions during completion of the materials. One-hundred-fifty-four (91%) of the participants in this study reported no interruptions (see Table H3) as compared to 90% in Rossing's study. Reasons for interruptions in order of frequency were reported as follows: materials were divided for completion at different times; phone rang; children needed attention; and a friend visited.

Seven participants (4%) in this study reported experiencing a distraction affecting the accuracy of answers during completion of the materials (see Table F3) compared to 5% in Rossing's study. Specific distractions reported in this study were: "timer going off," "difficulty in concentrating," "fatigue," "agitated with kids," "stressed about homework and activity," and a "friend was waiting." One

participant commented "after beginning rating scales part II, at first I answered

strongly for experiments I didn't understand or didn't make sense to learn more

details, then I changed my mind and would rather learn more about experiments

that I found useful or would expand my knowledge base." Numerical summaries

of the participants' responses are reported in Tables H1 and H2.

Relationships of surprise, perceived value, desire for knowledge.

Additional examination of the relationships of surprise, perceived value,

and desire for further knowledge in adult learners was achieved by comparing

and contrasting similar studies of curiosity in adults (Rossing, 1978; Camp et al.,

1984) with emphasis on Rossing's (1978) study.

Rossing's curiosity materials were used for this study because of the

strength of the design guided by Berlyne's theory of epistemic curiosity. Table 9

displays the individual mean scores for subject-matter interest, surprise,

perceived value and the desire for further knowledge for both studies. The mean

scores for perceived value and desire to know are higher in this study.

Mean scores for subject-matter interest in psychological experiments and

surprisingness of the experiment accounts are more similar, however.

Next, individual means and standard deviations for each of the 10

experiments and a mean rating for all 10 experiments were computed for the

variables of perceived value, surprise, and desire for additional knowledge. This

study is a replica of procedures followed by Rossing; results are in Table 10.

Table 9

Comparison of Individual Means and Standard Deviations for Curiosity
Measures

Variable	Rossing's Study (N = 79)		Present Study (N = 170)	
	M	SD	M	SD
Interest	5.95	1.60	5.94	1.75
Surprise	45.54	11.11	46.54	12.74
Value	47.34	13.12	50.68	16.37
Desire	55.53	13.80	57.10	14.25

Pearson product-moment correlations were computed, as they were in

other studies (Rossing, 1978, Camp et al., 1984), for each of the curiosity

measures to examine the relationships between experiment perceived value,

experiment surprise, and experiment desire for further knowledge. Key results

from the three studies are in Table 11. Findings are consistent among the three

studies in that correlations between perceived value and desire for further

knowledge are statistically significant, and no statistically significant correlations

between (a) surprise and perceived value, or (b) surprise and desire for

knowledge, are identified. The highest correlation coefficient between perceived

value and desire for further knowledge exists in this study. The following section

includes discussion of the findings in this study.

Table 10

Means and Standard Deviations of the Distributions of Surprise, Perceived

Value and Desire for Knowledge by Experiment

Experiment Number	Surprise		Value		Desire for Knowledge	
	M	**SD**	**M**	**SD**	**M**	**SD**
1	4.89	2.45	5.21	2.24	6.05	2.55
2	5.60	2.58	4.90	2.28	5.98	2.43
3	4.23	2.59	5.62	2.24	6.42	2.33
4	3.75	2.63	5.37	2.34	5.59	5.20
5	3.93	2.17	3.82	2.17	4.44	2.21
6	4.07	2.57	4.31	2.29	5.12	2.47
7	3.94	2.31	6.20	2.18	6.88	2.87
8	4.87	3.75	4.98	2.18	5.44	2.24
9	5.89	2.36	5.28	2.23	6.55	4.84
10	5.82	2.51	4.78	2.40	5.73	2.43
Avg **M**	4.70		5.05		5.82	
Avg **SD**		2.59		2.26		2.96

Table 11

A Comparison of Correlations of Experiment Surprise, Experiment Perceived

Value, and Experiment Desire for Knowledge

Correlated Variables	Rossing (1978) $\underline{N}$ = 79	Camp et al. (1984) $\underline{N}$ = 100	Present Study $\underline{N}$ = 170
Surprise and perceived value	r = .11	r = .09	r = -.04
Surprise and desire to know	r = .44	r = .21	r = .28
Perceived value and desire to know	r = .84**	r = .81**	r = .91**

**p < .01 $\underline{df}$ = 8

Discussion

Findings are discussed in the following pages under three headings: findings concerning the hypotheses; general discussion; and comparison of the findings of this inquiry with key aspects of Rossing's (1978) findings.

Discussion of Hypotheses

The purpose of this study is to determine the relationship between curiosity and self-directed learning readiness among adult learners. The three null hypotheses tested were found to be significant at the alpha level of .05 and they were, therefore, rejected. Thus, three alternative hypotheses are suggested:

1. Desire for knowledge is positively associated with self-directed learning readiness.

2. Perceived value is positively associated with self-directed learning readiness.

3. Perceived value is positively associated with desire for knowledge.

Levels of significance are high for the three hypotheses ($p < .01$). Correlation coefficients for the first two hypotheses are lower than for the third hypothesis. Desire for knowledge accounted for 4.5% of the variance in self-directed learning readiness. Perceived value accounted for 5.3% of the variance in self-directed learning readiness. Perceived value accounted for 36.6% of the variance in desire for knowledge. According to Ravid (1994), correlation coefficients of .20 to .50 represent a low to moderate relationship, correlation coefficients of .60 to .90 represent a moderate to substantial correlation. Presence of low correlation coefficients of curiosity measures and self-directed learning readiness suggest other variables yet to be identified in predicting SDLRS scores. Thus, curiosity scores are limited in usefulness for explanation or prediction of self-directed learning readiness.

These findings provide some help in understanding the relationship between curiosity and self-directed learning readiness in four to five percent of the cases. It would be difficult, however, to predict SDLRS scores by curiosity scores (perceived value and desire for knowledge) or the reverse. While the associations are statistically significant, an array of possible variables that

(a) either interact with curiosity and self-directed learning readiness, or (b) might improve the explanation of the relationship, remain.

Evidence suggests a stronger association between the curiosity measures of perceived value and the desire for further knowledge than the association between the same curiosity measures and self-directed learning readiness as measured by the SDLRS-A. This finding potentially exemplifies what Berlyne (1960) describes as extrinsic epistemic curiosity. Extrinsic epistemic curiosity represents the need for knowledge being motivated by reward values rather than intrinsic epistemic curiosity, or the satisfaction of knowledge for its own worth. Rewards are dependent on mechanisms such as: (a) social usefulness which may include prestige or being successful on a test, or (b) perceived usefulness of the knowledge in a practical sense for future problems. Duffy (1974) comments that both intrinsic and extrinsic motivations for knowledge can be present, and suggests that intrinsic epistemic curiosity provides the most meaningful learning. Descriptive and correlational findings are discussed in the following section.

General Discussion

Two types of findings concerning variables, descriptive and correlational, are discussed in this section. First, comparisons to different populations and a discussion of descriptive findings serves to provide more information of the sample in this study.

<u>Descriptive</u>

Demographic variables of sex, ethnicity, marital status, and GPA are

compared to other populations, then SDLRS scores are compared to other

samples. Although the great majority of this sample is female, this is not an

unexpected finding for students enrolled in nursing programs and represents a

homogeneous sample of the population. According to the Center for Research in

Nursing Education and Community Health report (1996) published by the

National League of Nursing (NLN), enrollments of men in baccalaureate nursing

programs in 1994 comprised a total of 12% in all regions and 10.1% for Midwest

regions. This study has a slightly higher percentage male students (14.1%)

compared to other regions. Similarity in this study's sample to other

baccalaureate nursing students at the national and state level provides

additional indication of homogeneity.

The blend of ethnicity of participants in this study is similar to the ethnicity

of students enrolled in baccalaureate nursing programs in the United States

(Center for Research in Nursing Education and Community Health, 1996).

Nationally, 88% of the students were White, followed by 5% Black, 3.3% Asian,

2% Hispanic, and 0.5% Native American. In Oklahoma, 80.5% of the students

were White, and approximately the same for other groups except for a higher

percentage of students being American Indian (7.5%).

The study's sample used represents a mixture of traditional and

nontraditional college students as demonstrated by age (53% > 26 years of

age), and marital status (49.4% married or divorced). Data for employment status and campus residency were not directly obtained. The university serves a large metropolitan area and traditionally has relatively few students residing on campus. The majority of the students in the nursing program are employed part-time in health care settings.

The mean and median undergraduate GPA is 3.19 points based on a 4.00 system. Minimum grade point criteria for admission to the program is 2.50 points and university requirements for graduation is 2.00 points. The mean GPA for this study is considerably higher than the 1996 fall semester GPA average (2.83 points) for all undergraduate students at the university setting (personal communication with Laura Tyree, coordinator of Institutional Research, May 21, 1998). The higher than average GPA possibly indicates that the majority of the students are extrinsically motivated and goal oriented in the nursing program.

The mean SDLRS score for this study is 232.86 and is higher than the meta-analytic SDLRS mean of 227.7 computed for a total of 4596 subjects by McCune, Guglielmino, and Garcia (1990). Comparisons to other nursing samples reveals this sample to be among the highest in SDLRS scores reported. Linares(1989) reported comparable SDLRS mean scores of 230 for generic students and 233.9 for RN students. Dixon (1991) reported a comparable SDLRS mean of 232.7 for registered nurses. Lower SDLRS mean scores of 225 (Davis & Pearson, 1996; Wiley, 1983) and 223.4 (Crook, 1985) were reported for other samples of undergraduate nursing students. Distinctly lower mean SDLRS

scores were reported by O'Kell (1988) as means ranged from 142.97 for third year students to 148.93 for first year nursing students. O'Kell did not reference scores to norms of other samples but did comment about the low SDLRS scores for her study's sample. O'Kell's study design was cross-sectional. The above comparisons provide evidence that this study's sample appears to possess above average self-directed learning readiness.

Level of education

A purpose of the study is to examine the association between level of education in a nursing program, curiosity, and self-directed learning readiness. The cross-sectional design of this study provides some useful information about the association among educational levels, self-directed learning readiness, and curiosity. Significant differences among the educational levels exist for desire for further knowledge, however, significant differences do not exist for self-directed learning readiness or perceived value. Although SDLRS scores decrease by 5.33 points from 236.38 to 231.06 from the junior to senior level, and increase by 5.66 points from the sophomore to junior level, differences by level of education and SDLRS scores are not significant as determined by the Tukey HSD post-hoc comparison (p = .32) method. The pattern of an increase in SDLRS scores followed by a decrease across a three year academic endeavor leads to three possibilities: (a) the group of junior subjects was already highly self-directed learners, (b) there is a program element in the junior year that promotes self-direction in the learner, or (c) the approaching conclusion of the degree program

has psychological effects that reduces or inhibits interest in self-directed learning. The cross-sectional nature of the inquiry limits the ability to make causal statements.

In comparison, O'Kell (1988), in a cross-sectional study, reported a decline in SDLRS scores across successive years of nursing education. O'Kell (1988) reported a statistically significant (p = .05) progressive decline in SDLRS scores of 6 points from first year nursing students to third year nursing students and attributed the decline to the traditional nursing education system that "trains out the qualities of independence in students" (p. 202).

A pattern of decline is revealed for years in the nursing program for the curiosity measures of perceived value and the desire for knowledge. A MANOVA revealed a significant interaction effect for SDLRS, perceived value, and desire for knowledge scores: Wilks' Lambda $F(6, 330)$ = 0.924, p = .041. Post-hoc analysis indicate that senior participants' scores for desire for further knowledge are significantly lower than the sophomore (8 points, p = .01) and junior (6 points, p = .03) participants. Although the mean scores for perceived value decrease by 6.38 points from the sophomore to senior level, post-hoc analysis revealed non-significant differences. Thus, this statistical evidence provides support to the notion that self-directed learning readiness may be influenced by program effects, and that schooling may negatively influence curiosity as evidenced by the statistically significant progressive decrease in desire for further knowledge scores. Limitations of this cross-sectional design, however,

interferes with drawing definitive conclusions concerning this developmental

relationship.

Descriptive and correlational findings for curiosity and SDLRS

The distribution of mean scores among the three sub-elements

comprising curiosity suggests some interesting possibilities. First, the mean

scores, from highest to lowest are 57.10 (desire for knowledge), 50.68

(perceived value) and 46.54 (surprisingness). Hence, the participants reported a

higher desire for knowledge score than for the surprisingness of the information

score in the materials used. This difference may be an accurate reflection of the

importance attributed to each of the elements in general, or the differences

merely may be a factor of content. The positive association between desire for

further knowledge and SDLRS is suggestive of a trait rather than a state

condition, however, the procedure and specific content complicate the nature of

the attribute. Similarly, a significant and positive correlation between perceived

value and SDLRS might suggest a trait of valuing information in general. Yet, in

this study, even though the correlation between perceived value and SDLR is

significant (r = .231, p = .002), the mean value of 50.68 may indicate that

perceived value may be associated with the information in the materials used in

the study. Therefore, it is possible attributes measured by high SDLRS scores

interact with, or support, the desire for further knowledge, and consequently

contribute to the highest correlation (r = .605) noted: value and desire for further

knowledge.

Surprisingness, the third sub-element of curiosity received the lowest

scores among the three (46.54). The relative low score for surprisingness may

be explained by the participants' familiarity (M = 2.75 of possible 4.00) and

limited interest (M = 5.94 of possible 9.00). Surprise and interest appear to

interact little, if at all, in contrast to the interaction of desire for knowledge and

value as shown in Table 7. Accordingly, it is likely that familiarity limits surprise,

and therefore fails to stimulate interest. This finding is in concert with Berlyne's

theory of epistemic curiosity and surprise. Surprise occurs when "a stimulus

inducing an expectation and a later stimulus that contradicts the expectation"

(Berlyne, 1960, p. 24). Hence, the richer the past experience with psychological

experiments, the less likely an individual is to be surprised by the incongruity of

the information. As this sample of nursing students report a relatively high level

of familiarity with psychological experiments, it is reasonable to explain the lower

rating of surprise based on prior knowledge. Indeed, the statistically significant

negative correlation of surprise and familiarity further supports this explanation.

The above indicates that curiosity, as examined in this study, is a complex

construct. The desire for knowledge, and sub-elements of surprisingness, and

value appear to represent two important but different psychological attributes:

state and trait. Desire for knowledge may be generally identified as a trait; value

may overlap with state and trait characteristics, and surprise most often may be

a state condition. Consequently, the associations of these sub-elements among

themselves and with other variables such as the SDLRS may not be stable.

Comparison to Rossing's Study

Part of his study is a replication of Rossing's study (1978) and includes operationalizing Berlyne's theory of epistemic curiosity to the rated strength of desire for further knowledge for ten psychological experiments. Comparisons of methodologies reveal no substantive differences in participants' reports of distractions or interruptions during completion of the curiosity materials. Fewer participants reported difficulty in understanding the experiment accounts in this study. The participants in both studies had difficulty in understanding the sixth and eight experiments.

Participants in this study have higher individual mean values for perceived value and desire for further knowledge (see Table 9). It is undetermined whether these differences are substantive or if they are different because of procedural differences. One could speculate that this difference could be associated with the variation in educational settings. The participants of this study may be motivated by more external rewards (i.e., grades and clinical performance) than Rossing's (1978) study participants who were enrolled in non-credit adult education courses or credit classes. Additionally, nursing students may be more likely to think that psychological experiments have an important relevance to nursing practice. Baccalaureate nursing students are required to complete a general psychology course for degree requirements, and may be more likely to have a greater knowledge about the subject area. In contrast, individual mean scores for subject-matter interest, and surprise were most

similar.

Camp et al. (1984) replicated Rossing's study design with a different sample of adult selected from a community setting. Experiment surprise, experiment perceived value, and experiment desire for knowledge were reported by Rossing (1978) and Camp et al. (1984). Comparisons of these two studies with this study are shown in Table 11. The highest correlation (r = .91) between experiment perceived value and experiment desire for knowledge is found in the present study. The mean scores for these variables are higher in this study. Therefore, it is possible that the differences suggest the subjects in this study are more extrinsically or goal motivated than was true for Rossing's or Camp's, . No significant correlations between experiment surprise and experiment perceived value or between experiment surprise and experiment desire for knowledge were found for these three studies. These comparative findings are consistent and provide additional support to the view that adult epistemic curiosity, or the intrinsic desire for knowledge, is more strongly influenced by perceived value or relevance of the information than curiosity evoked by surprise.

Summary of Findings

The main focus of this study is the association between self-directed learning readiness and curiosity. Three null hypotheses were tested and found to be significant at the .05 level and were therefore rejected. Based on the rejection of the null hypotheses, three alternate hypotheses are suggested:

(a) desire for knowledge is positively associated with SDLR, (b) perceived value is positively associated with SDLR; and (c) perceived value is positively associated with desire for knowledge. The first two hypothesis have low to moderate associations, therefore, these curiosity measures have limited usefulness for explaining or predicting SDLR or the reverse. A more moderate or substantial association exits between the curiosity measures of perceived value and desire for knowledge suggesting that curiosity is evoked by extrinsic motivations such as perceived value or personal relevance of the experiment accounts.

Several significant differences exist when marital status, ethnicity, and sex are examined with GPA, familiarity, subject-matter interest, surprise, perceived value, desire for knowledge, and SDLRS. No significant differences exist for ethnicity, however, the following differences are significant for marital status and sex: (a) divorced participants have higher GPAs than single participants; (b) single participants are younger than divorced or married participants; (c) male participants are older than female participants; and (d) male participants reported being more familiar with psychological experiments.

Patterns of scores with the different levels of education are found. Age and familiarity scores increase with the level of education in the nursing program, in contrast, perceived value and desire for further knowledge scores decrease. The only statistically significant difference, however, is the decrease

in desire for knowledge scores as senior participants scored lower than the sophomore and junior participants. This finding supports the notion that schooling may negatively effect curiosity, however, the cross-sectional design limits the ability to draw conclusions about developmental effects.

Moderate positive associations ($r > .20$) exist among (a) age, familiarity, subject-matter interest, perceived value, desire for knowledge, and SDLR; (b) familiarity and subject-matter interest; and (c) subject-matter interest, surprise, perceived value, and desire for knowledge. Subject-matter interest correlates the highest with SDLR and perceived value correlates highest with desire for further knowledge. Smaller significant correlations exist, however, they are not mentioned here for correlation coefficients less than .20.

Comparisons of methodologies and results of this study to others (Camp et al., 1984; Rossing, 1978) reveal similarities. Rossing's sample included adults enrolled in either classes for credit or non-credit courses, and Camp's sample included adults selected from the community independent of an adult education activity. Participant reports of difficulties with experiment accounts, completion of the materials, and interruptions are relatively similar between this study and Rossing's. Correlations between experiment perceived value and experiment desire for knowledge are strongly correlated among the three studies with the highest correlation in this study (.91, $p < .01$).

CHAPTER V

Summary, Conclusions, Implications, and Recommendations

<u>Summary</u>

Self-direction in learning and curiosity have been described in the literature as desirable characteristics of the adult learner. These characteristics are thought to contribute to success in the development of lifelong learning. A high degree of curiosity was one of eight characteristics of a highly self-directed learner identified by Guglielmino (1977/1978) based on results of her survey of experts. No research has been identified that has explored the relationship between self-directed learning readiness and curiosity.

The purpose of the study was to examine the relationship between curiosity and self-directed learning readiness in a sample of adult learners. Specifically, the study was designed to address two problems: (1) the association between self-directed learning readiness and curiosity; and (2) the association between nursing students' educational level and self-directed learning readiness and curiosity. Based on the review of the literature, it seems reasonable to assume that curiosity and self-directed learning readiness are related in some way.

This research is based on a cross-sectional design comprised of a convenience sample of students enrolled in a baccalaureate nursing program. The population was selected because of the importance of self-directed learning

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in the nursing profession. One hundred and seventy nursing students volunteered to participate in the study representing a response rate of 85%.

Data used in this study were obtained from two sources: (1) direct request from the subjects, and (2) the institution's academic records. Guglielmino's (1977/1978) Self-Directed Learning Readiness Scale (SDLRS-A) was used to measure readiness for self-directed learning and Rossing's (1978) curiosity materials were used to measure epistemic curiosity. Participants returned their completed SDLRS-A and curiosity questionnaires to the investigator and scores were computed. Institutional academic records were accessed for cumulative grade point averages. Demographic and biographical data for age, sex, marital status, ethnicity, and educational level were obtained from questionnaires completed by the subjects.

Pearson's Product Moment Correlation was used for hypothesis testing. Other statistical tools used in the data analysis were descriptive statistics, Pearson's Product Moment Correlation, multiple regression, t-tests, analysis of variance (ANOVA) with Tukey's HSD method, and multivariate analysis of variance (MANOVA). One hundred and seventy participants successfully completed and returned the SDLRS-A questionnaires, the curiosity materials, and the biographical and demographic questionnaires. Participants' SDLRS-A scores and curiosity scores were calculated, The three null hypotheses, were tested and rejected based on use an alpha level of .05.

Data analysis revealed that the respondents were predominately female,

single, and Caucasian. Participants' mean SDLRS score of 232.9 is higher than

the SDLRS score mean of 227.7 reported by McCune, Guglielmino, and Garcia

(1990) in their meta-analytic study. Compared to other nursing populations, the

SDLRS mean for this group is among the highest reported for other nursing

samples (Crook, 1985; Davis & Pearson, 1996; Dixon, 1991; Linares, 1989;

O'Kell, 1988). Therefore, this sample appears to have an above average

orientation towards self-directed learning. Additionally, curiosity measures of

surprise, perceived value and desire for knowledge are higher than those

reported by Rossing (1979) indicating, at a minimum, a sample of curious

learners.

Conclusions

This study investigated the relationship of curiosity and self-directed

learning readiness among a sample of baccalaureate nursing students. Three

important findings emerged based on data analysis of the three hypotheses: (a)

desire for knowledge is positively associated with self-directed learning

readiness, (b) perceived value and self-directed learning readiness are

positively associated, and (c) perceived value and desire for knowledge are

positively associated. These findings are highly significant but appear somewhat

complex and problematic because of the large percentage of the unexplained

variance between curiosity (desire for further knowledge) and SDLR.

Conceptually, desire for knowledge appears to be the best and most

useful definition for curiosity. If so, then this study has affirmed an association

between the two constructs and the relationship most likely represents a trait condition. The positive association between perceived value and SDLR possibly represents a trait of valuing information in general. It is possible that high SDLRS scores interact with the desire for further knowledge and contribute to the high correlation between perceived value and desire for knowledge.

Further data analysis, however, revealed a stronger positive association between subject-matter interest and SDLR. This finding leads to two possible explanations: (a) it is a spurious correlation, or (b) in this particular instance, the nature of psychological research may be of greater interest to a wide variety of participants. If interest represents intrinsic motivation to learn as suggested by some (Berlyne, 1960; Deci & Ryan, 1982; Duffy, 1974; Nenniger, 1992), then this finding is suggestive of a trait condition for two reasons: (a) participants rated their subject-matter interest prior to completing the research stimulus materials, and (b) specific interest may have a broader application. Findings include a positive association between subject-matter interest and familiarity with the content. Prior knowledge has been described as having a positive linear relationship with interest (Tobias, 1994). Surprise and interest appear to have little interaction compared to the interaction among perceived value, surprise and desire for knowledge.

Findings of this study include a pattern of decline in curiosity (desire for knowledge) among progressive educational levels within the nursing student sample. Although these findings suggest that schooling may have a negative

effect on curiosity, other explanations are possible, thereby making a definitive conclusion difficult. The progressive decrease in desire for knowledge may be explained by the (a) the timing of data collection occurring at the end of the school year and program completion for the seniors, or (b) the senior participants might be less curious in general independent of program influences.

The situational variables of surprise and perceived value were the best predictors of curiosity (desire for knowledge) about psychological research. Curiosity being evoked most strongly by perceived value is a common finding in other studies (Camp et al., 1984; Rossing, 1978) and lead to the conclusion that perceived value represents an extrinsic motivational component for the intrinsic need for knowledge, or curiosity. Other variables such as GPA, familiarity, and interest contributed little. Conceptually, subject-matter interest is likely to have played a larger role influencing perceived value and desire for knowledge, however, no measure of how interesting the stimulus materials were was obtained.

The impact of the interaction of variables such as age, educational level, interest, surprise, perceived value, and desire for knowledge indicate that it is difficult to predict self-directed learning readiness from curiosity without greater controls and a different design. Therefore, it is difficult to suggest definitive conclusions. Findings of this study, however, contribute to the empirical knowledge of these constructs. Findings from this study have generated several implications for practice.

Implications

Knowles (1975) wrote that as we face a world where rapid change is the constant characteristic, education cannot continue to be a system of merely transmitting knowledge that becomes obsolescent in a decade or less. Education must thus address the need to impart skills for inquiry and acquisition of new knowledge for the development of lifelong learning competence. Thus, the adult who becomes proactive and self-directed in the learning process tends to learn more with greater effectiveness and retention, and is able to find application for learning.

Tough's (1971) continued study of adult learning projects revealed that adults may engage in learning for a variety of reasons; many for practical reasons relating to the home or a job, or relating to obtaining a degree or certificate, but may also be motivated by curiosity and interest. Positive associations in this study between subject-matter interest and SDLR support Tough's research. It appears that interest and familiarity with content are associated. Therefore, other associations with the above variables, and variables such as age, surprise, value, and curiosity might lead to different relationships for a different sample and design.

If interest is an intrinsically motivating factor for self-directed learning, methods of assessing specific content areas of interest would have value in the design of future studies and might lead to other relationships of the variables. Rating interest prior to and following stimulus materials would offer more specific

data to analyze the influence of interest with SDLR and curiosity. Self-ratings of content familiarity might not reflect actual knowledge of a topic, therefore, ways to assess knowledge would be useful.

One assumption of andragogy (Knowles, 1978) is that a maturing adult's "readiness to learn is decreasingly the product of his biological development and academic pressure and is increasingly the product of the developmental tasks required for the performance of his evolving social roles" (p. 57). Therefore, based on this assumption, one can speculate that senior students (a) did not experience a greater need to know more about the psychological experiments and viewed the experiments as less valuable for practical application in their expanded clinical experiences, or (b) did not perceive a necessity to know the information for evaluative purposes. Timing of the data collection should be considered. Conducting the data collection during a time period such as the middle of the semester might lead to different results.

In conclusion, practical applications of this study's findings are many. Providing methods to assess, support and facilitate self-directed learning would be valuable in enhancing learning, particularly for the development of lifelong learning skills and competencies. Maw (1971) wrote that all motivation is internal or intrinsic and that there are external incentives such as external rewards or reinforcements. The curiosity materials (Rossing, 1978) provide a method to evaluate the relative strength of motivation to seek further knowledge. If the adult learner is primarily motivated to learn from perceived relevance and value

of information, then ways to promote relevance and value of learning subject-matter would be beneficial to learners. Although surprisingness did not contribute as strongly as perceived value to the desire for further knowledge, exploring ways to create conceptual conflict for the learner would be useful for some learners. Findings from this study have generated various recommendations for future research in adult education in the area of curiosity and self-directed learning.

<u>Recommendations for Future Research</u>

The results of this study contribute to the empirical knowledge of self-directed learning and the of role curiosity in adult learners. Subjects were assumed to have responded (a) to the best of their ability, and (b) honestly when completing the SDLRS-A and the curiosity materials. This study; did not , however, include any way to determine if the subjects would act on their desire for knowledge or their readiness for self-directed learning. Therefore, one recommendation for further research would be to develop a way to measure actual manifestations of these behaviors.

The findings of this study have limited generalizability based on the selection of (a) a convenience sample, (b) subjects enrolled in a baccalaureate nursing program, and (c) the cross-sectional design. Replication of the study including a randomized sample selection would strengthen the research as would selection of other professional groups for basis of comparisons. In order to study the effects of maturation or program effects, longitudinal studies are

recommended. Since the data collection was performed during the final weeks of the semester, earlier administration of the materials might control for any apathy or hastening of completion of the materials.

The results of this study are based on subject-specific psychological experiments and can only be interpreted with this in mind. Developing other curiosity stimulus materials more relevant to nursing practice might enhance the measurement of curiosity and relationships to self-directed learning readiness. Similarly, curiosity stimulus materials for other samples might be more individualized to areas of experience and interest. Inclusion of a panel of experts to evaluate stimulus materials would be helpful. Measurement of interest prior to and following administration of curiosity materials would add to the ability to judge differences between state and trait orientations. Addition of qualitative methods might possibly strengthen the study.

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APPENDIX

APPENDIX - A

Biographical Information Form

INTRODUCTION

Thank you for taking time to participate in this study. This research is being carried out to learn more about adult learners and their interests in different subject matter. The completed study will be submitted as a doctoral dissertation to the University of Oklahoma Graduate College.

At this time, please fill in the biographical information in the section below. The information you provide **will be treated confidentially** and will **only** be used for purposes of this study.

Name:_____Pin Number:_____

Sex:_____ Birth date:_____ Age:_____

Marital Status: Single ___Married ____ Divorced ___Separated ___

ETHNIC GROUP (Please check one):
Caucasian_____ African-American _____ Native American_____

Hispanic _____ Asian _____

WHAT LEVEL OF CLASSES IN THE NURSING PROGRAM ARE YOU CURRENTLY ENROLLED IN? (Please check one):

SOPHOMORE_____ JUNIOR_____ SENIOR_____

ARE YOU A CAREER LADDER STUDENT? YES _____ NO _____

NAME OF PRESENT CLASS ENROLLED IN:_____

In this study you will have an opportunity to read brief descriptions of several psychological research experiments. Some of you may know of such studies and others may know very little about this type of research. Please indicate below how familiar your are with reports of psychological research. (Circle the number that is true for you)

1	2	3	4	5
Know nothing of this area, never read or heard of a psych experiment	Have heard of psych experiments but know little about them	Have read or studied about a few psych experiments	Have read or studied about several psych experiments	Know many psych experiments in detail

Generally speaking if you were given an opportunity to read or find out about some psychological research experiments how interested would you be? (Circle the number that is true for you)

	1	2	3	4	5	6	7	8	9	
I have no interest in this area										I have a great interest in this area

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APPENDIX - B

Instructions to Participants

DO NOT OPEN UNTIL YOU HAVE READ THE INSTRUCTIONS BELOW

RESEARCH MATERIALS

Please do not open this envelope and remove the materials until you are prepared to fill them out. Set aside 30 minutes for each set (2) of materials when you can complete them without interruptions or disturbances. Please complete them in the same order they are found in the packet. Please complete all materials on your own without any assistance from anyone. They are very easy to complete so you will have no trouble doing them by yourself. After you begin filling out the materials, please do not discuss the study with anyone until you have completed all sections. These steps are all necessary to insure that this will be a valid study. Your care in following these procedures will be greatly appreciated.

When you open this envelope, you will notice that there are two sets of materials. Use the directions found with the SDLRS-A . The colored papers contain two separate sections inside. Please begin by reading Section 1 and do not look through either section until the instructions tell you to do so.

Instructions for Returning the Materials

When you have completed the materials, please place them in this envelope again. Then please bring the envelope to class one week from today, deliver it to me in person, or place it underneath my door in Room 131.

APPENDIX - C

Curiosity Materials

SECTION 1

EXPERIMENT DESCRIPTIONS

Instructions:

For this part of the study you will be asked to rate your reactions to descriptions of several psychology experiments. To insure valid results please follow the instructions carefully and answer one item at a time in the requested order. Do not go back and check earlier ratings on the same experiment. Simply give your honest reaction to each rating as you come to it. Also, please do not discuss your ratings with anyone until you have completed all of these materials. Your care in following these steps will contribute a great deal to the value of this study.

Directly following is an example of a psychological experiment description and the steps you are to follow in rating these experiments. Now please read through the example and then go to the beginning of Section 2.

Example of Experiment Description

People were asked to sit in front of a white screen and to imagine a picture of a banana being displayed on the screen. Then, without letting these people know he was doing it, the experimenter projected a very faint picture of a banana on the screen with a slide projector. Later the people were asked if they had imagined a picture of a banana on the screen and all said they had. None of them realized that there was a real picture of a banana on the screen.

Now please go to Section 2 and follow the instructions at the top on the page.

EXPERIMENT DESCRIPTIONS

Experiment 1

People were asked to give their opinion about which side of an issue they favored. They were then paid to write a paper defending the other side of the issue. Different ones were paid different amounts to write their paper. The amounts paid were either 50 cents, $1, $5, or $10. After writing the paper each person was asked again to give his real opinion on the issue. People who were paid the least (50 cents) had changed their opinion the most to agree with what they had written. Persons paid the most ($10) held most closely to the original opinion they held before writing the paper.

Experiment 2

One group of people was shown a list of 10 common words. They then tried to recite the list by heart. The list was shown again until they could repeat it from memory perfectly. A second group of people was repeatedly shown a list of 20 common words until they could recite it perfectly. A week later the two groups were asked to recall the words in their lists. The people who had learned the long list performed much better than the people who had learned the short list.

Experiment 3

Two groups of people were asked to find a way to put two rings on a peg from a position six feet away from the rings and the peg. They were told that they could use anything in the room they saw to solve the problem. There were two sticks in the room, but neither was long enough to reach the rings and peg. Included in the room when the first group did the problem was a piece of string hanging from a nail on the wall. When each person in this group had their turn they saw the string, took it down, tied the sticks together, and reached out with the tied sticks to lift the rings and place them on the peg. When persons in the second group did the problem the string on the wall was holding a mirror. The string was in clear view. 2 out of 3 of these people never thought to use the string and thus could not solve the problem.

Experiment 4

Intelligence tests were given to children in kindergarten, and grades one through five at the end of the school year. In September the researchers casually gave teachers the names of about 5 children in their class who could be expected to show unusual progress and intellectual advancement in the coming year according to test results. The teachers did not know that the names of these children had simply been picked out of a hat--the 5 children in each class had not been identified on the basis of their test results. At the end of the school year in May the intelligence tests were given again. Among 1st and 2nd grade children those students who had been pointed out to the teachers improved their test scores twice as much as other students their classes. In the higher grades there was only a slight difference in test scores between students pointed out to their teachers and other students in the class.

Experiment 5

People were asked to speak into a microphone connected to a tape recorder. The tape recorder played the person's words back to him through a pair of earphones while he was speaking. Before playing the speech back the tape recorder stored it for a fraction of a second so that there was a short delay between the time when the person spoke a word and the time when he heard it. People speaking into the tape recorder under these conditions began to falter and stutter in their speech. Some people had to stop speaking entirely.

Experiment 6

Several people were offered a choice between drawing once for a prize ticket from a box of 10 tickets or drawing 10 times from a box of 100 tickets. The ticket drawn each time was replaced before making the next draw. The mathematical odds of drawing the prize ticket were the same in both cases. Most of the people chose to make a single draw from a box of 10. Next they were offered the choice of making a single draw from a box of 10 tickets or of drawing 10 times from each of 10 separate boxes with 100 tickets in each box. Again each ticket drawn was replaced before making the next draw. Most of the people now chose to draw 10 times from each of the 10 boxes. Again the mathematical odds were the same in both cases.

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Experiment 7

Several small groups of people were shown a card with a line drawn on it. They were then shown a card with three lines drawn on it. One of the three lines was equal in length to the line on the first card, one was much shorter, and the other was much longer. The members of each group were then asked one at a time to say which of the three lines was the same length as the single line. The experimenter had secretly told everyone in each group except one person (the genuine person) to give a wrong answer. In each group the genuine person gave his answer after most of the false answers had been given. In one out of every three groups the genuine person gave the wrong answer agreed upon by the other members of the group. In the other groups the genuine person gave the correct answer.

Experiment 8

People were paid $20.00 a day to lay on a comfortable bed in a small lighted room 24 hours a day for as long as they cared to stay. They came out only for meals and toilet. They wore plastic visors which caused them to see only diffuse light. A U-shaped foam pillow limited their hearing and cotton gloves limited their sense of touch. After several days many of these people said they began seeing things that weren't there while they were in the isolation room. Then when they came out of isolation their performance on several simple tests involving word copying and recognition of symbols and patterns was worse than it had been before the experiment. Also after isolation several people said that objects appeared to be changing their size and shape and walls appeared to be curved.

Experiment 9

People were presented with arithmetic problems to solve in their mind without paper and pencil. The size of the pupils in their eyes was continuously measured by a series of photographs. The researchers found that as soon as the arithmetic problem was presented the size of the pupil began to increase. The pupil reached its largest size as the person came up with his solution. The researcher then asked for the answer. As the person told his solution the pupil began to decrease in size and returned to its original size.

Experiment 10

By recording brain-wave patterns, eye movements, pulse and respiration researchers studying dreaming have been able to determine with reliable consistency when a person is having a dream while sleeping. Using these procedures persons were awakened every time they started to dream to prevent them from dreaming all night. After each awakening they were allowed to go back to sleep. This procedure was carried out for three to seven consecutive nights for different persons. Each night the researchers found that these people started a greater number of dreams requiring a greater number of awakenings. In some cases the number of dreams begun on nights after the first night was three times greater than the number of dreams begun on the first night of dream deprivation.

* SECTION 2 *

RATING SCALES

PART I

Instructions:

You now have read the sample experiment description. The next step would be to rate the experiment on the two scales which are assigned to each experiment. You simply circle the number that reflects what is true for you in answer to the question on each scale. Please note how the sample rating are filled out on the experiment example below. Also as a practice exercise please circle the number that is true for you on these sample ratings.

Example of Rating

Sample Experiment Description

How surprising or unexpected do you find the results of this experiment?

1   2   3   4   5   6   7   8   9

Not surprising   Very surprising,
at all, just as   not at all as I
I would have   would have
expected   expected

How valuable or useful is the information in this experiment to you?

1   2   3   4   5   6   7   8   9

No value or   Very valuable
use to me   or useful to
                                        me

RATING SCALES

EXPERIMENT 1

How surprising or unexpected or hard to believe do you find the results of this experiment?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Not surprising
at all, just all
I would have
expected

Very surprising,
not at all as I
would have
expected

How valuable or useful is the information in this experience to you?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

No value or
use to me

Very valuable
or useful to me

EXPERIMENT 2

How surprising or unexpected or hard to believe do you find the results of this experiment?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Not surprising
at all, just all
I would have
expected

Very surprising,
not at all as I
would have
expected

How valuable or useful is the information in this experience to you?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

No value or
use to me

Very valuable
or useful to me

EXPERIMENT 3

How surprising or unexpected or hard to believe do you find the results of this experiment?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Not surprising
at all, just all
I would have
expected

Very surprising,
not at all as I
would have
expected

How valuable or useful is the information in this experience to you?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

No value or
use to me

Very valuable
or useful to me

EXPERIMENT 4

How surprising or unexpected or hard to believe do you find the results of this experiment?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Not surprising
at all, just all
I would have
expected

Very surprising,
not at all as I
would have
expected

How valuable or useful is the information in this experience to you?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

No value or
use to me

Very valuable
or useful to me

EXPERIMENT 5

How surprising or unexpected or hard to believe do you find the results of this experiment?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Not surprising
at all, just all
I would have
expected

Very surprising,
not at all as I
would have
expected

EXPERIMENT 5 (Continued)

How valuable or useful is the information in this experience to you?

    1   2   3   4   5   6   7   8   9
    No value or   Very valuable
    use to me   or useful to me

EXPERIMENT 6

How surprising or unexpected or hard to believe do you find the results of this experiment?

    1   2   3   4   5   6   7   8   9
    Not surprising   Very surprising,
    at all, just all   not at all as I
    I would have   would have
    expected   expected

How valuable or useful is the information in this experience to you?

    1   2   3   4   5   6   7   8   9
    No value or   Very valuable
    use to me   or useful to me

EXPERIMENT 7

How surprising or unexpected or hard to believe do you find the results of this experiment?

    1   2   3   4   5   6   7   8   9
    Not surprising   Very surprising,
    at all, just all   not at all as I
    I would have   would have
    expected   expected

How valuable or useful is the information in this experience to you?

    1   2   3   4   5   6   7   8   9
    No value or   Very valuable
    use to me   or useful to me

EXPERIMENT 8

How surprising or unexpected or hard to believe do you find the results of this experiment?

	1	2	3	4	5	6	7	8	9

Not surprising
at all, just all
I would have
expected

Very surprising,
not at all as I
would have
expected

How valuable or useful is the information in this experience to you?

	1	2	3	4	5	6	7	8	9

No value or
use to me

Very valuable
or useful to me

EXPERIMENT 9

How surprising or unexpected or hard to believe do you find the results of this experiment?

	1	2	3	4	5	6	7	8	9

Not surprising
at all, just all
I would have
expected

Very surprising,
not at all as I
would have
expected

How valuable or useful is the information in this experience to you?

	1	2	3	4	5	6	7	8	9

No value or
use to me

Very valuable
or useful to me

EXPERIMENT 10

How surprising or unexpected or hard to believe do you find the results of this experiment?

	1	2	3	4	5	6	7	8	9

Not surprising
at all, just all
I would have
expected

Very surprising,
not at all as I
would have
expected

How valuable or useful is the information in this experience to you?

	1	2	3	4	5	6	7	8	9

No value or
use to me

Very valuable
or useful to me

PART II

Instructions

This is the last rating scale you will be asked to complete. As you have read the experiment descriptions thus far, you may have felt a desire to know more about various ones. On this rating scale please reread the description of Experiment I and then rate the strength of your desire to know more about it on the first scale below. Simply circle the number that is true for you. Then follow the same steps with each of the remaining experiment descriptions. Please do not go back and review your ratings on the scales in Part I while you are completing the scales in this part. Please begin.

EXPERIMENT 1

How strongly would you like to know more about the details, explanation and/or conclusions of this experiment?

	1	2	3	4	5	6	7	8	9
	No desire							Very strong	
	at all							desire	

EXPERIMENT 2

How strongly would you like to know more about the details, explanation and/or conclusions of this experiment?

	1	2	3	4	5	6	7	8	9
	No desire							Very strong	
	at all							desire	

EXPERIMENT 3

How strongly would you like to know more about the details, explanation and/or conclusions of this experiment?

	1	2	3	4	5	6	7	8	9
	No desire							Very strong	
	at all							desire	

EXPERIMENT 4

How strongly would you like to know more about the details, explanation and/or conclusions of this experiment?

	1	2	3	4	5	6	7	8	9
	No desire							Very strong	
	at all							desire	

EXPERIMENT 5

How strongly would you like to know more about the details, explanation and/or conclusions of this experiment?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

No desire
at all

Very strong
desire

EXPERIMENT 6

How strongly would you like to know more about the details, explanation and/or conclusions of this experiment?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

No desire
at all

Very strong
desire

EXPERIMENT 7

How strongly would you like to know more about the details, explanation and/or conclusions of this experiment?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

No desire
at all

Very strong
desire

EXPERIMENT 8

How strongly would you like to know more about the details, explanation and/or conclusions of this experiment?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

No desire
at all

Very strong
desire

EXPERIMENT 9

How strongly would you like to know more about the details, explanation and/or conclusions of this experiment?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

No desire
at all

Very strong
desire

EXPERIMENT 10

How strongly would you like to know more about the details, explanation and/or conclusions of this experiment?

1	2	3	4	5	6	7	8	9
No desire at all								Very strong desire

You have now completed all ratings in this study. Please answer the questions below before returning the materials.

Were the descriptions of any of the experiments confusing or hard to understand?
Yes ___ **No** ___. If Yes, please describe the confusing parts.

Were you able to complete the materials in one uninterrupted session?
Yes ___ **No** ___ If no, please describe how you completed them.

Did anything happen while you were completing the materials which may have affected the accuracy of your answers?   **Yes** ___ **No** ___ If yes, please describe.

Thank you very much for participating in this part of the study. I hope you have enjoyed it. If you have any comments, please use the space below and on the back of this page.

To return these materials, please enclose them in the original envelope and follow the instructions for return of materials.

APPENDIX - D

Program Administer's Letter

CONSENT AND RELEASE FORM
UNIVERSITY OF CENTRAL OKLAHOMA
DEPARTMENT OF NURSING

Karen Barnes is conducting a doctoral study under the guidance of Dr. Huey B. Long or the University of Oklahoma College of Education. The title of the study is "Curiosity and Self-Directed Learning among a Sample of Nursing Students". This study will include the administration of two take-home questionnaires and the collection of demographic data. There is no experimental treatment in this study's design. There are no foreseeable risks or discomforts to participants in this study. Nursing students who have been accepted in the program or are enrolled in nursing courses will be asked to participate. The study will also require access to the University of Central Oklahoma academic records for grade point averages. All subjects will be required to complete a consent and release form before participating. Confidentiality will be strictly maintained by coding identification of the students, keeping data in locked files, no reporting of individual data, and destruction of questionnaires per IRB guidelines.

I have read the foregoing and understand and agree to its terms and conditions. I have identified no problems with the study described above.

_____*Pat LaGrow*_____   _____*3-5-97*_____
Dr. Pat LaGrow, Chairman   Date
UCO Department of Nursing

APPENDIX - E

Consent and Release Form

INDIVIDUAL CONSENT AND RELEASE FORM
RESEARCH CONDUCTED UNDER THE AUSPICES OF
THE UNIVERSITY OF OKLAHOMA, NORMAN CAMPUS

Karen L. Barnes is conducting a doctoral study under the guidance of Dr. Huey B. Long of the University of Oklahoma College of Education. This study will investigate the relationship between learning styles, academic measures of achievement, and demographic variables. In order to obtain measures of academic achievement, individual academic university records will be available to the researcher.

You are asked to complete the attached learning style questionnaires and allow Karen L. Barnes the use of academic and demographic data available from the files of the University of Central Oklahoma Nursing Department. The questionnaires are proven instruments that have been used in other research projects. Upon its return, along with this signed and dated consent form, the questionnaires will be scored and the findings statistically combined with academic and demographic data.

If you wish feedback from the questionnaires I will supply to you, within six weeks from receipt of the completed form, a report explaining your score and a description of the questionnaire. There is no other involvement asked of you. No foreseeable risk or discomfort to you is anticipated.

Your participation is voluntary, refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled, and you may discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled. Your response will remain completely confidential. Be assured that your name or identity will not be revealed. All responses will be statistically merged and only the combined results will be reported. Your questionnaire will be destroyed at the completion of the study. If you have further questions concerning this study you may contact Karen Barnes at (405) 341-2980 , extension 5186.

I have read the foregoing and understand and agree to its terms and conditions. I further release the University and its designees from any and all claims arising out of or in any way connected with the above granted uses and representations.

Signature   Date

**PLEASE SIGN, DATE, AND RETURN THIS FORM WITH COMPLETED
QUESTIONNAIRES (a copy will be made for you)
THANK YOU!**

APPENDIX - F

Analysis of Variance Table

Table F

ANOVA Tests - By Marital Status N = 170

Variable	Source	SS	DF	MM	F	p
Age	Level	1789.65	2	894.83	18.04	0.00
	Error	8281.86	167	49.59		
GPA	Level	0.86	2	0.43	3.00	0.05
	Error	24.14	167	0.15		
Familiar	Level	0.39	2	0.19	0.35	.070
	Error	91.24	167	0.55		
Interest	Level	3.48	2	1.74	0.56	0.57
	Error	514.81	167	3.08		
Surprise	Level	573.30	2	286.65	1.78	0.17
	Error	26850.91	167	160.78		
Value	Level	766.35	2	383.18	1.44	0.24
	Error	44522.49	167	266.60		
Desire	Level	146.06	2	73.03	0.36	0.70
	Error	34025.24	167	203.74		
SDLRS	Level	852.58	2	426.29	0.97	0.38
	Error	73090.04	167	437.67		

APPENDIX - G

T - Test Tables

Table G1

T-Test: Variables Grouped by Sex

Variable	t - Value	df	Probability (2 tail)
Age	2.637	168	0.009
GPA	-1.524	168	0.129
Familiar	2.405	168	0.017
Interest	0.572	168	0.568
Surprise	0.449	168	0.654
Value	-0.893	168	0.373
Desire	-1.546	168	0.124
SDLRS	0.508	168	0.612

Table G2

<u>T-Test: Variables Grouped by Ethnicity</u>

Variable	t - Value	<u>df</u>	Probability (2 tail)
Age	-0.913	168	0.363
GPA	0.210	168	0.834
Familiar	0.761	168	0.448
Interest	-1.285	168	0.200
Surprise	-1.161	168	0.247
Value	-1.478	168	0.141
Desire	-0.909	168	0.365
SDLRS	-0.228	168	0.820

Table G3

T-Test: Variables Grouped by Educational Level: Senior and Career Ladder

Variable	t - Value	df	Probability (2 tail)
Age	-0.742	68	0.461
GPA	0.780	68	0.438
Familiar	-0.401	68	0.690
Interest	0.366	68	0.716
Surprise	1.322	68	0.191
Value	-0.044	68	0.965
Desire	1.104	68	0.274
SDLRS	0.969	68	0.336

APPENDIX - H

Participants' Responses to Procedure

Table H1

<u>Data on Clarity of Accounts of Psychology Experiments</u>

	Subjects Reporting Difficulty Understanding Experiment Accounts			
	No Difficulty	Difficulty with 1 Experiment	Difficulty with 2 Experiments	Difficulty with 3 Experiments
Number of Subjects	159	13	7	1

Table H2

Experiments Reported as Confusing or Hard to Understand

Experiment Number

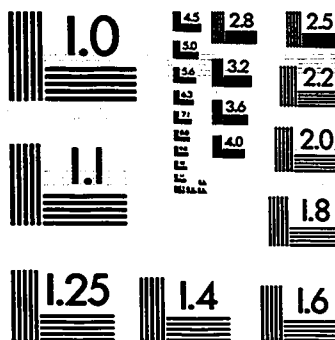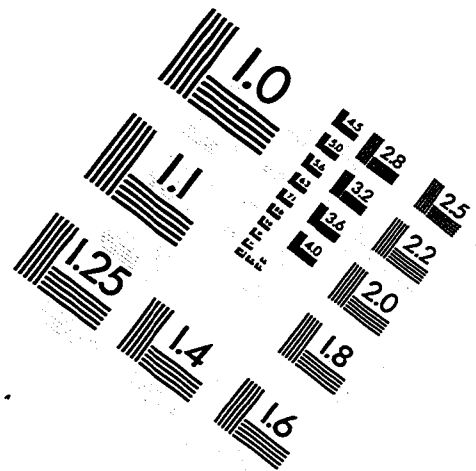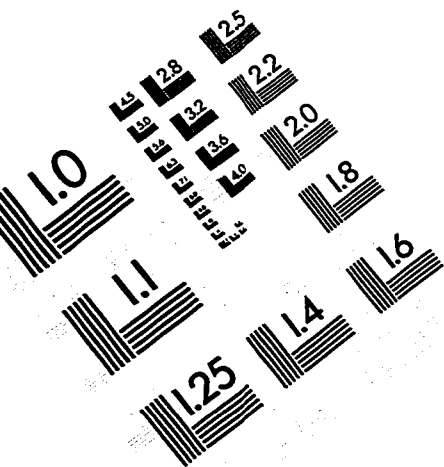|	1	2	3	4	5	6	7	8	9	10
Number of Subjects	3	0	2	2	2	9	5	1	1	2

Table H3

Data on Conditions During Self-Administration of Curiosity Materials

| | Interruptions During Completion of Materials | |
	No Interruptions	Some Interruptions
Number of Subjects	154	16

| | Distractions During Completion of Materials Affecting Accuracy of Answers | |
	No Distractions	Some Distractions
Number of Subjects	163	7

IMAGE EVALUATION
TEST TARGET (QA-3)

150mm

6"