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The *Journal of Vocational Education Research (JVER*) is published four times a year and is an official publication of the American Vocational Education Research Association *(AVERA)*. *AVERA* was organized in 1966 and strives to: (a) stimulate research and development activities related to vocational education, (b) stimulate the development of training programs designed to prepare persons for responsibilities in vocational education research, (c) foster a cooperative effort in research and development activities with the total program of vocational education, other areas of education and other disciplines, and (d) facilitate the dissemination of research findings and diffusion of knowledge.

The Journal of Vocational Education Research

EDITORIAL POLICY: The *Journal of Vocational Education Research* (*JVER*) publishes refereed articles that examine research and research-related topics in vocational education, preparation for work, and the workplace. The *JVER* Editorial Board is committed to publishing scholarly work that represents a variety of conceptual and methodological bases. Submission of manuscripts representing one of the following styles is encouraged: (a) empirically-based manuscripts that report results of original research, either quantitative or qualitative, (b) reviews or synthesis of empirical or theoretical literature, (c) essays derived from original historical or philosophical research, (d) reviews of recently published books, and (e) rejoinders to articles recently published in the *JVER*. Page costs are not typically assessed. However, if a manuscript is accepted, authors will be asked either to supply camera-ready tables and figures, or pay for the costs incurred in preparing complex tables and figures for publication.

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Journal of Vocational Education Research, Vol. 26, No. 1, pp. 1-3.

Editor's Notes

James R. Stone III
University of Minnesota

In this first issue of 2001, we have contributions from the immediate past president of the American Vocational Education Association (AVERA) and three sets of authors who bring international perspectives on postsecondary vocational education. These authors address three transcendent issues in career and technical education (CTE): the use of theory in research, persistence of students in postsecondary CTE, turnover and retention of postsecondary CTE faculty, and the formulation of adult career interests.

We begin with William Camp, immediate past president of AVERA, who discusses the kinds of theoretical frameworks provided in recent written and oral presentations of CTE research. He posits a three level framework for theory and suggests that most studies in CTE refer to theoretical frameworks at the level of substantive theory and argues against using the term "conceptual framework" in that context. A minimal expectation for a true theoretical framework would include a literature review that leads directly to and establishes a clear basis for the theoretical framework; a succinct and logical sequence of theoretical assumptions; a transparent connection between the theoretical framework and the purpose, objectives, questions, or setting of the study; and connecting the result of the study to the original theoretical framework. Camp concludes his musing on the current condition of CTE research by noting that the ultimate goal of researchers in CTE should be to relate our work to the larger community of research and theory. If we ignore establishing true conceptual frameworks in the name of expediency, we fail to meet our ultimate obligation as scholars.

In a different context, Chen and Thomas offer a study of persistence for students in Taiwanese technical colleges. The application of the persistence models developed in the United States were found to be useful in Taiwan to build models that can assist vocational educators to identify students who have a high likelihood of dropping out of technical schools. The set of variables, though not exactly mirroring those from studies in the U.S., adhere very closely. Of particular interest to American college leaders is the finding that the first and second semester GPAs significantly influence persistence, but participation in an academic remedial program does not. Also, students enrolled in occupational guidance programs have a higher probability of persistence than those who not so enrolled. These two findings raise important questions for those concerned with improving persistence in postsecondary CTE. There are gender effects as well. The authors found that male and female students leave college for different reasons (e.g., housing). Any program or policy, the authors argue, designed to increase student persistence should take gender differences into account.

Turnover and retention of technical college instructors in the United States is studied by Ruhland, a study that offers insight into a little examined aspect of professional development. She notes that high turnover coupled with expanded programming in two-year colleges is creating critical shortages of qualified technical instructors. Comparing technical college instructors who chose to stay with those who have chosen to leave, Ruhland found that those who stay in the profession are more committed to teaching but curiously, had a less positive first year teaching experience. Ruhland also provides a list of 15 reasons teachers cite for leaving. For those charged with recruiting and inducting postsecondary instructors, this list and her other findings will provide much to consider.

Athanasou and Cooksey investigate factors that influence adults' and older adolescents' interest in vocational education subjects in Australia. They examine 20 factors related to the

course, ability, difficulty, relevance or importance of a subject, teaching quality, student effort, career and vocational interests, and demographic factors. They conclude that personal judgments of vocational educational interest are based more on career interests than on contextual/situational or extraneous factors. This demonstrates the importance of individual differences in determining why people choose to pursue vocational learning.

As I begin my second year as editor of the *JVER*, I am cognizant of the important role a research journal can have in improving the profession. We have an important reminder from a noted CTE scholar about the importance of theoretical constructions in our research. This is a significant message to those of us who conduct research and nurture young researchers. We have research-based recommendations for two-year college leaders on how to improve practice as they work to keep students in the classroom learning and instructors in the classroom teaching. Finally, we have research to support our understanding of how students come to choose vocational course taking.

However, as interesting as these studies are, it is even more interesting that they represent researchers from three nations. This illustrates again the worldwide importance of career and technical education.

Journal of Vocational Education Research, Vol. 26, No. 1, pp. 4–25.

Formulating and Evaluating Theoretical Frameworks For Career and Technical Education Research

William G. Camp
Virginia Polytechnic Institute and State University

Abstract

Increasingly, reviewers for research journals and other venues for reporting research are demanding clearly articulated theoretical frameworks in manuscripts under consideration for publication or presentation. Yet, if one examines the articles published in the major journals in our field and attends the research sessions at the annual AVERA meetings, one must conclude that there is a general lack of agreement on what is meant by theoretical framework. The author examines the theoretical literature on the relationship between theory and research from the perspective of the researcher. He presents succinct examples from the career and technical education literature of theoretical frameworks at the level of grand theory, middle range theory, and substantive theory. He argues that an adequate theoretical framework for a research study can be built at any of those three levels. He contends that writers who present conceptual frameworks for their studies are actually referring to theoretical frameworks at the level of substantive theory and argues against using the term "conceptual framework" in that context. This article is based on the author's Presidential Address at the AVERA Annual Meeting in December 2000.

Kerlinger (1979) emphasized the importance of objectivity in science. He insisted "its (objectivity) implementation makes it possible for scientists to test their ideas apart from themselves" (pp. 8-9). In spite of attempts at objectivity, a re-

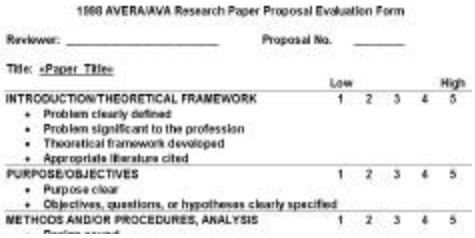
searcher's preconceptions and biases inevitably surface in the design of research and in the interpretation of results. Cohen (1956) noted "every enquirer must begin not with a *tabula rasa* for the recording of fresh facts, but with a fund of information. Discoveries in nature are not made by those who follow Bacon's precept and rid themselves of all anticipations of nature. The man who knows nothing about the subject may be free of bias but he will not discover anything. The facts of human nature do not stream into empty minds" (p. 170). Inevitably, the work of individual researchers will be guided by their own theoretical frameworks (Marriam, 1994).

Background

One of the most perplexing problems those of us who advise graduate students must continuously address is how to explain such esoteric concepts as the relationship between theory and research, theoretical frameworks, or as they are sometimes called conceptual frameworks. Moreover, as we prepare our own papers for presentation and manuscripts for review, establishing meaningful theoretical frameworks can be just as problematic. In general, a major stumbling block for many researchers in conceptualizing research is the development of an adequate theoretical framework for a study. Equally daunting is the problem of verbalizing the theoretical framework for the purposes of publication in the research literature.

The first section of the review form for papers considered for the annual meeting of the American Vocational Education Research Association (AVERA) is "INTRODUCTION/ THEORETICAL FRAMEWORK." Under that heading, a separate bulleted item is "theoretical framework developed." See the 1998 review form shown partially in Figure 1. No guidance is provided for reviewers as to what "theoretical framework" means. The AVERA *Journal of Vocational Education Research* review form includes a similar item. Yet no rubric or instruction is provided regarding how to evaluate that

item for either the paper session or journal reviewer.



1998 AVERA/AVA Research Paper Proposal Evaluation Form

Reviewer: _____ Proposal No. _____

Title: «Paper Title»

	Low				High
INTRODUCTION/THEORETICAL FRAMEWORK	1	2	3	4	5
• Problem clearly defined					
• Problem significant to the profession					
• Theoretical framework developed					
• Appropriate literature cited					
PURPOSE/OBJECTIVES	1	2	3	4	5
• Purpose clear					
• Objectives, questions, or hypotheses clearly specified					
METHODS AND/OR PROCEDURES, ANALYSIS	1	2	3	4	5

Figure 1. Portions of review form for AVERA research meeting paper proposals.

The *Journal of Agricultural Education* provides its reviewers with little more guidance. An instruction sheet for reviewers accompanying each manuscript includes the following four questions:

1. What is the research base for the manuscript?
2. Does the theory lead to the problem, purpose and/or objectives, and the proposed solution?
3. Is appropriate literature cited?
4. Was a theoretical framework built? (J. Kotrlik, personal communication, December 1, 2000).

Problem and Purpose

The conceptualization, conduct, and publication of research require a clear understanding of the notion of theoretical frameworks. The review process for the research meetings and journals in career and technical education specifically require the evaluation of the theoretical framework of each manuscript considered. Yet, the guidance provided to our researchers, graduate students, and manuscript reviewers regarding theoreti-

cal frameworks is, at worst missing altogether, and at best negligible.

The purpose of this paper is to examine the concepts of theory and theoretical frameworks as they relate to research in career and technical education. To that end, let us consider the following general questions:

- What is theory?
- What is the relationship of theory and research?
- What do we mean by theoretical framework for research?
- How do we formulate a theoretical framework for a study?
- How can we evaluate the adequacy of a theoretical framework for research?

What is Theory?

Certainly, such a question may seem almost trivial among members of the research community; nevertheless, it is still worth exploring. Indeed, the answer to that question is, as I often say to graduate students, "It all depends." In this case, the definition of theory depends on the researcher's conceptual paradigm.

Basic Premises

Creswell (1994) posited that theories could be grouped into three types based on the degree of the theory's generality or specificity. **Grand theories** are used to explain major categories of phenomena and are more common in the natural sciences. **Middle-range** theories fall somewhere between the working hypotheses of everyday life and grand theories. **Substantive theories** offer explanations in a restricted setting and are limited in scope, often being expressed as propositions or hypotheses.

Ary, Jacobs, and Razavieh (1990) posited that a theory

must meet four criteria. First, it must add to our understanding of observed phenomena by explaining them in the simplest form possible. They refer to this characteristic as the *principle of parsimony*. It should fit cleanly with observed facts and with established principles. It should be inherently testable and verifiable. Finally, it should imply further investigations and predict new discoveries.

Creswell's ordering of theory based on its degree of generality or specificity will be very important later in this paper as we discuss formulating theoretical frameworks and as we examine the efficacy of the conceptual framework as a substitute for the theoretical framework. Ary, Jacobs, and Razavieh's criteria will form much of the basis for the discussion on evaluating theoretical frameworks later in this paper.

Quantitative Perspective: Theory is a Specification of Relationships

Kerlinger (1979) provided a perspective of "theory" appropriate for a quantitative researcher. He defined theory as "a set of interrelated constructs (variables), definitions, and propositions that present a systematic view of phenomena by specifying relations among variables, with the purpose of explaining natural phenomena" (p. 64). Ary et al. (1990) described theory derived in this manner as a model that is built upon a "conceptual analog, generally of a physical or mathematical nature, which is used to suggest empirical research" (p. 16).

Creswell (1994) elaborated on Kerlinger's definition by noting that the relationships among variables are typically stated in terms of magnitude and direction. He called this a systematic view of theory. He used the metaphor of a rainbow to explain this meaning of theory, explaining that theory provides a bridge between the independent and dependent variables or constructs at any given study. The bridge ties together the variables, thus providing an "overarching explanation for how and why one would expect the independent variable to explain or predict the dependent variable" (pp. 82-83).

We might visualize this concept of theory as a path diagram where one or more variables impact upon one or more subsequent variables, perhaps in a complex temporal sequence. See Figure 2 for an illustration of a quantitative theory.

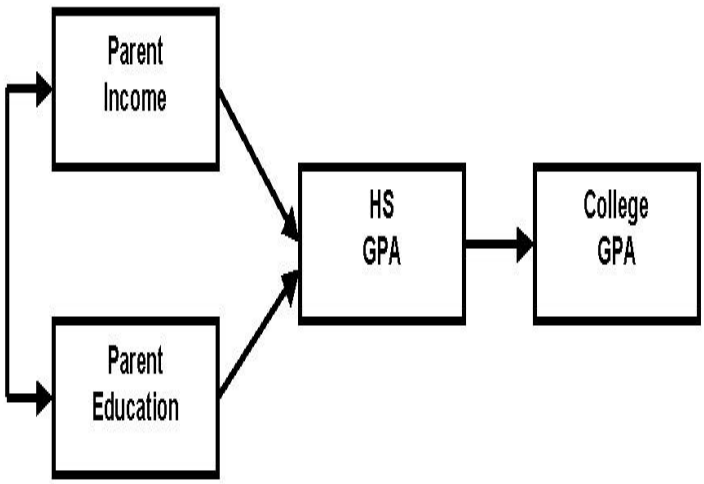


Figure 2. Graphic illustration of a quantitative theory.

In this illustration, a researcher might find support in the literature to hypothesize that a student's performance in college is predicted by his or her performance in high school. Performance in high school is predicted by parental income and education. This would be what Creswell calls a substantive theory.

Qualitative Perspective: Theory is an Explanation of Reality

Marriam (1998) approached the definition of theory from an operational perspective as a qualitative researcher. She wrote, "Thinking about data -*theorizing*- is a step toward developing a theory that explains some aspect of educational practice

and allows a researcher to draw inferences about future activity. Theorizing is defined as *'the cognitive process of discovering or manipulating abstract categories and the relationships among those categories'*" (p. 188). According to this perspective, theory is seen as a result of inductive contemplation of observations made within the holistic context of naturalistic inquiry. Although she fails to provide a literal definition of theory, *per se*, she operationally describes theory as hypotheses that suggest links among categories and properties derived from the analysis of qualitative data.

Ary, Jacobs, and Razavieh (1990) described this approach to theory as inductive, and explained that in this form of theory building, mathematical or analog models are inappropriate because they would necessarily bias the researcher's data collection and analysis. Perhaps a graphic illustration of a theory in a qualitative research study might be useful here as well. See Figure 3.

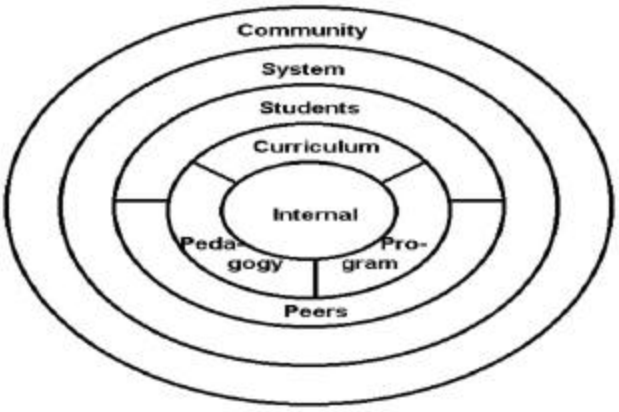


Figure 3. Graphic illustration of a qualitative theory as it emerged from a qualitative study. The Teacher Proximity Continuum (Camp, Heath-Camp, 1990).

This is an example of a theoretical explanation offered by a team of researchers who had examined the induction process of beginning career and technical teachers. After analyzing the qualitative data, they theorized that influences on the beginning teacher can be characterized based on the conceptual proximity to the teacher, beginning within the teacher in the form of internal factors and ranging outward to the educational system and finally to the community as a whole (Camp & Heath-Camp, 1990).

Theory Defined: A Compromise

What then is theory? As a researcher with both qualitative and quantitative leanings, I like to start with Kerlinger's reductionist definition, but expand it to allow for naturalistic inquiry. Using the approach of compromise, we might define theory as *a set of interrelated constructs, definitions, and propositions that present a rational view of phenomena by explaining or predicting relationships among those elements*. For the purposes of this definition, the word rational is used to mean either mathematical/analog relationships or conceptual/holistic relationships. The joint functions of explaining or predicting can thus be viewed in either a mathematical or conceptual sense. Using this approach, theory may result from direct observation and measurement of variables or may arise from a contextual examination of the data itself. Moreover, such a broad definition allows theory either to precede and inform research or to emerge from and explain observations.

Role of Theory in Research

Kerlinger (1979) also addressed the relationship between theory and research quite clearly. According to him, "*The purpose of science is theory*" (p. 15). His implication was that the fundamental purpose of science, and by extension, the fundamental purpose of research, is to create theoretical explanations of reality. Conversely, Marriam (1998) described theory as

providing the conceptual basis for all research. Citing Becker (1993), Marriam noted, "We couldn't work at all if we didn't have at least an implicit theory of knowledge. We wouldn't know where to start" (p. 45). Thus, we can infer a symbiotic relationship between theory and research. Theory provides context without which the research could not be meaningful and research generates and tests theory without which the theory would not have meaning. The two, theory and research, are each the *sine qua non* of the other.

Quantitative Perspective: Theory Guides Research; Research Leads to Theory

Best and Kahn (1993), whose definition of theory mirrors Kerlinger's, explained that the role of theory is to establish a "cause and effect relationship between variables with the purpose of explaining and predicting phenomena" (p. 9).

Creswell (1994) wrote that quantitative research involves "an inquiry into a social or human problem, based on testing a theory composed of variables, measured with numbers, and analyzed with statistical procedures, in order to determine whether the predictive generalizations of the theory hold true" (p. 2). Using this positivistic approach, researchers generate hypotheses as a means of prescribing methodology and analysis. Best and Kahn (1993) defined hypothesis as an "a formal affirmative statement predicting a single research outcome, a tentative explanation of the relationships between two or more variables" (p.11). This presumes a mathematical relationship among variables and provides that the ultimate goal of the research is to determine whether the hypothesis is supported by the data.

A graphic illustration of the role of theory in the quantitative research process might be helpful at this point. This illustration should show clearly that in quantitative research the theory is the starting point as well as the ending point. See figure 4.

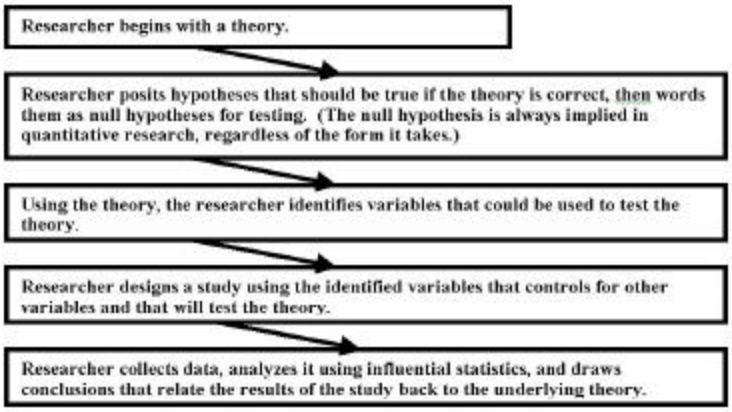


Figure 4. Graphic illustration of the role of theory as both the starting and ending point in quantitative research.

Qualitative Perspective: Theory Emerges from Research

Marriam (1998) described theory as growing from speculation of qualitative data and of value in research only as it provides theoretically grounded explanations of phenomena observed in a holistic context. From this perspective, theory is seen as providing explanation, not in a mathematical sense or as an analog model intended to predict future results, but rather in a contextual sense. Thus, explanation and prediction are viewed from a conceptual perspective. One would never derive an R^2 from such theory.

Using a naturalistic approach, researchers may generate hypotheses, but as Marshall and Rossman (1989) explained, in this setting hypotheses are not tested; rather they are used to guide the development of questions to be asked and patterns for which to search. Marriam (1998) explained that in qualitative research, hypotheses are always tentative and are developed through use of a constant comparative analysis of data. Hypotheses emerge, according to her, simultaneously with the collection and analysis of data, rather than being stated in advance

of data collection as occurs in quantitative research. For a graphic illustration of how theory emerges from qualitative research, see Figure 5.

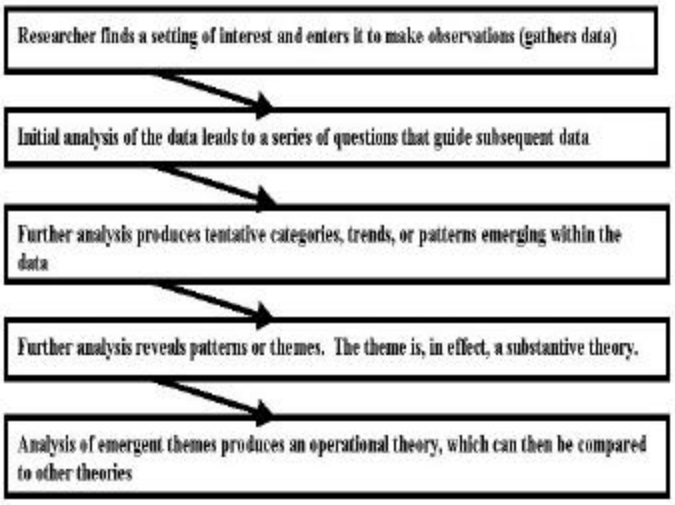


Figure 5. Conceptual role of theory in the process of qualitative research.

Role of Theory in Research: Another Compromise

Again, let us attempt to reconcile these two seemingly disparate positions. We can probably all agree that the purpose of science is indeed the development of theory; however, one can argue that the theory does not necessarily have to be in the form of an analog model, that the explanation need not be linear or mathematical, that the explanation need not be in terms of an R^2, and that prediction need not be based on the use of a formula. In a quantitative perspective, theory guides research and research tests and confirms theory, in a symbiotic relationship. In qualitative research, theory emerges from research and offers explanations of reality, in a constructivist sense.

Combining the best of both perspectives, we might posit that the role of theory in research is *to provide for the rational explanation of the interrelationships among constructs, definitions, and propositions and for the explanation of present conditions or prediction of future conditions in natural phenomena*. As in the previous section, allow me to define rational, explanation, and prediction rather loosely. Just as critically, by this definition, theory can either precede research, derive from it, or both.

What is a Theoretical Framework?

Having addressed the definition of theory and explored its role in both qualitative and quantitative research, let us consider the next important question. What is a theoretical framework? Again, the answer to be found in the literature depends somewhat on the conceptual paradigm of the researcher.

Theoretical Framework: A Quantitative Perspective

Ary, Jacobs, and Razavieh (1990) noted that, "Education in particular has suffered from an absence of theoretical orientations; the main emphasis has been upon empiricism. Educators have been criticized for their continued concern with 'getting the facts' rather than finding out the 'why'" (p. 19). They explained that, in its early development, a science must first gather facts through empiricism. They went on to say, "Only with maturity does science begin to integrate the isolated knowledge into a theoretical framework" (p. 19).

In an effort to clarify the role of the theoretical framework for the practice of research in our field, members of the American Vocational Education Research Association (AVERA), acting as the Vocational Education Special Interest Group (SIG) of the American Educational Research Association (AERA) convened a *Symposium on the Theoretical/Conceptual Framework in Vocational Education Research* in conjunction with AERA's annual meeting in 1986. At that symposium, Warmbrod (1986)

expanded on the definitions of theory put forth by Gage (1962) and Kerlinger (1979) to explain the concept of the theoretical framework as it relates to research in career and technical education. Warmbrod wrote, "I am assuming that we agree that a theoretical/conceptual framework can be defined as a systematic ordering of ideas about the phenomena being investigated or as a systematic account of the relations among a set of variables" (p. 2). Warmbrod advised researchers in our field to emphasize the theoretical/conceptual framework in research as a means of focusing design and analysis procedures as well as to provide "structure and meaning to the interpretation of findings" (p. 4).

According to Creswell (1994), the researcher examines the discipline-based literature related to the study topic as well as related studies in the research literature. From those sources, the researcher attempts to identify an overarching theory that "explains the central hypothesis or research question in the study" (p. 90). Guiding that process, Creswell suggested the use of a "rainbow question" (p. 90), seeking an understanding of why the independent variable(s) should be expected to affect the dependent variable(s). I strongly recommend that interested readers see Chapter 6 in Creswell's book for a lengthier discussion on this topic.

Theoretical Framework: A Qualitative Perspective

From a qualitative perspective, Marriam (1998) posited, "it would be difficult to imagine a study *without* a theoretical or (a term that can be used interchangeably) conceptual framework" (p. 45). In a manner befitting a qualitative researcher, she provided her concept of theoretical framework by explaining and giving examples, rather than by specifying a succinct definition. She held that the theoretical framework of a study is really the researcher's pre-conceived conceptual perspective. The researcher's disciplinary orientation leads to the topics that will be studied and the questions that will be asked. It is the "lens through which [the researcher] view[s] the world" (p. 45).

In the same regard, Marshall and Rossman (1989) used the term “theoretical frame” (p. 24). According to those authors, the theoretical frame provides the conceptual grounding of a study. The theoretical frame is built on a combination of tacit (experience-based) theory and formal (literature-based) theory and serves to inform the researcher's assumptions and guide his or her questions about the research setting.

Theoretical Framework: Yet Another Compromise

The exact term "theoretical framework" does not appear often or prominently in research methods texts. Creswell (1994) devoted his entire first chapter to the discussion of frameworks for research studies, but he used the term framework in a global sense, describing the framework of a study as dependent on the researcher's worldview and culminating in a selection of either the qualitative or the quantitative paradigm, using the term theoretical perspective to mean the same thing that Warmbrod referred to as “theoretical/conceptual framework” (p. 1). Ary, Jacobs, and Razavieh (1990) relegated the term "theoretical framework" (p. 87) to a single mention buried within a paragraph, describing the broader concept of theoretical perspective.

We might call it theory, theoretical perspective, theoretical frame, theoretical framework, conceptual framework, or theoretical/conceptual framework. Regardless of semantics, the researcher attempts to identify a theory or several closely related theories from the literature to form the conceptual point of departure for the study. The research hypotheses would then be derived deductively from that theory, almost in the form of "if-then" statements, beginning with the theory as the basic premise of the study. The results of the study would provide a test of the accuracy of the premise and its derived hypotheses in the new context, thus either expanding the scope of the theory or refuting its efficacy in the new context.

How can we understand the concept of theoretical frame-

work so that both perspectives are respected? First we defined theory as *a set of interrelated constructs, definitions, and propositions that present a rational view of phenomena by explaining or predicting relationships among those elements.* Then we described the role of theory in research as *to provide for the rational explanation of the interrelationships among constructs, definitions, and propositions and the explanation of present conditions or prediction of future outcomes in natural phenomena.*

Those premises lead to yet another definition. A theoretical framework might be defined *as a set of theoretical assumptions that explain the relationships among a set of phenomena.*

Conclusions

Conceptual Frameworks?

Given all of the preceding discussion, what should we make of the term "conceptual framework?" In reality, the theoretical literature is ambivalent on the use of the term conceptual framework. When a writer chooses to use the term "conceptual framework" in discussing a particular study, the implication appears to be that the researcher cannot find a "Grand Theory," or at the very least a middle-range theory that has been published in a respected source, on which to base the study. The implication seems to be that the assumptions underlying the research must be no more than a conceptual framework, and by extension are at a lower level of sophistication than is required of a "theoretical framework." Yet, if the conceptual framework begins with a supportable premise and then extends that premise through a logical path of reported research and clear reasoning to form the basis for the study, then it is in fact a substantive theory, and should rightly be called a theoretical framework. If, on the other hand, the conceptual framework is not based on a supportable premise or was not extended in a rational, research-supported way to form the basis of the research, then the study does not have a good conceptual framework, and by extension

does not have a solid theoretical framework.

What then does this line of reasoning mean? If a study cannot trace its roots to a grand theory or to a middle level theory published in a reputable source, but it has a legitimate, clean, rational framework then it is based on a substantive theory. If it does not, then the study badly needs to be reconceptualized before it should be judged to be publishable in the research literature. The writer of research should be expected to establish a theoretical framework for any study, even if that framework is only at the level of substantive theory. Using that logic, a conceptual framework that does not rise to the level of a theoretical framework, at least at the level of substantive theory, is not an adequate foundation for a piece of research that is being considered for a scholarly journal or session.

Formulating a Theoretical Framework

Merely citing theoretical concepts, which may or may not relate to the study at hand, is not the same thing as "formulating a theoretical framework." To formulate a theoretical framework, the writer must first identify and summarize a set of theoretical assumptions that explain the relationships among the phenomena being studied. Just as importantly, he or she must then build conceptual linkages showing how the theoretical assumptions lead directly to the purpose, objectives, and/or questions of the study.

Hold in mind that theoretical assumptions can be at the level of the Grand Theory, Middle-Range Theory, or Substantive Theory. The higher up that continuum one can go, the better; but many meaningful studies simply are not based on generally accepted grand theories or even middle-range theories. Let me give three examples that might clarify how to formulate a theoretical framework beginning at each of these three levels.

Grand theory. In his dissertation, Dobbins (1999) intended to identify essential clinical experiences that should be provided for future teachers of agricultural education during their preser-

vice educational programs. He started with the grand theory of behavioral science. He showed how behavioral science leads directly to the middle-level theory of mastery learning. He contended that the precepts of mastery learning lead directly to the requirement for a list of discrete, incrementally sequenced competencies. That theoretical framework lead directly to his research objective, which was to determine the competencies that should be included in the early field experience and student teaching components of agricultural teacher education programs.

Middle-level theory. In a paper presented at the AVERA meeting in December 1999, Belcher and Frisbee (1999) examined the factors that influence students to enroll in four-year automotive technology programs. They established their theoretical framework by drawing on a theoretical model previously proposed by several other researchers. The researchers explicitly stated the theoretical framework of their paper as follows:

> Models for student enrollment behavior theory started to emerge in the early 1980's (Paulsen, 1990). Several multi-stage models began to develop (Hanson & Litten, 1982; and Kotler & Fox, 1985). However, Hossler and Gallagher, (1987) and Jackson, (1982) developed a 3-stage model that has become the most widely accepted model in enrollment behavior. The steps include: a) college aspiration, b) search and application, and c) selection and attendance (Belcher & Frisbee, p. 4).

Substantive theory. In another paper at the 1999 AVERA research meeting, Roberson, Flowers, and Moore (1999) reported a study on the status of integration of academic and agricultural education in North Carolina. Making no attempt to start with a single grand theory, such as that cited by Dobbins, or a middle-level theory, such as that cited by Belcher and Frisbee, Roberson, Flowers, and Moore (1999) synthesized an extensive literature base on curriculum integration. From their

discussion, the reader could extract the following set of theoretical assumptions explaining academic and vocational integration:

- Vocational and academic integration provides numerous benefits to both students and teachers.
- Vocational and academic integration is supported both by the teaching profession and by business and industry.
- Yet, despite those two conditions, barriers within the schools exist to hinder the progress of vocational and academic integration.

  (Roberson, Flowers, & Moore, 1999)

Evaluating Theoretical Frameworks

As a minimum, for a quantitative study to have an acceptable theoretical framework it must provide adequate discipline-related and research-based literature to produce a set of theoretical assumptions that lead directly to the research question or questions. In addition, it must be apparent how the current study could have implications for testing the appropriateness of those theoretical assumptions for the study.

- What theoretical assumptions undergird the study? The theoretical assumptions provide a premise for the study so that a coherent argument can be made for the research questions. A problem establishes the reason for the study. The literature provides the background and knowledge base elated to the study. The theoretical framework provides a premise for the study. The premise leads directly to the research questions.
- What implications will the results of the study have for determining whether those theoretical assumptions indeed are the appropriate ones on which to base the study? The research questions relate back to the theoretical assumptions. The findings of the study can be used to verify that the theory applies in this new setting. The study holds the promise of adding to the gen-

eralizations already made under the theory.

As a minimum, for a qualitative study to have an adequate theoretical framework, the basic assumptions of the researcher must be elucidated to provide an intellectual context for the research. If the study will begin with specific research questions, a study-specific theoretical framework should provide the rationale by which the research questions were derived, much as is done in item 1, in the preceding paragraph. If the research will not begin with specific questions, the theoretical assumptions must make clear why the researcher selected that particular setting and provide a thorough examination of the extant knowledge base relative to similar or related settings.

Regardless of the paradigm used, in evaluating the theoretical framework of a study, four questions should be addressed:

- Did the researcher provide a literature review that leads directly to and establishes a clear basis for the theoretical framework?
- Did the researcher enumerate the theoretical assumptions succinctly and in a logical sequence so that the theoretical framework is coherent?
- Did the researcher show that the theoretical framework actually leads to the purpose, objectives, questions, or setting of the study?
- Did the researcher relate the results of the study back to the theoretical framework in a meaningful way?

Discussion

Researchers in career and technical education have drastically expanded their horizons of inquiry in recent decades. An almost total domination by quantitative research only a few years ago has given way to a more eclectic approach to research in career and technical education today. We see a greatly increased emphasis on the relationship between theory and research in our field and on the formulation of theoretical frame-

works to guide research in career and technical education.

The fundamental precepts of research and theory remain as solid as ever. The basic purpose of theory is to understand reality. The basic purpose of research is produce theory. Yet the mechanical processes involved in relating theory and practice continue to evolve. In the research community in career and technical education, we must continue to emphasize the inseparability of research and theory.

We cannot afford to be seduced by the oversimplification that all research must derive directly from grand theory. Substantive theoretical propositions based on appropriate discipline-based and research-based literature provide adequate theoretical frameworks for most research in career and technical education. Applied research based on theoretical assumptions falling well short of grand theory can have important implications for practice in our field and can be perfectly legitimate. Indeed, given the scientific immaturity of educational research in general and career and technical education in particular, substantive theory may well form the theoretical frameworks of much of our research for some time to come.

On the other hand, a review of related literature does not provide an adequate theoretical framework for a study. To provide an adequate theoretical framework for a study, the literature must first establish at least one supportable premise and then generate one or more propositions that the researcher can postulate in the form of theoretical assumptions regarding the phenomena under study. Simply adding the heading "Theoretical Framework" to a review of related literature does not actually make it a theoretical framework. Moreover, labeling an inadequate "theoretical framework" as a "conceptual framework" does not make it adequate.

Finally, the ultimate goal of researchers in career and technical education should be to relate our work to the larger research and theoretical community. Systematically ignoring larger issues at the level of grand theory, as we are so often

tempted to do for the sake of expediency, will only delay the time when our profession can begin to address its larger issues and solve its larger problems.

In his AVERA Presidential address some years ago, Gary Moore (1992) challenged us to concern ourselves with the "significance of our research." I challenge us to concern ourselves with the theoretical bases and implications of our research, holding always in mind the ultimate goal of building a solid theoretical framework for practice in career and technical education.

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Author

WILLIAM G. CAMP, is professor at the department of Agricultural and Extension Education, Virginia Polytechnic Institute and State University, 282 Litton Reaves Hall (Mail Code 0343), Blacksburg, Virginia 24061. [E-mail: wgcamp@vt.edu]. Dr. Camp is past president of AVERA.

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Constructing Vocational and Technical College Student Persistence Models

Sea-Shon Chen
Dahan Institute of Technology, Taiwan, R.O.C.

Hollie Thomas
Florida State University

Abstract

We constructed student persistence models for students at a vocational and technical college in Taiwan to predict student retention. Based on suicide, employee turnover, and social bond theories and relevant empirical research, a conceptual model was presented. Logistic regressions produced first and second semester persistence models. Our results also supported the statistical significance of nine variables (first semester GPA, entrance examination scores, gender, first semester social integration, second semester GPA, first semester gym grade, housing, major department, and occupational guidance program) in the conceptual model. The overall classification rate for the primary persistence model was 77.0%, and for the secondary persistence model, was 78.0%. The primary and secondary persistence models can be used to calculate the probability of persistence for freshman-year students at the end of the first and second semesters.

The problem of dropouts in Taiwan is similar to that in U.S. colleges and technical schools. The problem has been documented in the U.S. as early as 1880 (Tinto, 1982). However, little is known about the predictors of persistence/dropout in Taiwan. In community colleges in the U.S., "Only a third of all beginning full-time students earn associate degrees" (Tinto, Russo, & Kadel, 1994, p. 26). Many variables could account for

the substantial dropout rate of vocational-technical students, e. g., high school GPA, socioeconomic status, SAT or ACT scores, gender, departments, housing, financial aid (e.g., Eaton & Bean, 1995; Metzner, 1989; St. John & Starkey, 1996; Webb, 1988). While this problem has been studied extensively in the U.S., little is known about persistence in vocational technical schools in Taiwan. This research is an attempt to determine whether models developed in the U.S. are generalizable to other cultures such as that of Taiwan. In addition, it was thought desirable to identify factors that contribute to persistence/dropout so that the college could assist those students whose life goals would be met by persisting in their selected curricula.

Because of differences between four-year colleges or universities and two-year or vocational-technical colleges, available predictors of persistence or retention for students enrolled at these two types of institutions may differ. No report is available that includes all suitable variables to form a prediction model of two-year or four-year college student persistence. Thus, we sought to identify important variables that could be used to construct models of five-year vocational-technical college student persistence in Taiwan. Models of student persistence would be useful as reference models for identifying students who are on the verge of dropping out. We sought answers to these questions: What are pragmatic and significant variables that affect five-year vocational-technical college student persistence? Can prediction models of college student persistence be developed? It is anticipated that the answers to these questions in the culture of Taiwan will provide assistance to student advisors as well as provide input to researchers within and without Taiwan as to how models of persistence may be revised.

We held two assumptions at the outset of this study. First, students are able to make the decision to stay in or drop out of school. Second, we believed that students' records in the college offices were correct. In the following section, articles are

reviewed, and a suggested model for empirical study is described.

Review of Literature

College student persistence models that were developed since 1970 were reviewed first. Critical analyses (i.e., comparing and synthesizing the literature) were performed to identify relevant variables and select an appropriate statistical method. Finally, we suggest a conceptual model that could be used for this study. In the following, we specify and integrate literature on concepts or issues to be studied.

Available Models

Spady (1970), based on Durkheim's suicide model, suggested a sociological model of the dropout process. Spady found suicide and dropping out of a selected course of action, matriculation in school in this case, to have many parallels in that both involve the termination of a course of action. In 1971, Spady used multiple regression analysis to form the empirical models and found six statistically significant predictors (academic integration, social integration, socioeconomic status, gender, choice of department, and SAT/ACT).

Pascarella and Terenzini (1979) synthesized Spady's (1970) model, Spady's (1971) empirical models, and Tinto's (1975) model to study college dropouts. Two-group discriminant analysis was the statistical tool. They found three variables (academic integration, social integration, and gender) significantly related to persistence. Bean (1989) also identified these three variables when, based upon Price's (1977) model of employee turnover, he proposed a conceptual model and used path analysis to study student attrition.

Pascarella and Terenzini (1983), Pascarella and Chapman (1983), Stage (1988), and Stage (1989) all used Tinto's (1975) model to conduct analyses to predict first-year student persistence. The important variables of precollege performance, eth-

nicity, and dormitory were recognized, in addition to the former significant predictors of academic integration, social integration, and gender.

Webb (1988) combined Spady's (1970), Tinto's (1975), Pascarella's (1980), Bean and Metzner's (1985) models, and Bean's (1986) metamodel of continued enrollment to conduct the research. A step-wise multiple regression analysis with 28 predictors was used to analyze the record of 15,132 students. In Webb's paper, we found the vocational education program to be the tenth significant variable.

Metzner (1989) used Bean and Metzner's (1985) theoretical model with multiple regression to study the freshman attrition. Cabrera, Stampen, and Hansen (1990) introduced human capital theory (Becker, 1964) and hypothesized a conceptual model to study student persistence. Nora, Attinasi, and Matonak (1990) adapted Tinto's (1975) theoretical model to form their conceptual model and conduct path analysis to predict student persistence. Ethington (1990) assumed a psychological model of student persistence and conducted empirical study. Stage and Rushin (1993) proposed a model of student predispositions to college and persistence in college and used LISREL to estimate relationships among the variables within the causal model. Cabrera, Nora, and Castaneda (1993) combined Tinto's (1975) model and Bean's (1986) model to create a structural equation model and used LISREL VII to construct a two-step structural model. Eaton and Bean (1995) used the psychological approach behavioral theory to develop a conceptual model and studied the retention with multiple regression, LISREL, and logistic regression. St. John and Starkey (1996) examined the influence of student financial aid on within-year persistence and used logistic regression to analyze data. In these papers, statistically significant variables were academic integration, social integration, socioeconomic status, gender, precollege performance, ethnicity, and price. Price was the eleventh important variable that we identified. In the following paragraph we have summarized

significant variables and models.

Significant Independent Variables

Eleven statistically significant variables were found in the literature review. The variables of academic integration, social integration, socioeconomic status, gender, and precollege performance strongly influenced persistence. Major departments, ethnicity, SAT/ACT scores, living in a dormitory, vocational education program status, and price also influenced persistence.

Conceptual and Empirical Models

The literature revealed many models (e.g., Bean & Metzner, 1985; Cabrera, et al., 1990; Cabrera, et al., 1993; Eaton & Bean, 1995; Nora, et al., 1990; Spady, 1970; Stage & Rushin, 1993; St. John & Starkey, 1996; Tinto, 1975; Webb, 1988;) that have been used to explore college student persistence. In the 1970s and 1980s, researchers tended to use Tinto's (1975) conceptual model. Up to the 1990s, researchers proposed their own conceptual models and formed new empirical models. We also found from the study and the literature that: (a) the females and males have different significant predictors and model structures (e.g., Bean, 1980; Spady, 1971); (b) the resulting models were different because two- or four-year college and vocational or nonvocational education program status were not the same, (e.g., Stage, 1988; Webb, 1988); (c) background variables directly influenced persistence in the model as was found in studies conducted by Webb (1988), Stage (1989), Cabrera et al., (1990), Ethington (1990), Stage and Rushin (1993), and Eaton and Bean (1995); and (d) some significant psychological variables, e.g., value, personality, and satisfaction could be employed to improve the model (e.g., Eaton & Bean, 1995; Ethington, 1990). Based upon the 11 important variables recognized and the examination of models, we propose and discuss a new model.

Conceptual Model Proposed

We used the significant variables identified and added pre-

dictors of academic remedial program, occupational guidance program, and gym grades to form a conceptual model (See Figure 1). Variables used to construct the conceptual model are specified and discussed next.

Academic integration. This variable is basically grade performance. Corresponding to suicide and turnover theories, students with low grades may be dissatisfied and lose their confidence, thus they may decide to drop out. Academic integration was a significant predictor in 13 studies.

Social integration. This concerns students' leadership and campus activities. In Taiwan, advisors give this score to each student in judging their own leadership, participation in extracurricular activities, and the student's discipline when he/she is in school. Corresponding to suicide and turnover theories, students who join campus activities may feel that they belong and fit in the college; thus, they will persist in the college. Social integration was a significant predictor in 10 studies.

Parental education. Parental education is a major variable of socioeconomic status (SES) and correlates to the price variable (e.g., Cabrera, et al., 1993; St. John & Starkey, 1996). Corresponding to human capital theory, parents' education levels are correlated with student's persistence, because the student is able to pay the tuition and expense. SES was reported as a significant predictor in nine studies.

Gender. Authors of nine articles reported that gender was a significant variable of persistence. The predictive validity in gender difference was also found in these studies.

Entrance examination. Aptitude is a variable measured by the SAT/ACT and is similar to precollege performance. Like SAT/ACT scores, entrance examination scores are used to assess students' precollege performances and used to meet entrance examination requirements in Taiwan. Either precollege

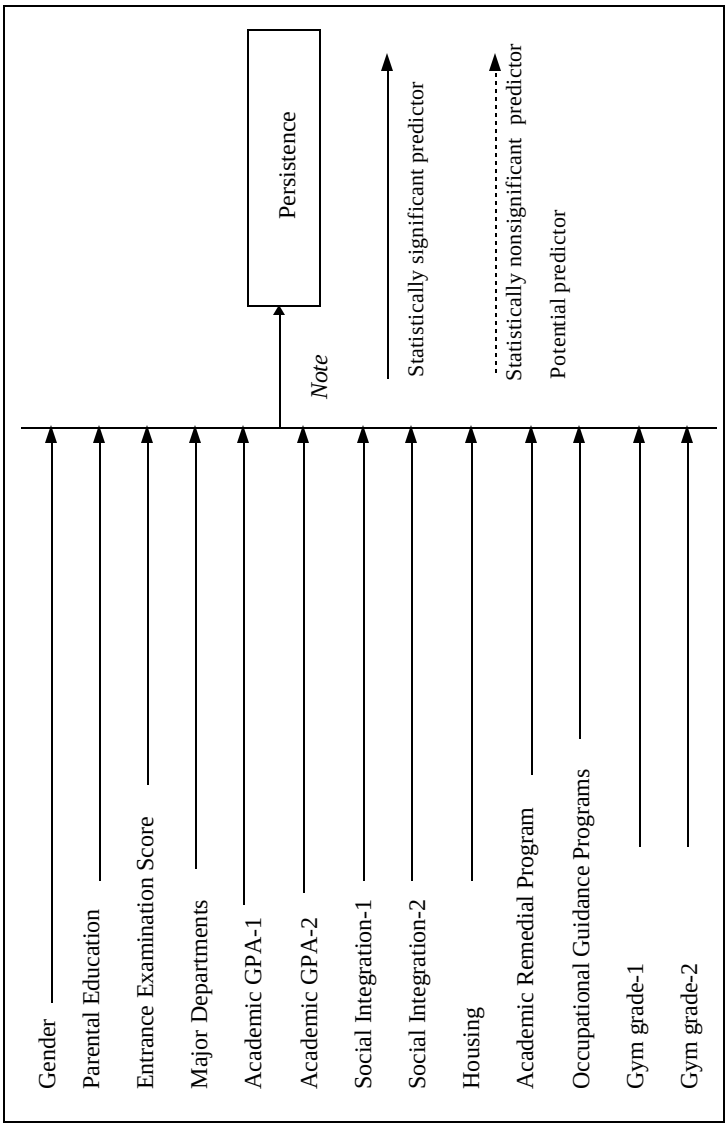

Figure 1. The conceptual model of college student persistence on which this study is based

performance or SAT/ACT were reported as significant predictors in seven studies.

Gym grade. This variable was not assumed as a predictor of persistence in the 16 articles reviewed. Yet, based on Hirschi's (1969) theory of social bonding (i.e., attachment, commitment, involvement, and belief), the gym grade may correlate with persistence. According to the results of empirical studies (Braddock, 1981; McNeal, 1995; Melnick, Sabo, & Vanfossen, 1992), participation in athletic activities reduced a student's likelihood of dropping out. Thus, we suggest the gym grade is a potential predictor of persistence in Taiwan.

Major departments. Because each student has his educational goal and the department's commitment, the major department is assumed as a predictor of persistence. The major department is a significant predictor of persistence in four empirical studies.

Housing. Pascarella and Chapman (1983) studied college withdrawal and found living in a dormitory had a direct effect on persistence for four-year residential colleges. Because students who live on campus may have more opportunities to join in campus activities, corresponding to social bonding theory, they may decide not to leave college.

Occupational guidance program. Vocational education program (VEP) status was a significant predictor of persistence in Webb's (1988) study. This predictor is similar to the variable of vocational guidance program (VGP). Students in VGP may better understand what their future will be and what they should do; a higher persistence rate can be expected for those students enrolled in vocational guidance programs.

Academic remedial program. Academic integration or success was a significant predictor of persistence. If students enroll in the remedial program, they may foresee that they can get

higher grade-point-average (GPAs) and then probably persist in college.

In summary, with variables specified in the former paragraphs, we propose Figure 1 as the conceptual model. In the model, persistence is the dependent variable. The independent variables that correlate with persistence are gender, parental education, entrance examination scores, academic GPA_1 (first semester), academic GPA_2 (second semester), social integration_1 (first semester), social integration_2 (second semester), major departments, academic remedial program, occupational guidance program, housing, gym grade_1 (first semester), and gym grade_2 (second semester). The methods to test the model conceptualized will be expressed in the next section.

Method

The participants were 1,243 anonymous vocational-technical college freshmen. Two college data files were the sources of data. One file was in the office of the registrar, and the other was in the office of student general affairs. We assigned freshman-year to sophomore-year persistence as the dependent variable. It was coded "1" for persistence (i.e., students enrolled at the same college for the next semester) and coded "0" for nonpersistence (i.e., students left school in the next semester).

Statistical Analysis

The analysis methods used in the 16 empirical studies cited were diverse. Except for the differences of variables and conceptual models, we found that the models were merged and modified, and the improvement of statistical methodology made a difference. Because the outcome is dichotomous and the purpose is to predict, logistic regression analysis can be used. Logistic regression does not adhere to assumptions about the normality of distribution nor the constant variance (Tabachnick & Fidell, 1996; Tate, 1995). Other researchers (e.g., St. John &

Starkey, 1996; Stage, 1988, 1989) have also used logistic regression to develop models.

Procedures

The study was carried out in steps: to screen out outliers, to assess the model's goodness-of-fit and to build empirical models, to conduct the case analysis, and to predict probability of student persistence. We will focus on assessing and constructing the model and prediction.

Test of model-goodness-of fit. Logistic regression can be represented by the logit equation (Equation 1) and the probability function (Equation 2). In Equation 2, P is the probability of persistence. To test the null hypothesis, the chi-square statistic should compare to the critical value (Tate, 1995).

$$g = B_0 + B_1 X_1 + B_2 X_2 + ... + B_k X_k \qquad \text{Equation (1)}$$

$$P = \frac{\exp(g)}{1 + \exp(g)} \quad \text{or} \quad P = \frac{1}{1 + \exp(-g)} \qquad \text{Equation (2)}$$

where $\exp(g)$ represents the constant, $e = 2.718$, raised to the power g.

Model parameter estimation. To estimate a model parameter, the researcher needs to test the overall relationship of the outcome and predictors. The statistic -2 log Likelihood can be calculated by
$-2LL = \Sigma [Y_i \ln(P_i) + (1 - Y_i) \ln(1 - P_i)]$, where Y_i is the actual outcome (either equal to 1 or 0), and P_i is predicted probability (Tabachnick & Fidell, 1996).

Identification and prediction. With the empirical model constructed, the probability of persistence for a student is calculated by the combination of Equations 1 and 2, and the combined equation can be used to identify at-risk students who are

Model parameter estimation. To estimate a model parameter, the researcher needs to test the overall relationship of the outcome and predictors. The statistic -2 log Likelihood can be calculated by
$-2LL = S\ [Y_i \ln(P_i) + (1 - Y_i) \ln(1 - P_i)]$, where Y_i is the actual outcome (either equal to 1 or 0), and P_i is predicted probability (Tabachnick & Fidell, 1996).

Identification and prediction. With the empirical model constructed, the probability of persistence for a student is calculated by the combination of Equations 1 and 2, and the combined equation can be used to identify at-risk students who are in high probability of leaving college.

In summary, because persistence was the dichotomous dependent variable, logistic regression was used to analyze data, and models of persistence were constructed and presented in figures and equations. Data analysis produced the following results.

Results

Based upon the analysis of 1,243 freshmen records, the persistence rate was about 69%. We used the logistic regression methods of Enter and Fstep to analyze data. Because the Enter method was the best method that could classify nonpersistence (66.8%), we used the results to construct the primary persistence model (Figure 2 and Equation 3). The regression coefficients are listed in Table 1. Second, we used the Fstep method to identify significant predictors and used these significant variables to construct the secondary persistence model (Figure 3 and Equation 4). The regression coefficients are listed in Table 2.

Primary Persistence Model

This model includes 14 independent variables. However, it should be noted that Major Departments and Housing are made

Table 1

Regression Coefficients and Effects in Standardized Score for the Primary Model

Variable	*B*	*S.E.*	*Sig*	*R*	Effect
Academic Remedial	.039	.157	.806	.000	1.039
Academic GPA1	.562	.089	.000	.158	1.754
Dept. Civil Eng.	-.453	.260	.081	-.026	.636
Dept. Mech. Eng.	-.635	.257	.014	-.052	.530
Entrance Exam	.618	.079	.000	.196	1.855
Parent Educ.	.072	.074	.329	.000	1.075
Gender	-1.003	.178	.000	-.139	.367
Gym Grade	.260	.074	.001	.082	1.297
Housing – Home	.574	.376	.128	.015	1.775
Housing – School	-.285	.277	.303	.000	.752
Occupational Guid.	.332	.156	.033	.041	1.394
Social Integ. 1	.339	.074	.000	.111	1.403

up of 3 variables each. These two sets of variables are dummy variables and thus reduce the number of variables in the equation to 12. The cut value (i.e., the value to classify an individual into the persistence or the nonpersistence group) was set at 0.61 in order to obtain the maximum overall classification rate. The cut value of .61 was identified to maximize the number of correct classifications of presisters and non-persistors. After the analysis processes of test of model-goodness-of fit, model parameter estimation, classification of individuals, and case analysis, a primary persistence model was constructed and presented in Figure 2. The logit function for future prediction or classification is the following (Equation 3):

g = -14.5118 - 1.0031 (gender; M=1, F=0) + 0.3321 (occupational guidance; Y=1, N=0) + 0.0386 (academic remedial; Y=1, N=0) + 0.5737 (living at home; Y=1, otherwise=0) - 0.2849 (living at school; Y =1, otherwise=0) - 0.6345 (mechanical engineering major; Y=1, otherwise=0) - 0.4528 (civil engineering major; Y=1, otherwise=0) + 0.0721 (first semester academic GPA) + 0.0411 (first semester social integration) + 0.0395 (first semester gym grade) + 0.0139 (years of parental education) + 0.0121 (entrance examination score). Equation (3)

Table 2

Regression Coefficients and Effects in Standardized Score for the Secondary Model

Variable	*B*	*S.E.*	*Sig*	*R*	Effect
Academic GPA1	.447	.093	.000	.117	1.563
Dept. Civil Eng.	-.384	.263	.144	-.010	.681
Dept. Mech. Eng.	-.569	.260	.029	-.043	.566
Entrance Exam	.620	.080	.000	.195	1.859
Gender	-.960	.180	.000	-.132	.383
Gym Grade 1	.205	.076	.007	.059	1.228
Housing – Home	.795	.285	.005	.062	2.215
Occupational Guid.	.304	.152	.046	.036	1.355
Social Integ. 1	.299	.075	.000	.095	1.348
Housing - Other	.261	.275	.342	.000	1.299
Academic GPA2	.323	.088	.000	.087	1.381

Secondary Persistence Model

First, we used the Fstep method to test the statistical significant of 13 predictors six of which were dummy variables (see Figure 1). Then, through the processes of Enter method analysis, a secondary model with 11 predictors, which also included

the two sets of dummy variables, was constructed in Figure 3. Taking regression coefficients to construct a function for future prediction is (Equation 4):

g = -14.6205 - 0.9603 (gender; M=1, F=0) + 0.3038 (occupational guidance; Y=1, N=0) + 0.7952 (living at home; Y=1, otherwise=0) - 0.2612 (living at neither home nor school; Y=1) - 0.5694 (mechanical engineering major; Y=1) - 0.3844 (civil engineering major; Y=1) + 0.0574 (first semester academic GPA) + 0.0363 (first semester social integration) + 0.0312 (first semester gym grade) + 0.0297 (second semester academic GPA) + 0.0122 (entrance examination score). Equation (4)

Summary of Models

The primary model supports the conceptual model (see Figure 1) with eight significant predictors. A combination of Equations 2 and 3 can be used to predict the student probability of persistence at the end of first semester. The first semester model correctly classified 66.84% nonpersistors, 81.58% persistors, and 77.07% overall correct classification (see Table 3). The secondary model also supports the conceptual model with nine significant predictors. The combination of Equations 2 and 4 can be used to predict the student probability of persistence at the end of the second semester. The secondary model was able to classify correctly 69.21% nonpersistors, 82.04% persistors, and 78.12% overall correct classification (see Table 4). All three (persistence, nonpersistence, and overall) classification rates of the secondary model are greater than that of the primary model. Yet, the primary model can be used to classify early most students who are prone not to persist at an early point in their education. The implications and applications about models and equations are discussed in the next section.

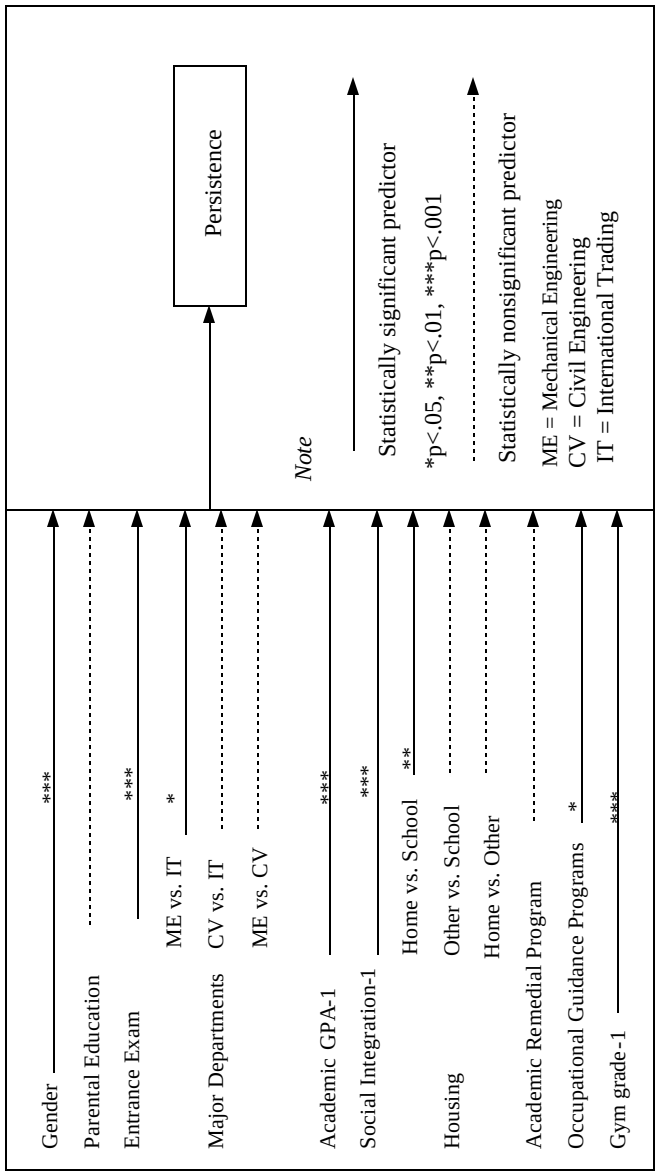

Figure 2. Primary college student persistence model.

Discussion

We used the example cases to illustrate how to use the models in equation form. The implication and application of the primary and secondary persistence models are also addressed in this section.

Table 3
The Primary Model Classification Table

		Predicted outcome			
		0	1	Correctly classified	
Observed outcome	0	254 (66.84%)	126 (33.16%)	66.84%	Nonpersist
	1	159 (18.42%)	704 (81.58%)	81.58%	Persist
		Overall correctly classified			77.07%

Table 4
The Secondary Model Classification Table

		Predicted outcome			
		0	1	Correctly classified	
Observed Outcome	0	263 (69.21%)	117 (30.79%)	69.21%	Nonpersist
	1	155 (17.96%)	708 (82.04%)	82.04%	Persist
		Overall correctly classified			78.12%

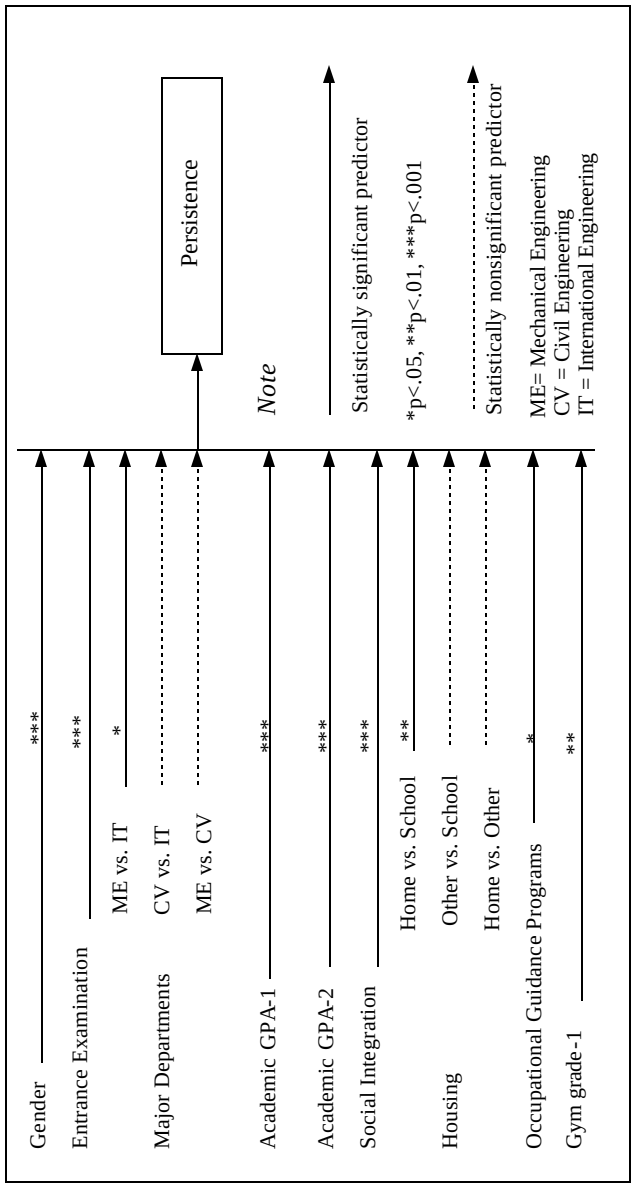

Figure 3. Secondary college student persistence model.

First-Semester Persistence Model

The combination of Equations 2 and 3 can be used to estimate the probability of first-semester persistence, e.g., cases A and B. For student-A, the logit and the probability of persistence are calculated as (Equations 5 and 6):

$$g = -14.5118 - 1.0031\,(1) + 0.3321\,(0) + 0.0386\,(0) + 0.5737\,(0) - 0.2849\,(1) - 0.6345\,(1) - 0.4528\,(0) + 0.0721\,(79) + 0.0411\,(90) + 0.0395\,(77) + 0.0139\,(18) + 0.0121\,(336) = 0.3179. \quad \text{Equation (5)}$$

$$P = \frac{1}{1 + \exp(-g)} = \frac{1}{1 + \exp(-0.3179)} = 0.5788 \quad \text{Equation (6)}$$

The resulting probability of persistence for student-A is 0.5788. When the cut point probability was set at 0.61, student-A was incorrectly classified, because the persistence variable of student-A is 1, but he or she is assigned to the nonpersistence group. Similarly, to calculate the probability of persistence for student-B, the result is $P = 0.5009$; student-B is correctly classified as a nonpersistor. When using Equation 2 and 3, the probability of persistence for each student can be calculated at the end of the first semester by using Equations 5 and 6.

Second-Semester Persistence Model

The combination of Equations 2 and 4 can be used to calculate the probability of persistence at the end of the second semester. For student-A, the probability of persistence is equal to 0.631. With the cut point probability set at 0.62, the probability that maximized the number of correct classifications, student-A is correctly classified (notice that student-A was mis-classified at the end of first semester). For student-B, the calculation is the following (Equations 7 and 8):

$$g = -14.6205 - 0.9603\,(1) + 0.3038\,(0) + 0.7952\,(0) - 0.2612\,(0) - 0.5944\,(0) - 0.3844\,(1) + 0.0574\,(61) + 0.0363\,(93) + 0.0312\,(67) + 0.0297\,(62) + 0.0122\,(412) = -0.1279 \quad \text{Equation (7)}$$

$$P = \frac{1}{1 + \exp(-g)} = \frac{1}{1 + \exp(0.1279)} = 0.4676 \quad \text{Equation (8)}$$

The probability of persistence for student-B is equal to 0.4676. Student-B is also correctly classified as nonpersistor at the end of the second semester. In the future, by using the first-year student's data and Equations 2 and 4, the freshman probability of persistence can be calculated at the end of the second semester by using Equations 7 and 8.

Conclusions

This section presents the influences of predictors on persistence, the reasons that some predictors are significant yet some are not, and the implications of primary and secondary persistence models. Finally, we state practical recommendations for the college to improve schooling and recommendations for future research.

Primary Persistence Model

We will discuss each predictor in Figure 2 or Equation 3. The results of the primary regression supported eight assumed predictors but did not support two assumed predictors. The implications and rationale of predictors follow.

First semester academic GPA. The student with a high GPA has a higher probability of persistence, provided that other predictors are controlled. Controlling for other predictors is also applied to later comparisons about probability of persistence. This result is consistent with suicide and turnover theories and

results of past empirical studies (e.g., Bean, 1980; Chen, 1988; Chen & Chen 1988; Hwang, 1994; Kau, 1996; Lin, 1975; Liu, 1994, 1995; St. John & Starkey, 1996; Xie, Shu, & Guo, 1983).

Gender. The female student has a higher probability of persistence than does the male student. The relationship between gender and persistence has been found in many studies presented in the literature review. For this sample, the gender difference is consistent with previous findings (e.g., Chen, 1988; Liu, 1994; Metzner, 1989; Spady, 1971).

Entrance examination. The student with high entrance examination scores has a higher probability of persistence. This result is consistent with the theory that prior knowledge may facilitate later learning (Anderson, 1985) and with empirical findings in the literature (e.g., Spady, 1971; Webb, 1983) that precollege performance is a significant predictor of persistence.

Major departments. The choice of department reflects the student's educational goal and the student's commitment to the department. Thus, a student with a high degree of commitment to a department has high inclinations toward persistence. This result is consistent with previous findings (Kao, 1996; Lo & Lee, 1982; Stage & Rushin, 1993).

First-semester social integration. The student with a high social integration has a higher probability of persistence. This result is consistent with suicide and turnover theories and former empirical studies (e.g., Liu, 1995; Stage & Rushin, 1993; Young, 1982).

Housing. Social bond theory (i.e., attachment to others and involvement in activities decrease isolation) and Pascarella and Chapman's (1983) findings would lead us to conclude that living on campus and away from home would result in higher persistence rates. Yet, our finding that location of residence did not increase our probability of predicting persistence. The finding

that location of housing did not contribute to persistence may be contrary to the findings in the United States for a number of reasons including negative dormitory situations (e.g., too many students living in a small room, bad food, and lack of good administration of the dormitory) or the avoidance of homesickness or both.

First-semester gym grade. The student with a high gym grade has a higher probability of persistence. This result is consistent with the social bond theory (i.e., commitment to conformity and involvement in activities increase human relationships) and empirical studies (Braddock, 1981; McNeal, 1995; Melnick, et al., 1992;) that participation in athletic activities increases the student's likelihood of persistence.

Occupational guidance programs. Students enrolled in occupational guidance programs have a higher probability of persistence than those who not so enrolled. Because a future occupation may motivate students to persist in the college (McKinney, Lorion, & Max, 1976), students in the programs know what their futures may be and what they will do. The similar result was found in Webb's (1988) study that vocational education program status was a significant predictor of freshman-year persistence.

Parental education. Presented in human capital theory (Becker, 1964), parental education is one of the indices of SES. Students' parents in high level SES are able to pay tuition and expenses. Studies (e.g., Lin, 1975; Eaton & Bean, 1995; Stage, 1989) showed that high SES correlated with persistence. However, if the tuition and expenses are not very high as after in Taiwan after 1990 or generally low-interest student loans which have a simple application process are readily available, this family SES predictor may be nonsignificant (Becker, 1964). The nonsignificant result was also found in other studies (e.g., Cabrera, et al., 1993; Xie, et al., 1983).

Academic remedial program. The absence of a significant relationship between this predictor and persistence may mean that students who enrolled in the program did not benefit academically (Kulik, Kulik, & Shwalb, 1983), or that students with low entrance examination scores evaded enrolling in the program (e.g., Eaton & Bean, 1995).

Secondary Persistence Model

Eleven predictors were used by the Enter method to construct the secondary persistence model (Figure 3). We will identify predictors that were and were not specified in the primary persistence model.

Significant predictors. The results of the secondary regression supported nine assumed predictors. Of the nine predictors, eight of them have been discussed. The ninth significant predictor is the second-semester academic GPA. Students with a high second-semester academic GPA have a higher probability of persistence, when other predictors are controlled. Because high academic GPA students may be satisfied and confident, they decide to persist. This result is consistent with suicide and turnover theories and past empirical evidence.

Nonsignificant predictors. Second-semester social integration and second-semester gym grades are variables that were not supported by the results of the analysis. Based upon social bond theory, since the social bonds are saturated in the first semester (e.g., during the first semester, students adjust to the college circumstances and build up human relationships) (Bruno, 1977; Calhoun & Acocella, 1978), in the second semester, the social bond does not increase. Thus, the second-semester bonding score adds very little to predicting persistence. It is recommended that the primary model be used at the end of the first semester and the secondary model at the end of the second semester to predict college freshman persistence probability. More recommendations follow.

Practical Recommendations

The results indicate that several practices may be considered to identify dropping out and to increase persistence.

1. The application of the persistence models developed in the United States were found to be useful in Taiwan to build models that be of assistance to vocational educators in identify students who have a high likelihood of dropping out of technical schools. The set of variables, though not exactly mirroring those from studies in the U.S., adhere very closely to the identified models. It is recommended that the models developed be employed to identify students who have a high likelihood of dropping out so that these students can be provided assistance to resolve identified problems.
2. The first and second semester GPAs significantly influence persistence, but participation in an academic remedial program does not. The college administrator should make changes designed to improve teaching and learning in regular class to assist students in earning higher GPAs, thus increasing student persistence.
3. The administration should investigate to determine effectiveness of the remedial program to see if the identified objectives are being met and, if so, to identify the lack of relationship of the remedial program with persistence.
4. Faculty and student affairs staff should be advised that the male and female students leave college for different reasons (e.g., housing and major departments). Any program or policy designed to increase student persistence should take gender difference into account.
5. The college advisors should strive to attract students with low entrance examination scores and a low first-semester academic GPA into vocational guidance programs. These programs foster an increase in the stu-

dents' knowledge of occupational goals and enhance interactions with faculty and peers, thus probably in creasing persistence.

6. Because the gym grade is a significant predictor, the gym instructors and the class advisors should notice those students who do not like to join athletics or extra curricular activities. Instructors and advisors may work together encouraging and assisting students to build up their participation in exercise customs and to join cam pus activities. It should be noted that the gym grade in Taiwan is similar to a social integration score in the U.S.

The Research Recommendations

This study can be useful in introducing further persistence research that constructs freshman-year models at the end of the first and second semesters. Several recommendations for future study are as follows.

1. Logistic regression analysis is an appropriate and practical statistical exploratory analysis to classify significant predictors and to construct the persistence model. We recommend using logistic regression analysis in future exploratory research concerning persistence.
2. Pascarella and Chapman (1983) reported a pooled clas sification rate that was 70% (p. 94). In this study, the overall classification rate for the primary model is 77% and for the secondary model the rate is 78%. In future research, for comparison, reporting predicted outcomes in classification tables as presented in Tables 3 and 4 is recommended.
3. The causal models built in this study may not be suit able for other colleges to predict their student persis tence, because the model may be quite different at low- and high-prestige colleges, large and small schools, and two-year, four-year, and five-year institutions. Yet, the

variables of gender, academic GPA, precollege experi ence, ethnicity (in the U.S.), housing, major depart ments, social integration, and gym grade should be taken into consideration.

4. To improve classification rates, researchers may in clude constructs such as "value" (Ethington, 1990), "occupational predisposition," and other psychological variables (e.g., approach or avoidance attitude, Bean & Eaton, 1995; personality, Johnson & Buck, 1995) in conducting research on persistence.
5. The college researcher may be well advised to con-struct or revise the models every one or two years to better identify students at-risk of dropping out. This recommendation is based on the fact that the data are easy to access from permanent records and that inter-ventions may change the weights of variables being used.

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Authors

SEA-SHON CHEN is associate professor at the Dahan Institute of Technology, Taiwan, Korea, P.O.Box 9-26, Hualien, Taiwan, R.O.C. [E-mail: seachen@ms8.tisnet.net.tw; seashon.chen@msa.hinet.net]. His research interest is educational leadership in vocational education.

HOLLIE THOMAS is professor at the Florida State University, 113 Stone Building, Department of Educational Leadership, Florida State University, Tallahassee, Florida 32306 [E-mail: hthomas@garnet.acns.fsu.edu]. His research interests are career development and leadership in vocational education.

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Factors that Influence the Turnover and Retention of Minnesota's Technical College Teachers

Sheila K. Ruhland
University of Minnesota

Abstract

Technical colleges are being faced with the increased number of teacher vacancies due to retirements, teacher's decisions to leave the teaching profession, and growth in career and technical education programs to meet employment demands. The potential applicant pool may be further reduced by the career opportunities from business and industry that, in recent years, have hired teachers from two-year colleges with salaries as an incentive. Few studies have been conducted to explain teacher's decisions to leave or remain in the technical college teaching profession. In order to develop and retain the high quality of technical college teachers, an understanding of the factors associated with teacher turnover and retention is critical. The purpose of this study was to identify factors that influence the turnover and retention of technical college career teachers.

Technical colleges are being affected by the increased number of full-time, retiring teachers. In addition to retirements, the tremendous growth in private sector career and technical jobs has resulted in technical colleges hiring additional teachers to teach courses in these areas driven by the fact that the 10 highest projected growth occupations can be classified in either the computer technology or health fields (Silvestri, 1997). Between 1996 and 2006, these occupations are projected to grow from 69% to 117%. Silvestri further stated that average growth would be greater for occupations requiring at least an associate's degree. Retirements and job growth in technical areas

will affect the demand for teachers in technical colleges across the United States.

In 1997, a study conducted by Vandermast (1998) indicated 65% of full-time faculty in community colleges were 45 years of age or older. An earlier study by Baker, Roueche, and Gillett-Karam (1990) found over 50% of the teachers currently in community colleges were planning to retire soon. "After years of hiring freezes, reductions in force, and restricted growth, community colleges today are recruiting increasingly large number of new faculty to fill retirees' positions" (Gibson-Benninger & Ratcliff, 1996, p. 151). Community colleges, already facing the challenges of recruiting and hiring good qualified faculty, find they are in competition with business and industry where salaries are typically higher.

Few studies have been reported addressing the turnover and retention of technical college teachers. A study conducted on the turnover intentions of university faculty (Hinsz & Nelson, 1990) reports "attitudes toward leaving the organization and subjective norms regarding leaving the organization form the basis of the most predictive model of turnover intentions" (p. 82). The study tested several models to predict turnover intentions. In a study conducted by Pucel (1990), technical college teachers were surveyed to identify factors that attracted them to stay in and leave the teaching profession. Factors rated most important for staying in the profession include: (a) working with students, (b) sharing knowledge, and (c) work environment. The most important factors identified for those leaving teaching, other than retirement, include: (a) wanted a job change, (b) stress, (c) co-workers, and (d) work environment.

Pucel, Sonnach, and Obok (1992) conducted a study related to job satisfaction of beginning and experienced technical college teachers. One key finding of this study was that job needs of beginning and experienced teachers are significantly different. In addition, these authors identify six factors that explain a technical college teacher's decision to leave the teaching pro-

fession. These include: (a) work environment, (b) students, (c) less stress, (d) type of co-workers, (e) maintain competence, and (f) wanted a job change. Pucel and Kaynes (1989) in an earlier study, found that experienced instructors move in, out of, and within the postsecondary technical institutes due to job change, co-workers, and work environment.

The related issues of secondary teacher satisfaction and retention have been the focus of research for more than 20 years (Chapman, 1984; Chapman & Hutcheson, 1982; Chapman & Green, 1986, Chapman & Lowther, 1982; Cole, 1983; Knight & Bender, 1978; McBride, Munday & Tunnell, 1992; Miller 1974; Reilly & Welton, 1979; and U. S. Department of Education, 1997). The results of these studies have shown that personal characteristics, student concerns, workload, recognition received, salary, and policy-administration as common turnover and job dissatisfaction factors. Research reported by Han (1994) and Kirby and Grissmer (1993) reported higher salaries as the main factor needed to retain teachers. "While money is not the primary factor in deciding to choose teaching as a career, it is a major factor in the decision to leave teaching" (Han, 1994, p. 15).

With the impending teacher shortage, the time is right to study those factors that will enable technical colleges to retain teachers, especially those who teach in areas of high industry demand. Turnover is costly to any organization, and it is far more cost effective to retain teachers than to hire. Understanding the factors associated with teacher turnover and retention is the critical first step to developing teacher retention strategies. The purpose of this study is to identify those factors influencing technical college teacher turnover and retention. Price (1977) defines turnover as "the degree of individual movement across the membership boundary of a social system" (p. 4). Mobility data related to turnover includes changing: (a) employer, (b) occupation, (c) geographic location, (d) employed to unemployed, and (e) into and out of the labor force. Turnover fo-

cuses on the movement of the individual, not the movement within the organization. Retention is defined as remaining in the teaching profession (Grady & Figueira, 1987).

Theoretical Framework

Three models are particularly useful to this study of teacher turnover and retention. Holland's (1973) theory of vocational choice posits that vocational satisfaction, stability, and achievement depend on the congruence between one's personality and environment in which one works. This theory suggests that career changes may be related to changes in personality, environment, or overall perception of what is involved in teaching. Thus, teachers who rate themselves higher in skills and abilities, values, and professional accomplishments should exhibit more satisfaction with their career.

Krumboltz' (1979) social learning theory of career selection identifies four factors (genetic endowment and special abilities, environmental conditions and events, learning experiences, and task approach skills) that influence the nature of a career decision. The basis for this theory are educational and occupational preference and how these influence career selection. Genetic endowment and special abilities include race, gender, physical appearance, and physical characteristics. Social, cultural, political or monetary factors are the basis for environmental conditions and events. Examples of this factor include job training opportunities, technological developments, and training resources. Previous learning experiences influence an individual's career decision-making. Isaacson and Brown (1997) define learning experiences as (a) instrumental, and (b) associative. Instrumental learning experiences have individuals responding to the environment to produce consequences. Associative learning experiences involve individuals learning by reacting to external stimuli, observing models, or pairing of two events. Skills that individuals apply to a task or problem define the task approach skills. Examples include performance stan-

dards, work habits, and symbolic rehearsing. Understanding these factors can help answer the question of why individuals change occupations throughout their lives.

Chapman expanded on Holland's theory of vocational choice and Krumboltz' social learning theory and developed a public school teacher retention/attrition model (Chapman, 1983; Chapman, 1984; and Chapman & Green 1986). The model suggest that teacher retention is a function of: (a) teachers' personal characteristics, (b) educational preparation, (c) initial commitment to teaching, (d) quality of first teaching experience, (e) social and professional integration into teaching, and (f) external influences. Personal characteristics include gender and age. Educational preparation includes quality of teacher preparation program, student performance (e.g., grade point average, course grades), and degree obtained. Initial commitment to teaching and quality of first year teaching measures overall learning experiences as a teacher. Professional and social integration are measures of a teacher's values, skills and abilities, and accomplishments. The external influences are measured based upon environmental conditions (e.g., employment climate, alternative employment opportunities). Chapman's conceptual framework as adapted forms the theoretical framework for the present study.

Purpose and Research Questions

The purpose of this study was to identify factors that influence the turnover and retention of technical college teachers. A second purpose was to identify possible skills that teachers possess or experiential factors influencing a teacher's willingness to continue teaching.

The following research questions guided this study:

1. Is there a statistically significant difference in commitment to teaching between teachers who choose to leave and those who remain in the profession?

2. Is there a statistically significant difference in perception of first-year teaching experience between teachers who choose to leave and those who remain in the profession?
3. Is there a statistically significant difference in self-assessed skills between teachers who choose to leave and those who remain in the profession?
4. Is there a statistically significant difference in willing ness to continue teaching between teachers who choose to leave and those who remain in the profession?
5. What factors influence a technical college teachers' decision to leave the teaching profession?

Method

Population

The population consisted of technical college teachers from southwestern Minnesota who completed the first course required for initial certification between 1995 and 1999 at the University of Minnesota Twin Cities campus. The course, Introduction to Vocational and Technical Teaching is the first of five required courses in the Technical Education Series (TES) required to meet postsecondary teacher certification requirements. Technical colleges offer courses and programs that teach specific knowledge and skills leading to specific jobs. Community colleges provide a start towards a bachelor's degree or completion of a two-year associate degree. Minnesota's state universities offer courses and programs leading to bachelor's, master's, and advanced degrees.

Names and addresses were obtained from the Office of Professional Development and Outreach (OPDO) at the University of Minnesota Twin Cities campus. Only those teachers who indicated on their registration form approval to release their names and addresses were part of the initial population. Four hundred twenty teachers who completed Introduction to Voca-

tional and Technical Teaching provided approval for release of their name and addresses. Limitations of this study included: (a) the population is not a representative sample of the United States, (b) not all teachers completing Introduction to Vocational and Technical Teaching between 1995 and 1999 provided approval for release of their name, thus they were not included in the initial population, and (c) phone numbers were not available, so telephone follow-up was not feasible for non-respondents.

The initial mailing was sent in January 2000, with two follow-up mailings sent in February and March 2000. Sixteen surveys were returned non-deliverable or with incomplete information. For surveys returned non-deliverable a more current address was located and sent a second time. Data from respondents are self-reported and are based upon respondents feelings and perceptions of themselves. The actual number of returned and useable surveys was 135 for a return rate of 32%.

Instrumentation

The survey developed for this study employed items used in an earlier study by Chapman and Lowther (1982), and Chapman and Green (1986). Additional questions were developed to obtain responses related to the quality of teacher preparation. The survey consisted of five sections. Section one educational preparation and section five demographics, related to Chapman's model of personal characteristics, educational preparation and initial commitment to teaching. Section two, teaching experience related to Chapman's quality of first teaching experience. Section three, skills and abilities related to Chapman's social and professional integration into teaching. Section four, institutional factors related to external influences (e.g. environmental conditions). Survey questions included: (a) open-ended, (b) close-ended with ordered choices, (c) close-ended with unordered response choices, and (d) partially close-ended (Dillman, 1978). Each of the questions asked in the survey fit into one of the four categories. The open-ended question asked

participants to identify their professional goals for the next five and next 10 years.

Members of the Council for the Study of Community Colleges (CSCC) reviewed and validated the survey. These experts were asked to make recommendations for improving, adding, or deleting any survey items. In addition, the Office of Measurement Services at the University of Minnesota Twin Cities campus reviewed the survey providing additions and deletions and recommendations on the format of the survey. Recommendations from the reviewers were added to the final survey document.

Data Analysis

Data analysis determined whether the two groups (those who choose to leave and those who remain in the profession) differ in their attitudes toward a variety of measures. For research questions one through four, significant differences were tested using the Mann-Whitney U test to contrast those who choose to leave and those who remain in the profession. The value for statistical significance was set at the $p < .05$ for all statistical comparisons. Participants who did not respond to a specific question were not included in the statistical comparisons for that question.

The significance test used here, the Mann-Whitney *U* statistic, is mathematically equivalent to the Wilcoxon rank-sum test (Howell, 1997). Both are distribution free tests for statistical significance and do not utilize means, medians, modes, or standard deviations in the computation of the *U*-value. This means that the *U* test will work with any distribution. Howell suggests that the test may be testing differences in central tendency at times, but because we gain freedom of assumptions we loose the specificity of the difference that we are actually testing. A significant value via the U test, then, does not tell us the way that the data for the two groups differ, but merely that they do differ in a fashion that is unlikely attributable to chance. Con-

cerning the descriptive statistics reported in this study, medians and/or modes are often the most appropriate description of ordinal data such as that found in this research. But, because means and standard deviations are more familiar to most, they are used to describe the data sets here and are reported in the subsequent tables.

Findings

The primary purpose of this study was to identify factors that influence teacher turnover (leavers) and retention (stayers) of technical college teachers in southwestern Minnesota. For the purpose of the findings reported in this study, stayers are defined as teachers who entered the teaching profession and are still teaching. Leavers are defined as teachers who taught at least one year and then choose to leave the teaching profession. Table 1 provides the respondents demographics, and Table 2 provides the number of respondents by year and area of certification. The majority of respondents completed the initial Technical Education Series (TES) course in 1999.

Eighty percent of the respondents had five years or less total technical college teaching experience. Within this group, 58% of the respondents each had over 15 years of business and industry experience, 28% of the respondents had 6 to 15 years of business and industry experience, and 10% had five years or less of business and industry experience. (Four percent of the respondents did not provide a response to this question.) Respondents identified their career goals in the next five years to include continue teaching (19%), complete a bachelor's degree (12%), and enhance their teaching skills and pursue and/or complete a master's degree (10%). The most frequent career goal for the next ten years was to pursue a master's degree (10%). Other goals for the next ten years with nine participants or less each identifying the goal included: develop curriculum, continue to teach, obtain an administrative position, pursue a doctorate degree, and retire.

Research question 1 asked, "Is there a statistically significant difference in commitment to teaching between teachers who choose to leave and those who remain in the profession?" Teaching commitment was measured as: 1 = extremely committed, 2 = above average commitment, 3 = some commitment, or 4 = no commitment. The mean score (with standard deviations in parentheses) for those choosing to leave was 2.10 (.99),

Table 1
Respondents' Demographics

Category		Percentage
Gender		
	Male	53
	Female	46
Age		
	30 years or under	6
	31-40	34
	41-50	47
	50 or above	13
Education		
	Associate degree	7
	Bachelor's or post-baccalaureate	39
	Master's	11
	Doctorate	4
	Non-degree/licensure only	39

and for those remaining in the teaching profession was 1.54 (.65). The *U* test revealed a statistically significant difference ($p = .004$) between those choosing to leave and those remaining in the teaching profession.

Research question 2 asked, "Is there a statistically significant difference in perception of first-year teaching experience

between teachers who choose to leave and those who remain in the profession?" First-year teaching experience was measured as: 1 = extremely positive, 2 = very positive, 3 = positive, 4 = somewhat positive, and 5 = poor experience. The mean score (with standard deviations in parentheses) for those choosing to leave was 1.57 (.63), and for those remaining in the profession was 1.63 (.63). The *U* test revealed a statistically significant difference ($p = .035$) between those choosing to leave and those remaining in the teaching profession.

Research question 3 asked, "Is there a statistically significant difference in self-assessed skills between teachers who choose to leave and those who remain in the profession?" Respondents were asked to self-rate their current skill level. Skill level was measured as: 1 = very poor/nonexistent, 2 = poor, 3 = fair, 4 = good, 5 = excellent. The independent variables were identified from Chapman and Lowther's (1982) survey, literature review, and CSCC reviewers. Significant differences were

Table 2
Respondents by Year and Certification Area

Year	Total Sample	Total Respondents	Ind Ed	Hth	Bus Mkt	FCS	Gen Ed.	Agr	Other
1995	113	27	14	4	3	2	1	0	3
1996	57	15	5	3	2	0	2	0	3
1997	90	25	10	9	1	2	0	1	2
1998	92	30	14	6	3	3	1	2	1
1999	68	38	11	11	7	2	2	3	2
Total	420	135	54	33	16	9	6	6	11

Note: Ind. Ed. (Industrial Education), Hth. (Health), Bus. Mkt. (Business and Marketing), FCS (Family and Consumer Sciences), Gen. Ed. (General Education), and Agr. (Agriculture).

reported for practical experience in the teaching area ($p = .021$). Table 3 illustrates the means (with standard deviations in parentheses) between the two groups of teachers (those choosing to stay and those remaining in the profession) on the perception of their own skill level.

Research question 4 asked, "Is there a statistically significant difference in willingness to continue teaching between teachers who choose to leave and those who remain in the profession?" Participants were asked to self-rate each item as to its importance in determining their willingness to continue teaching. Willingness to continue teaching was measured as: 1 = not important, 2 = somewhat important, 3 = very important, 4 = extremely important. The independent variables were identified from Chapman and Lowther's (1982) survey, literature review, and CSCC reviewers. There was no significant difference reported for the 17 independent variables by the two groups of teachers (those choosing to leave and those remaining in the teaching profession) and perception of their own willingness to continue teaching. Table 4 illustrates the means (with standard deviations in parentheses) for the 17 independent variables.

Research question 5 asked, "What factors influence a technical college teachers' decision to leave the teaching profession?" Respondents were asked to check more than one reason, if applicable. Reasons identified for leaving the teaching profession are provided in Table 5. The reasons cited most often for leaving the teaching profession were perceived limit on salaries and program/teaching position ended with 29% of those leaving selecting these reasons.

Discussion

The primary purpose of this study was to identify factors that influence the turnover (leavers) and retention (stayers) of technical college teachers. This study revealed significant differences between those choosing to leave and those remaining

Table 3
Differences Between Two Groups of Teachers and Perception of Skill Level

Skills	*Mean (SD)*		*U* test
	Leavers	Stayers	*p*-values
Written communication skills	4.17 (.60)	4.10 (.74)	.759
Oral communication skills	4.38 (.68)	4.26 (.64)	.332
Organization and planning	4.03 (.68)	4.05 (.82)	.832
Function within a team environment	4.28 (.75)	4.27 (.71)	.925
Supervision and leadership	4.17 (.85)	4.21 (.66)	.925
Analysis and evaluation of ideas and presentations	4.07 (.80)	4.16 (.70)	.586
Development of new approaches to problems	4.17 (.85)	4.07 (.72)	.455
Persuasion of others to accept your ideas	3.83 (.66)	3.82 (.76)	.966
Involvement with long-term projects	3.69 (.66)	3.85 (.85)	.214
Conflict resolution	3.93 (.92)	3.84 (.72)	.382
Integrate technology into the curriculum	4.03 (.91)	4.15 (.84)	.550
Knowledge of curriculum development	3.59 (.73)	3.74 (.82)	.342
Knowledge of teaching methodologies	3.55 (.74)	3.65 (.74)	.516
Practical experience in teaching area	3.72 (1.03)	4.20 (.89)	.021

Note: The values are significant at the $p < .05$. Leavers $N = 31$, Stayers $N = 104$.

Table 4
Differences Between Two Groups of Teachers and Perceptions of Willingness to Continue Teaching

Continue Teaching	*Mean (SD)*		*U* test
	Leavers	Stayers	*p*-values
Positive teaching experience	3.46 (.65)	3.51 (.61)	.746
Currency of cooperative learning techniques	2.75 (.79)	2.80 (.77)	.956
Professional growth and development opportunities	3.23 (.65)	3.21 (.78)	.951
Participation in professional associations	2.31 (.97)	2.50 (.92)	.369
Inner sense of knowing I'm doing a good job	3.77 (.43)	3.69 (.49)	.451
Availability of induction/ mentoring program	2.80 (.71)	2.67 (.91)	.532
Recognition by supervisors/ administrators	2.81 (.94)	3.02 (.78)	.307
Recognition by peers	3.00 (.80)	3.01 (.79)	.879
Recognition by students	3.27 (.72)	3.45 (.70)	.202
Approval of family and/or close friends	2.46 (.95)	2.75 (.88)	.143
Adequate time to complete job responsibilities	3.54 (.51)	3.46 (.66)	.783
Pleasant working conditions	3.35 (.75)	3.40 (.65)	.831
Quality and quantity of resources available	3.54 (.51)	3.38 (.60)	.269
Chance to contribute to important decisions	3.38 (.64)	3.13 (.74)	.118
Leadership opportunities	2.88 (.82)	2.87 (.84)	.937
Perception of job security	3.08 (1.09)	3.24 (.82)	.764
Potential for salary advances	3.23 (.71)	3.34 (.70)	.431

Note: Leavers $N = 31$, Stayers $N = 104$.

in the teaching profession for teaching commitment level (p = .004), and perception of first-year teaching (p = .035). Teachers staying in the teaching profession, typically have a higher degree of commitment to teaching versus teachers who were considering to leave or had left the teaching profession. Teachers who had left the teaching profession rating their first-year teaching experience more positive than teachers currently in the teaching profession. This finding is of interest since it appears that teachers who left the teaching profession did not leave as a result of their first-year teaching experience. One of the 14 skills, practical experience in teaching area (p = .021) revealed significant difference. There was no significant difference between the 17 factors listed as important to determine a teacher's willingness to continue teaching.

There is modest support for Chapman's model. Teachers in this study differed on commitment to teaching and first-year teaching experience which is consistent with research previously conducted by Chapman (1983, 1984, and 1986). However, no significant difference was found on 30 of the independent variables related to skills and willingness to continue teaching.

It is important to note that the reasons teachers left the teaching profession are not all inclusive. From the 31 respondents who left teaching, only eight of the respondents identified "other" reasons in addition to the eleven reasons listed on the survey. Other reasons identified included lack of support from administration and department, obtained other position, lack of resources, and pressure to increase enrollment. With career opportunities from business and industry, it is not uncommon for teachers to leave the teaching profession to obtain other positions. The majority of respondents (58%) indicated they had over 15 years of business and industry experience. The other reasons identified indicate the importance of a work environment and resources a teacher needs to do the job required in today's educational environment.

Table 5
Reasons Left Teaching Profession

Reasons Identified	Number of Respondents	Percentage
Perceived limit on salaries	9	29
Program/teaching position ended	9	29
Institutional climate	7	23
Additional time commitments outside of teaching	7	23
Licensure requirements	5	16
Lack of job security	5	16
Lack of job advancement	4	13
Lack of support from administration, department	4	13
Lack of teacher preparation training	3	10
Classroom management issues	3	10
Decided teaching wasn't for me	2	6
Job related stress	2	6
Obtained another position	2	6
Lack of resources	1	3
Pressure to increase enrollment	1	3

Note: Reasons are listed in order of frequency reported.

Findings from this study provide modest support for Hans (1994), Pucel, Sonnach, and Obok (1992), and Pucel and Kaynes (1989) research that identified higher salaries, work environment, stress, co-workers, and job change as reasons teacher's left the teaching profession. Leavers from this study identified limit on salaries (29%), institutional climate (23%), classroom management issues (10%), job-related stress (6%) and decided teaching wasn't for them (6%) as reasons for leav-

ing the teaching profession. Leavers indicated their career goals for the next five and 10 years were to pursue and/or complete a bachelor's or master's degree. The other reasons identified, as discussed previously, support the importance of an awareness of one's work environment and the factors that may influence a teacher's decision to leave the teaching profession.

Implications for Future Practice

Based upon the findings from this study, there are implications for future practice. One implication is to improve the quality of first-year teaching experience for new teachers. Teachers identified work environment and other external factors as reasons for leaving the teaching profession. The work environment factors identified included lack of job security, job advancement, support from administration or department, resources, and teacher preparation; classroom management issues; and job related stress. External factors identified included salaries, additional commitments outside of teaching, and licensure requirements.

Those responsible for hiring teachers should look for teachers who bring more experience to the teaching profession. Significant difference was reported by teachers who remained in the teaching profession for practical experience in the teaching area. A teacher's overall commitment to teaching is likely to increase based upon the practical experience they bring to the teaching profession.

Recommendations for Further Research

Further research needs to be conducted to identify other factors related to a teacher's decision to leave the teaching profession. Factors identified by respondents for leaving the teaching profession included lack of support from administration, lack of resources, institutional climate, and lack of job security. These factors are related to environmental conditions and events as discussed in Krumboltz (1979) social learning theory of career selection, and social and professional integration and

external influences presented in Chapman's (1983, 1984) retention/attrition model.

Further research should also be conducted to compare the perception of skill level that teachers may need to have that seems to be important, according to the findings from this study, in order for them to continue teaching for each of the technical college teaching certification areas (e.g., agriculture, business and marketing, family and consumer sciences, and industrial education).

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Author

SHEILA K. RUHLAND is Assistant Professor, Department of Work, Community and Family Education, University of Minne-

sota, 1954 Buford Avenue, St. Paul, MN 55108. [E-mail: ruhla006@umn.edu]. Her research interests include two-year technical and community colleges, teacher retention, evaluation and assessment, and Tech Prep education programs.

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Judgment of Factors Influencing Interest: An Australian Study

James A. Athanasou
University of Technology, Sydney, Australia

Ray W. Cooksey
University of New England, Australia

Abstract

The purpose of this study was to investigate factors that influence interest in vocational education subjects. The 20 factors that were investigated related to the course, ability, difficulty, relevance or importance of a subject, the quality of teaching, student effort, career and vocational interests, as well as demographic factors. The source data used in the study comprised 120 previously obtained student scenarios. Participants (N=18) from technical and further education acted as judges. They read the information in each of the scenarios and were asked to judge how interested they would be in taking the vocational education subject described. The multiple correlation of the 20 items in each scenario with ranked interest was 0.84 yet the median correlation of judgments was only 0.305. Overall, career interests were rated more importantly than other factors. Results confirmed the idiosyncrasy of interest perceptions and it was concluded that individual differences have an impact on the ways in which people determine their interest for learning.

This paper focuses on the area of educational interest and the specific purpose of this study is to determine which factors might influence a person's interest in a vocational education subject. Interest is a meaningful field for practical as well as

theoretical research and as far back as 1913, it was emphasised by Dewey as important for learning. Earlier work has related interest to topic recall (Renninger, 1992) as well as educational achievement (Schiefele, Krapp & Winteler, 1992; Athanasou, 1994) but has not focused upon factors influencing interest.

Components of Interest

Any applied investigation of interests might build usefully upon a range of modern German theories that have direct relevance for vocational learning (Athanasou, 1998a). These approaches view interest as a construct that characterises a person's special relationship with content, topics, subjects or a domain. A distinction is made between (a) individual interests that are content specific and an enduring characteristic of a person's behaviour, and (b) those situational factors that promote attention, arousal or the development of specific interest. Figure 1 provides a tentative model that incorporates those factors relevant to this study.

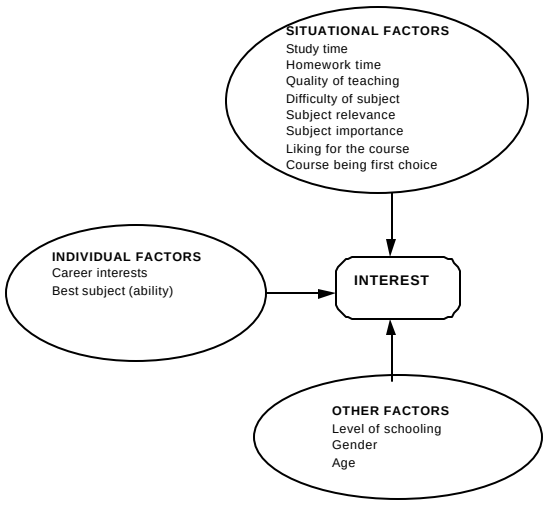

Figure 1. A tentative model of individual, situational, and other factors affecting subject interest.

Some of these individual and situational interest factors were investigated in a study of 940 technical and further education students from some 20 colleges and 60 courses (Athanasou, 1998b). They included, amongst others, the importance of the subject, the relevance of the course to students, whether it was their best subject, their easiest subject, the quality of teaching, the amount of time spent on homework and time spent studying. In addition to these factors, social and demographic variables together with vocational interests and course preferences were also investigated. Results indicated that there were no effects of gender, age, mode of study (part time or full time) on the extent of subject interests. Rankings of interest were, however, related more to factors such as the best and easiest subjects, the most relevant and most important subjects and to a lesser extent, quality of teaching, study and homework time.

The present study is an extension of this research and now considers how individuals might determine their interest in a subject. It investigates which factors a person considers important when he/she decides how interested they are in a subject. It was hypothesised that on the basis of the earlier findings, people will probably give greater emphasis to factors such as importance, relevance or being best at a subject.

The practical importance of the study arises from the fact that if we know which factors affect a person's interest then it may enable us to manage classroom learning, and to maximise student motivation or to better advise students about their course and career options. While previous research (Athanasou, 1994; 1998b) focused on large-scale surveys, it is not clear to what extent these findings can be applied to individual students. This study focuses on the intensive study of an individual and represents the application of judgment analysis to the topic of interest. In 1968, Snow advocated an approach to research on teaching that called for analyses of individual rather than group classroom behaviours (Snow, 1968). This emphasised multiple

sampling within an individual as opposed to sampling of multiple individuals. It represents a powerful design and contrasts sharply with group studies, which are popular in modern research but which cannot describe the behaviour of a single person or produce results that are transferable to new situations. The following section outlines some aspects of judgment analysis and the design of the study.

Judgment Analysis

Within these single person approaches, judgment analysis provides an ideal experimental basis for the investigation of decision making in a real situation (Cooksey, 1996). It permits a description of which factors are affecting a judgment and also enables a comparison between the judgments of an individual and a criterion. Judgment analysis breaks down human deci-

STUDENT PROFILE No. **0560** JUDGMENT No. ***82***

Course
1. Was this course your first choice? [ ] Yes [?] No
2. How do you feel about the course? [ ] Like [?] In-between [ ] Dislike
3. How many subjects are you studying this semester? [**6**]

Subject
4. Is this the most relevant subject, second or third most relevant etc? [**4**]
5. Is this our easiest subject, second or third most easiest etc? [**5**]
6. Is this your most important subject, second or third most important etc? [**2**]
7. How would you rate the quality of teaching? Best, second, third best etc? [**2**]
8. Is this your best subject, second or third best etc? [**3**]
9. How much time does this subject take for studying, revising (e.g., for tests, exams)? Most second most, third most etc? [**3**]
10. How much time does this subject take up for homework, assignments, projects etc.? Most second most, third most etc? [**2**]

Career and Work Interests
These work interests are numbered from 1 to 7, with 1 for the first choice, 2 for the second choice and so on up to 7 for the last choice.

11. Outdoor/Nature/Recreation [**4**]
12. Practical/Mechanical [**6**]
13. Scientific/Analytical [**7**]
14. Creative/Artistic/Literary/Musical [**3**]
15. Business/Persuading/Enterprising [**2**]
16. Office/Clerical/Administrative [**1**]
17. People Contact/Helping/Advising [**5**]

Other Details
18. Highest level of schooling completed? Year [12]
19. Other qualifications [ ] Trade [?] Certificate [ ] Diploma [ ] Degree [ ] Other
20. Age group: [ ] 15-19 [?] 20-24 [ ] 25-34 [ ] 35-44 [ ] 45-54 [ ] 55-60 [ ] 60+
21. [?] Male [ ] Female

Figure 2. A sample scenario of information about an actual student and the technical and further education subject they were studying.

sions into their components and some aspects of this approach are described in the following paragraphs.

Assume for a moment that we present repeated scenarios of information about a student and their response to a subject that they are studying to a judge (a sample scenario of information is depicted in Figure 2). Given the background information contained in the scenario, the judge is asked how interested he or she would be in studying a particular subject. Since each scenario contains the same set of items or cues for judgment, it is then possible to analyse which items are important to the judge and we can even decompose their judgment into several components. If the scenarios we used for the judgment analysis are taken from real students then the design of the study is representative. We are able to make generalisations to other situations or scenarios for this particular judge, but of course we would not make generalisations to other people. This whole approach was derived from the analysis of perceptions (Brunswik, 1956).

The astute reader might ask why we do not ask people which factors are most important to them in deciding whether they are interested in a subject. This was done already in the study referred to earlier (Athanasou, 1998b) and it was noted that the most important factors were subject specific factors, such as ability, difficulty, relevance, importance quality of teaching etc. The results of this earlier study, however, did not tell us which factors were consistently important to a particular person across many different subjects. Judgment analysis describes someone's decision making across a range of representative situations by asking them to place themselves in each scenario and to make a judgment about how interested he or she might be in taking a particular subject. The situation is certainly contrived but at the same time it is reasonably representative and there are precedents for this approach (see Athanasou, 1998c; 1999).

Furthermore, if we knew at the outset how much the person

depicted in the scenario was interested in their subject, then we would also be able to make comparisons between the judge's judgments across many scenarios and the interest in each of those scenarios. It is then possible to formulate an identity:

$$r_a = GR_eR_s + C\sqrt{(1-R_e)^2}\ \sqrt{(1-R_s)^2}$$

where:

r_a = the achievement index (i.e., the correlation between a judge's estimate and the ranked levels of interest for all scenarios)

R_e = the predictability index (i.e., the multiple correlation of the items with the ranked level of interest for all scenarios)

R_s = cognitive control (i.e., the multiple correlation of the items with the judge's estimate for all scenarios)

G = a knowledge index (i.e., the correlation between the predicted levels of interest and the predicted judgments for all scenarios)

C = an unmodeled knowledge (i.e., the correlation between the residuals from the above predictions).

Hursch, Hammond and Hursch (1964) developed this identity (subsequently simplified by Tucker, 1964) in which it is assumed that achievement (i.e., judgment performance) is equal to knowledge times task predictability times cognitive control plus an unmodeled component.

In this study we obtained 120 scenarios from a group of vocational education students. These scenarios contained 20 cues or items of information about each student and his or her ranking of some features of the subject described in the tentative model of interest (see Figure 1). The cues or items of information were derived from the earlier study on interest (Athanasou, 1998b). They can be categorised broadly and tentatively as (a) those which are pertinent to individual interest and which are

evaluative as well as relatively enduring in nature (see Schiefele & Krapp, 1996); (b) those which are pertinent to the situation, such as subject importance or subject relevance, quality of teaching etc. (see Hidi, 1990); and, (c) those factors which are demographic, such as level of schooling, age or gender, and which in previous studies have been seen to circumscribe interest to some extent (see Gottfredson, 1996).

For each student and scenario, however, there was also a criterion measure or outcome. In this study, the criterion was unknown to the judge but was known to the researchers. The criterion was the subject's interest ranking by the person described in each scenario. (The ranking was converted to a common measure (see Athanasou, 1994). For instance, if a person was studying four subjects in their course last semester then they were asked to rank the specific subject in terms of how interesting it was for them out of all the four subjects that they studied.) These multiple scenarios are presented to a separate group acting as judges and from this it is possible to describe the features of each person's judgments that are summarised in the judgment analysis equation.

This description is done statistically because each judge makes repeated judgments that can be analysed as a quantitative case study. In effect, it is an intensive study of a person across repeated situations. The equation indicates the components or decomposition of the judgment. We use multiple regression techniques to determine which cues or items were relied upon to make judgments and achievement (r_a) indicates the correlation between each person's judgments and the criteria (i.e., the subject interest rankings). A powerful feature of the equation is that it forms an identity in which one's perception of reality can be equated with a subset of its components (G, R_e, R_s, C) that are described above. It is recognised that this model and approach may be unfamiliar to many readers.

It allows one to consider judgments from two perspectives. Firstly, we can consider how judges made use of the different

cues or items of information in each scenario (these are the correlations between each cue and the repeated judgments). Secondly from the judge's perspective we can consider his/her overall use of the cues and make some predictions using multiple regression about what might have been his/her judgment. We can determine the residual between the actual judgment and a predicted judgment. This is called their cognitive control over the judgment process (R_s).

In addition to analysing the person's judgments or perceptions we also have detailed knowledge about the scenario. From the outset we had 120 scenarios containing items of information and the interest rankings of the persons described in the scenarios. This means that we knew the correlation between each item of information and interest in the subject. The multiple regression between the cues and these 120 criteria can be studied to determine which factors are really important from the outset. Knowledge (G) reflects the understanding of the task requirements (i.e., the correlation between predicted judgments and predicted criterion). Task control (R_e) is the correlation between the actual criterion and estimated criterion scores and reflects the upper limit of a person's potential judgment achievement (i.e., predictability).

Research Questions

Using judgment analysis it is possible to describe how a person might go about deciding that they are interested in learning. This paper reports a detailed analysis of how 18 judges reacted to situations and each of these judges is a separate study of the factors that might potentially influence interest in vocational education. From both a theoretical and practical perspective it is important for us to know what factors are linked with interest. In this study the research questions were: (a) how does a person estimate his/her interests; and (b) which factors does he/she take into account when determining interest in technical and further education?

Method

Participants

The judges for this study comprised 20 technical and further education students (7 males; 13 females) who ranged in age from 15 to 60 years and comprised 17 full time and three part time students. Most (*N*=16) had completed the highest level of secondary schooling and 10 had previous educational qualifications (3 certificate; 2 diploma; 5 degree). Results from two judges were discarded because they had difficulty with the task and consistently made judgments out of the permissible range.

Procedure

The study was conducted through the Sydney Institute of Technology. Permission to conduct the research was obtained from the Director of the Institute who arranged for an outline of the study to be provided to potential participants. Participants were advised that involvement was voluntary and confidential and that no names would be recorded. To encourage a high quality of data collection and accuracy, judges were offered two movie tickets for participating. Participants made appointments and the study was conducted off-site and with groups of varying size at the adjacent University of Technology, Sydney. No claim is made for the representativeness of the sample.

Instrument

Judges were handed a pre-printed book containing 120 scenarios of students who had completed surveys as part of the study by Athanasou (1998). Identifying details were deleted from the surveys. The surveys (*N*=120) were randomly selected from the 940 in that earlier survey.

Judges made 120 judgments of the level of interest after looking at each profile of information. They were asked to rank how interested they would be in this subject out of the total number of subjects studied. This provided a ranked estimate of interest. Judgments were then compared with the ranking of in-

Table 1
Correlations and Standardised Estimates Between Interest and 20 Independent Variables (Cues) in the Ecology (N = 120)

Cue	Correlation with interest (cue validities)	Standardised estimates
Whether course was first choice	.146	-.075
Whether the student liked the course	.217*	.059
Relevance of the subject	.459**	-.045
Whether it was their easiest subject	.558**	.286[a]
Whether it was their most important subject	.321**	.199[a]
Quality of teaching	.243**	-.177[a]
Whether it was their best subject	.719**	.613[a]
Amount of study time relative to other subjects	-.004	.157
Amount of homework time relative to other subjects	-.099	-.225[a]
Career interest: Outdoor	-.042	.136
Career interest: Practical	.132	.251
Career interest: Scientific	-.064	.011
Career interest: Creative	-.372**	-.066
Career interest: Business	.185*	.110
Career interest: Office	.184*	.041
Career interest: People Contact	-.089	.145
School Level	.164	.042
Other qualifications	-.075	-.057
Age	-.145	-.022
Gender	.161	.001

*$p<.05$; **$p<.01$; [a] t-value (b = 0) $p<.01$

terest stated by the original student in each scenario.

Judgment Analysis

Prior to analyses of individual judgments, the validity of each of the 20 cues for the 120 profiles was determined. The

multiple correlation of the 20 cues with actual interest was 0.84 indicating a relatively high degree of task structure in the prediction of interest. The correlation coefficients between each cue and the ecological criterion, subject interest, are indicated in Table 1 together with the standardised estimates (beta weights). Looking at the standardised estimates (Table 1), the easiest subject, quality of teaching, best subject, homework time and the importance of the course were amongst the most important predictors of interest. The regression coefficients were considered because they indicated the standardised amount by which interest would vary if an item increased by one standardised unit while simultaneously holding all other values constant. (The pre-printed book of 120 profiles, the matrix of cue correlations, the cue validities for each person, and the relative beta weights are available from the authors upon request.)

Reliability

To check that judges were making consistent decisions, 20 out of the 100 scenarios were randomly selected then added as repeat tasks. Test-retest correlations of these scenarios (see the last numerical column in Table 2) with the original 20 were computed in order to determine if each judge was consistent in his/her decisions. Consistency in judgments varied markedly from 0.023 to a maximum of 1.0 in this group (median = 0.669).

Analysis

The analysis of the judgments was undertaken for *each individual* using the judgment analysis equation as the framework. The multiple regression of the 20 cues on judgments of interest was calculated together with the additional indices, cognitive control, knowledge and task control. The results are reported in several stages. Firstly, the judges' responses are considered individually then overall judgment policies are described. Full details of the analysis are provided in the results

section.

Results

At the outset, it should be noted that the judges in this study were operating in a reasonably predictable environment (R_e= 0.84) but one in which none of the 20 items by itself would permit optimal prediction. A complex combination of cues (especially best subject, easiest subject, homework time, importance, quality of teaching,) was required to maximise achievement (r_a). Each judge's performance, however, really needs to be described on its own and the individual judgment analysis indices are reported in Table 2.

How did People Estimate their Interests?

Taking Judge A as an example for individual interpretation, it can be seen that this person's level of achievement in the judgment task was low (r_a = 0.32) but that the level of cognitive control over his/her judgments was extremely high (R_s = 0.997). The judge was only moderately aware of the requirements of the task (G = 0.379) and the unmodeled component of his/her knowledge was close to zero (C = 0.059). He/she was remarkably consistent or stable in the pattern of judgments (test-retest reliability = 0.995). Similar individual explorations can be made for each judge to describe their response.

For instance, Judge C had the lowest level of achievement in judgments (r_a = 0.005) and the level of cognitive control (R_s = 0.533) over his/her judgments was much lower than Judge A. This judge had minimal knowledge of the requirements of the task (G = 0.016) and the unmodeled component of his/her knowledge was also close to zero (C = -0.004). Nonetheless he/ She was quite stable in the pattern of judgments (test-retest reliability = 0.974). Table 2 provides only a quantitative summary of the judgment analysis and the remaining judges can be characterised in a similar fashion.

Table 2
Summary of Lens Model Parameters

Judge	Judgment performance R_A	Task predictability R_E	Cogni-tive control R_S	Know-ledge G	Un-modeled component C	Test-Retest Correlation	Most important relative cues[a]
A	.320	.84	.997	.379	.059	.995**	Importance
B	.563	.84	.800	.806	.062	.346	Office
C	.005	.84	.533	.016	-.004	.974**	Relevance, Importance, Study, Homework
D	.294	.84	.642	.568	-.030	.377	Importance,
E	.474	.84	.816	.624	.148	.023	Relevance, Easiest subject, Homework
F	.435	.84	.982	.538	-.095	1.000**	Relevance
G	.404	.84	.881	.512	.098	.861**	Relevance
H	.317	.84	.626	.672	-.088	.266	Relevance, Teaching quality, Homework, Practical
I	.554	.84	.86	.800	-.090	.550**	Best subject
J	.290	.84	.818	.476	-.120	.807**	Importance
K	.238	.84	.724	.321	.114	.634**	Outdoor, Practical, Scientific, Creative, Office
L	.356	.84	.654	.453	.261	.194	Practical, Scientific, Creative, Office, People
N	.028	.84	.494	-.029	.087	.227	Practical, Scientific

Table 2 (continued)
Summary of Lens Model

Judge	Judgment performance R_A	Task predictability R_E	Cognitive control R_S	Knowledge G	Unmodeled component C	Test-Retest Correlation	Most important relative cues[a]
O	.185	.84	.629	.326	.030	.322	Creative, People
P	.232	.84	.573	.304	.193	.723	Outdoor, Practical, Scientific, Creative, Business, Office, People
R	.223	.84	.796	.340	-.014	.704**	Outdoor, Practical, Scientific, Creative, Business, Office
S	.219	.84	.883	.328	-.097	.856**	Outdoor, Practical, Scientific, Creative, Business, Office, People
T	.377	.84	.875	.484	.082	.913**	Outdoor, Scientific, Creative, Business, Office, People
Median	.305	-	.798	.464	.044	.669	

*only cues with relative weights>0.1 are listed; participants M and Q excluded from calculations.

Overall Responses

The correlations (r_a) of judgments with interest varied from 0.005 to 0.563 (median=.305) and there was marked variability in their capacity to judge the level of interest (see Table 2 for the individual indices and the first column for the values of r_a). A combination of cues was used to make judgments as indicated in the multiple correlations (R_S) in Table 2, of around 0.798 (range 0.494 to 0.997). This multiple correlation between cues and judgments was high, but the degree of knowledge of the environment varied from one judge who had negative knowledge of the environment (-0.029) to other judges who had high levels of knowledge (0.806).

Which Factors did People Take into Account when Determining their Level of Interest in Technical and Further Education?

Judges differed in the extent to which they placed their emphasis on different cues. This is seen in the relative beta weights, which represent the proportion of the total of the absolute values of the beta weights. Relative beta weights permit a simple proportional explanation for cue emphasis, for example, a relative weight for a cue of 0.2 would suggest that a judge placed 20% of all cue weight on that cue (see Cooksey, 1996, pp.168-170 for a discussion of relative beta weights). To assist the reader, medians of the relative beta weights are reported in the final column of Table 3 and these indicated that judges placed relatively greater emphasis for themselves on vocational content (i.e., the career interest area) followed by whether a subject was their best subject, the importance of the subject and its relevance.

Discussion and Conclusions

This study considered the separate interest judgments of vocational education using a representative experimental design. The findings indicated that personal judgments of vocational educational interest are based firstly on individual factors

Table 3
Median Relative Beta Weights of the 20 Items of Information in Each Scenario

Cue	Median Relative Beta Weights of Cues
Whether course was first choice	0.024
Whether the student liked the course	0.027
Relevance of the subject	0.029
Whether it was their easiest subject	0.017
Whether it was their most important subject	0.030
Quality of teaching	0.016
Whether it was their best subject	0.033
Amount of study time relative to other subjects	0.013
Amount of homework time relative to other subjects	0.027
Career interest: Outdoor	0.060
Career interest: Practical	0.083
Career interest: Scientific	0.069
Career interest: Creative	0.051
Career interest: Business	0.032
Career interest: Office	0.081
Career interest: People Contact	0.070
School Level	0.010
Other qualifications	0.012
Age	0.012
Gender	0.015

such as career interests rather than on contextual/situational or extraneous factors. The most popularly used cues by judges were by far the career interests, followed by ability then factors such as importance and relevance.

Of course, the emphasis on career interests may be a feature of technical and further education in Australia, which is largely adult and vocational in orientation from trade to graduate level. The results may need to be replicated for other educational contexts. For instance, it is difficult to imagine how career bases for judgments of interest could be applied to the developing interests of children in elementary schools. Another feature of the judgments was that they did not reflect classroom factors; for example, quality of teaching was not considered most important for the level of interest. This may be intriguing for some readers but it is consistent with two separate and earlier studies of Athanasou (1994, 1998b) in technical and further education. It may reflect the situation, that for the most part vocational education teaching is of reasonably uniform quality and usually rated highly by students (see Athanasou & Petoumenos, 1998).

Analysis of the relative cue weights indicated a plethora of judgment policy combinations and confirmed idiosyncrasies in perceptions relating to the judgment of interest in vocational education subjects (cf. Athanasou, 1998b). It was difficult to discern any unequivocal or unique strategy that represented the judgment policy used to decide interest. The best that can be said is that students largely ignored the following factors: whether the course was the person's first choice; whether they liked the course; teaching quality; study time and homework times; level of schooling; other qualifications; age and gender. Such individual variations in judgment ability may have an impact for teachers in their reactions to students.

Results confirmed the emphasis that needs to be given to some factors when career interests are held constant. In particular, factors such as relevance, importance and ability may prove to be useful predictors once we know that a person's career in-

terest has been satisfied.

In essence, the judges represented 18 separate studies in which the findings did not support a uniform pattern of decision making when it came time to decide about one's vocational education interests. The actual sample in this study is not the 18 judges but the 120 scenarios that represented vocational education situations. Accordingly, one limitation of this study is the extent to which these 120 scenarios are truly representative of vocational education subjects. A further limitation is the extent to which judges were able to cope with a decision-making task involving 20 cues or items of information. Finally there is the important issue of the extent to which the logical inference from a judge's perception based on the 120 people in the scenarios is valid and could rightly be generalised to other contexts.

This analysis of motivation in classroom contexts allowed one to distinguish between what is actually happening in situations, what participants perceived to be happening and what researchers may theorise has happened. The a priori classification of interests into individual, contextual/situational and extraneous components was clear-cut in these individuals because it was the longstanding dispositions (e.g., career interests, ability) that dominated a person's perceptions. The results of this study suggest that it will not be easy for vocational education teachers to manage or influence the perception of interest in a classroom. To a large extent, the interest of a student may be influenced well before he/she even enters a class. Certainly there is scope for further exploration of the links between individual interests and ability and it is also hoped that Snow's (1968) suggestions for individual analyses of behaviour may find ready application in further studies using judgment analysis.

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Authors

JAMES A. ATHANASOU is professor at the Faculty of Education, University of Technology, Sydney, P. O. Box 123, Broadway 2007, Australia [Email: Jim.Athanasou@uts.edu.au]. He teaches in the area of workplace issues and his research focuses on the area of educational and vocational interests.

RAY W. COOKSEY is professor in the School of Marketing and Management, University of New England, Armidale, NSW 2351, Australia [Email: rcooksey@metz.une.edu.au].

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