MEASUREMENT AND VALIDATION OF SENGE'S LEARNING ORGANIZATION MODEL IN KOREAN VOCATIONAL HIGH SCHOOLS

by

JOO HO PARK

(Under the direction of Jay W. Rojewski)

ABSTRACT

This study measured and tested Senge's fifth discipline model of learning organizations in a culturally different population, the context of Korean Vocational high schools. Participants were full-time vocational and academic teachers of 976 in public trade industry-technical and business high schools. This study includes three research focuses. First, by using exploratory factor analysis, responses from Korean vocational high school teachers to questionnaire items designed to test the theoretical constructs and indices of Senge's learning organization model were analyzed to establish a measurement model. Second, the hypothesized model was tested using confirmatory factor analysis. Thus, results provided strong evidence for the construct validity of the measurement model (i.e., instrument) to measure the learning organization concept in school contexts. Third, multi-group confirmatory factor analysis referred to the factorial invariance tests that examined how generalizable the hypothesized learning organization model was for the two different teacher groups (vocational and academic teachers). Factorial invariance was detected across the two teacher groups. Consequently, the results and findings of this study provides strong evidence that the five disciplines of the learning organization model can be operationalized, measured, and applied in Korean educational contexts. At the level of extending

and generalizing learning organization theory, the creation of a measurement model related to the idea of "schools as learning organizations" and confirmation of the generalizability of Senge's learning organization theory to culturally different organizations are important contributions to the literature on learning organizations. Results of this study support the notion that the theory of learning organization and related concepts, initially developed against the background of Western culture, can also apply to a South Korean school context which reflects Asian culture.

INDEX WORDS: Learning Organization, Schools as Learning Organizations, Korean Vocational High Schools, Exploratory Factor Analysis, Confirmatory Factor Analysis, and Multi-Group Confirmatory Factor Analysis.

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A Dissertation Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

ATHENS, GEORGIA

2006

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May 2006

ACKNOWLEDGMENTS

The completion of this dissertation resulted from the support of many people, as well as my own endeavors. I am indebted to numerous individuals for their support and assistance. First I offer my sincere gratitude and deepest appreciation to my advisor, Dr. Jay Rojewski. He graciously provided encouragement and expertise during the entire process of this study.

I am grateful for the guidance I received from my committee members, Dr. John Shell, Dr. Roger Hill, and Dr. Seock-Ho Kim. Their invaluable assistance and expertise was critical to my success. Also, I am very appreciative of the insightful comments from Dr. Wendy Ruona and Dr. Karen Watkins on the item review for my instrument development.

Special appreciation goes to the many vocational high school teachers, school administrators, and supervisors in the Offices of Education in Seoul city, Incheon city, and Gyeonggi province who assisted with the data collection for the study.

I thank my Korean colleagues in the Korean Ministry of Education and Human Resource Development, Dr. Chang Yul Byeon, Dr. Sang Jin Lee, Dr. Yung-Chul Kim, Dr. Young Jun Kim, Dr. Yu Mi Seo, Yoongsoo Park, and Changbin Yim for their lovely friendship and support to complete this dissertation. I truly appreciate the Korean-American Educational Commission for providing financial support for my study at The University of Georgia.

Finally, I dedicate this dissertation to my grandmother, parents, three brothers, and my family members (my wife, Sun Jin; my son, Dong Il; and my daughter, Su Jeong) who always provide and nurture vision, hope and love to me.

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CHAPTER 1

INTRODUCTION

Rationale

In human beings as well as in organizations, learning and change are usually inseparable; learning changes us while change requires learning. It is essential that, like human beings, organizations change over time to insure their growth and long-term survival. Organizational change is facilitated by a continual learning process that is varied and complex (Lord & Ranft, 2000; Schwandt & Marquardt, 2000). As with two faces of a coin, learning and change have been applied conceptually to all organizations, including schools. In this respect, schools are viewed as living self-made systems which continuously grow, evolve, and recreate themselves through all levels of learning (Senge, Cambron-McCabe, Lucas, Smith, Dutton, & Kleiner, 2000).

Since the early 1990s, the term *learning organization* "has become one of the new buzzwords in the management, psychology, and human resource development literature" (Garavan, 1997, p. 18). In fact, the notion of the learning organization has become increasingly accepted as an organizational development or change strategy in business and industry. The learning organization concept is currently becoming more noticeable in public or non-profit institutions such as schools, hospitals, and the military in the context of defining values, structure, and prescriptive strategies (Fenwick, 1996; Marsick & Watkins, 1999).

Today, all organizations need to deal with the constantly changing demands caused by the latest wave of information technology, increasing worker diversity, and non-traditional family structures. These and other challenges must be addressed at all levels of organizations, including

structure, systems, and cultures. “Educational systems are undergoing a period of intense transition and transformation as we enter the global market, with global information systems and an awareness of ecological interconnectedness of all natural systems” (Diggins, 1997, p. 418). The requirement of change by organizational environments calls for new ways of re-culturing and restructuring schools, since school systems should strive to be structurally effective and adaptable to rapidly changing educational environments. It is within the context of a globally changing set of demands that educators and researchers have noted the necessity and advantages of transforming schools into learning organizations (e.g., Dalin, 1996; DuFour, 1997; Fullan, 1993, 1995; Isaacon & Bamburg, 1992; Keefe & Howard, 1997; Leithwood, Leonard, & Sharrat, 1998; O’Sullivan, 1997; Redding & Kamm, 1999; Senge et al., 2000; Silins, Mulford, & Zarins, 2002; Zederayko & Ward, 1999).

Two primary strategies have emerged for applying the learning organization concept in school settings to target school change; as a school reform strategy (Duffy, 1997; Fullan, 1995; Weller & Weller, 1997) and as professional development for teachers (Dilworth & Imig, 1995; Lashway, 1998; Redding & Kamm, 1999; Waddock, 1994; Zederayko & Ward, 1999). Increasingly, attention has been given to understanding school change through the notion of learning organization in both theory and practice (Hajnel, Walker, & Sackney, 1998).

Despite a growing need, few systematic empirical investigations have examined the constructs of the learning organization concept in schools (Griego & Gerory, 1999; Silins, Zarins, & Mulford, 1998). When the proposition that schools should become learning organizations is addressed without confirmation or identification of a concrete construct or variables defining the construct, school efforts to become learning organizations exist in name only (Zederayko, 2000). In the same vein, Moilanen (2001) argued that the discussion on learning organizations has been

extensive and diversified over the past many years, whereas the efforts to diagnose and measure this concept have been rare.

More recently, a few studies have examined the dimensions and features related to *schools as learning organizations*. By synthesizing findings from three independent studies, Leithwood et al. (1998) reported the specific conditions that foster organizational learning in elementary and secondary schools. School culture (collaborative and collegial), school structures allowing active teacher participation in decision-making, and policies and resources supporting professional development were identified as school-level conditions necessary to foster organizational learning. Similarly, Marks and Louis (1999) identified five dimensions required for creating school capacity for organizational learning: (a) school structure leading to participative decision-making grounded in teacher empowerment, (b) shared commitment and collaborative activity, (c) new knowledge and skills, (d) decentralized and facilitative leadership, and (e) feedback and accountability. Through exploratory factor analysis, Hajnel et al. (1998) evaluated a scale of 15 behavior items related to organizational learning in a project identifying school improvement, school initiative, and indicators of the institutionalization of change. They identified three underlying dimensions of organizational learning in school settings: collaboration, individual learning, and a sense of vision. The first dimension, related to a collaborative process, focused on sharing professional expertise among colleagues. The second was more individually focused representing each person's willingness to engage in professional learning and growth, and to reflect on and experiment with on-going practices. The third dimension pertained to aligning activities to school mission and goals. Hajnel et al. found that leadership and organizational learning were critical to school improvement.

In a more extensive study involving South Australian and Tasmanian secondary schools, Silins et al. (1998) identified seven characteristics of *schools as learning organizations* including environment scanning, vision/goals, collaboration, taking initiatives/risk, review, recognition/reinforcement, and continuing professional development. By analyzing the responses of 2000 teachers and principals, they confirmed four of these factors for viewing secondary schools as learning organizations: collaborative climate, taking initiative and risks, improving school performance, and professional development.

While previous works exist, evidence of the constructs or variables of *schools as learning organizations* is still thin (Zedrayke, 2000). Also, the constructs examined by previous work have not been approached from the original learning organization model defined by Senge (1990) in terms of assessing the degree of model fitness to school settings. Moreover, efforts to operationally define, measure, and validate the learning organization are still rare (Moilanen, 2001). Specifically regarding the issue of measurement, Yang, Watkins, and Marsick (1998) pointed out that little is known about how to measure the learning organization. In a similar sense, Moilanen argued that "the traditions of measuring learning organization are not well established or validated, which means that the development of new measuring tools has no solid or common ground to be utilized as a basis" (p. 6).

Consequently, more research is essential to empirically confirm and assess the existing models and concepts of learning organization in school settings, which can lead to generalizing a concept and establishing a theory of learning organization. This investigation represents a necessary step to identify and test the constructs of Senge's (1990) fifth discipline model of learning organizations across culturally different populations. As a validity study, this investigation is a valuable attempt to verify the extent to which the learning organization concept,

which originated and evolved in the U.S., can be applicable in Korean vocational high school settings.

At levels of practice and theory, application and investigation of the learning organization concept to Korean vocational high school settings—where two distinct teacher groups (academic and vocational) occupy two different worlds and exhibit distinct behaviors relative to schooling, students, and each other—needs to be considered. As adult learners, the two different teacher groups enter the educational process and teaching context with their own educational and life experiences. Therefore, both groups may function differently when learning new material, creating new concepts, and implementing new practices. For example, Jacobs (1989) observed that some academic and vocational teachers feel highly territorial about their subjects and are threatened as new views of their subject are promoted. Burrell (1993) found that academic teachers were more empathetic than vocational teachers toward students. In the process of developing and enacting actual reform policy to establish a comprehensive high school in Norway, Njerve and Sandvik (1997) concluded that "the lack of a parity of esteem between academic and vocational education stem from the teachers' own attitudes towards each other as groups and towards the educational pathways that they represent" (p. 1). Little (1992) also identified differences between academic and vocational teachers' professional identities and relationships within comprehensive high schools. Vocational teachers are often held in lower esteem by their peers and administrators and sometimes are embarrassed by their subject matter. High school vocational and academic teachers often have little contact and little in common unless they serve on faculty committees or coach sports together. In addition, vocational teachers suffer from a lack of prestige and support from administrators, other teachers, students, and

parents. Given these differences, studying these two different teacher groups can provide a means of examining the validity of measurements of the learning organization concept.

Statement of Purpose

Factor analyses were used to measure and test the extent to which Senge's (1990) fifth discipline model is applicable to vocational public high teachers and schools in Seoul Megalopolis, Korea. Through exploratory factor analysis (EFA), the five disciplines of the learning organization (Senge, 1990) were examined and analyzed to create a hypothesized measurement model. The measurement model defined by EFA was tested and evaluated using confirmatory factor analysis (CFA). Using multi-group CFAs, factorial invariance tests across vocational and academic teacher groups was used as evidence of the validity of applying the learning organization model to Korean vocational high schools. Specifically, through multi-group CFA analyses, factor structures and factor loadings were compared between academic and vocational teacher groups on a measurement model which constituted the common factors of behaviors in school-based learning organizations. The independent variable was defined by testing sub-items that reflected the five underlying constructs of the learning organization model. The dependent variable was differences (or invariance) in the factor structure and loadings derived from the two teacher groups in vocational public high schools in Seoul Megalopolis, Korea.

Research Questions

To investigate and test the underlying constructs of Senge's (1990) learning organization model in Korean public vocational high schools, this study attempted to answer the following research questions:

1. How do Korean vocational high school teachers perceive the constructs of the learning organization in their school organizations? Specifically, what items elicit responses indicating the teachers' perceptions toward the constructs of the learning organizations in their school?
2. To what extent can the learning organization model be derived and confirmed from Korean vocational high school teachers' responses in their school settings?
3. Does invariance exist across vocational and academic teacher groups regarding the factor structure and factor loadings of a measure of learning organizations?

Conceptual Framework

The learning organization is conceptually understood to be the desired type of organization; one that is developing the capacity to continuously adapt and change through facilitating the learning of individual, team, and organization. This definition includes targeting ongoing change that takes place throughout an organization. Therefore, the learning organization effectively functions to survive and thrive in a rapidly changing and unpredictable world. It supports both individuals and teams in continuous learning and improvement of performance. In this study, the concept of *the learning organization advocated by Senge (1990)* was applied to Korean vocational high school settings by conceptualizing, developing, and testing a measurement model.

The conceptual framework for this study was based on Senge's (1990) learning organization model consisting of five disciplines: personal mastery, mental models, shared vision, team learning, and systems thinking. Senge suggested that all organizations, including schools, should develop these five key disciplines throughout the organization in order to be transformed into a learning organization. Figure 1.1 reveals the learning organization model. According to Senge,

systems thinking is a main discipline which functions as an ensemble in building a learning organization. It integrates the other four disciplines but also needs each of them to realize its potential. Therefore, systems thinking is both separate from and embedded in each of the other four disciplines. In this study, these five disciplines formed the latent construct role of the *learning organization* concept.

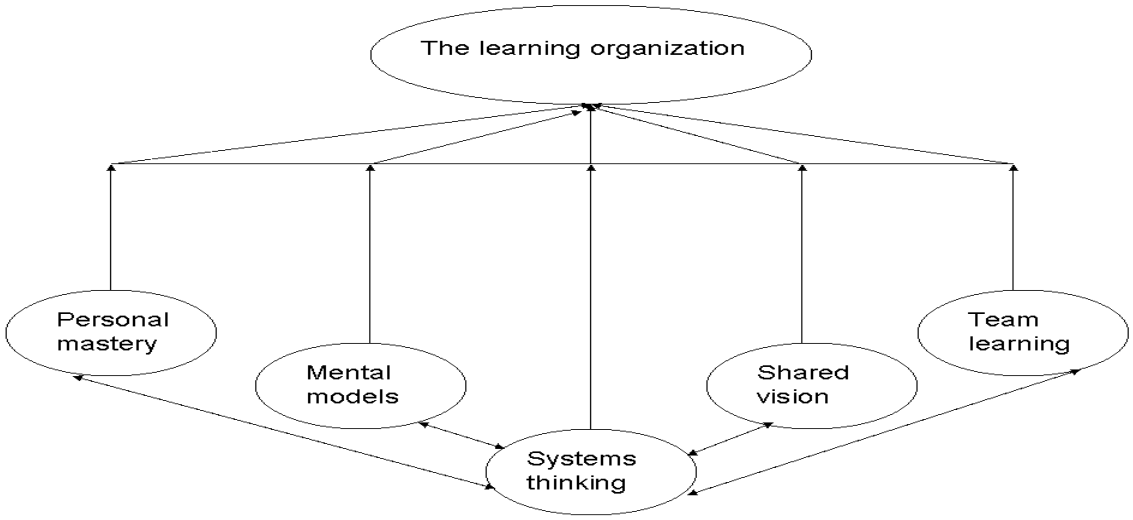

Figure 1.1. Senge's (1990) fifth discipline model of learning organization.

The learning organization concept, theoretical foundation that supports and explains the learning organization, and characteristics of Senge's (1990) model and other major competing models were identified (see Chapter 2). The broad theoretical foundations of the learning organization concept includes systems theory, adult learning theories, action learning theory, a general theory of action, and organizational learning theory. The contributions of these theories in support and explanation of the learning organization concept are discussed in detail in Chapter 2.

A second body of literature was used to assemble the major theoretical reasons for applying the learning organization concept to schools, rationale for selecting Senge's (1990) model for this study, and the theoretical constructs of *schools as learning organizations*. Practical need and characteristics related to *schools as learning organizations* are concretely described.

The third major conceptual contributor in support of *schools as learning organizations* addressed the contextual foundations used to support this study: The secondary vocational educational system in Korea, rationale for applying the learning organization concept at the level of both educational policy and exiting Korean literature, and characteristics of Korean social and educational systems. It is essential to note the social and educational culture, values, attitudes, and priorities at the educational policy level when applying a new system or theory to culturally different school settings. Specifically, in this study, the characteristics of traditional culture, values, and existing organizational systems functioned as criteria to analyze the utility of the learning organization concept for Korean school systems.

Finally, to measure and test the learning organization model, the necessity and process of developing an instrument was outlined. Senge's (1990) five disciplines were operationalized as the theoretical factors to be measured. In addition, a presentation of the research design and method, and the analysis and discussion of results were offered.

Significance of the Study

In all advanced countries, as well as most developing countries, the rapid pace of change based on globalization and continuously innovating information technology is forcing educators, educational administrators, and policymakers to pay more attention to new ways of re-culturing and restructuring schools. As one approach to addressing change, research and practice on *schools as learning organizations* (e.g., Dalin, 1996; DuFour, 1997; Fullan, 1993, 1995; Keefe &

Howard, 1997; Leithwood et al., 1998; O'Sullivan, 1997; Redding & Kamm, 1999; Senge et al., 2000; Silins et al., 2002; Zederayko & Ward, 1999) have increased over the last 15 years. In fact, many educational stakeholders advocate the concept of learning organization as a new school reform or change strategy (Fullan, 1993, 1995; Zedrayke, 2000). However, there is little empirical data that reveals the current state of schools as learning organizations. The information gathered and analyzed through this study contributes to the meager knowledge base related to *schools as learning organizations*.

In an academic spirit of thoroughly confirming and identifying existing theories or models, this study also focused on measuring and testing the learning organization model across culturally different population and organizational settings, specifically with educators in Korean vocational high schools. Therefore, in a theoretical sense, this study provides empirical evidence about the extent to which the learning organization concept, which was initially developed for business, can be defined and measured in educational sites. As a validity study, results show if and how the learning organization concept is applicable in a different cultural context. This study sheds light on the generalization of the learning organization concept from business contexts to educational organizations, and from the United States to South Korea by testing and evaluating its existing model with a different population.

In a practical sense, the greatest value of this study is that identified learning organization constructs provide current data about Korean vocational high school teachers and schools as administrators and policymakers endeavor to transform schools into learning organizations. Educational administrators and policymakers responsible for school change and reform, including teacher professional development, might be able to recognize selected aspects of the learning organization found in Korean vocational high schools. Also, they might be able to find

criteria or directions for developing policy or interventions necessary for school change and reform. In a benchmarking role, this study introduces the concept, benefits, and background of using the learning origination concept to Korean educational stakeholders.

This study is a first step toward an empirical test of the learning organization model promoted by Senge's (1990) five disciplines in vocational public high schools by analyzing the perceptions of two different teacher groups. Ultimately, I expect that this study may provide substantial cues in both practice and theory for developing a school change policy and for building learning organizations in educational settings.

CHAPTER 2

LITERATURE REVIEW

The Concept of Learning Organization

Unlike individual learning, learning in organizations is much more complex, involving interactions of organizational cultural and social structures (Lord & Ranft, 2000; Schwandt & Marquardt, 2000). Numerous attempts have been made to define a *learning organization*. Despite frequent discussions on learning organizations, however, a uniform or consistent conceptual definition has not been articulated in the research literature. To conceptually understand the meaning of learning organization, this section provides a brief background and offers definitions of the concept argued by major scholars.

Since the early 1990s, the term *learning organization* has achieved great prominence as a new buzzword within training and development literature as well as within management, psychology, and organizational studies (Garavan, 1997; Hughes, 2000). Some researchers argue that dimensions associated with a learning organization are not new concepts (Garavan; Swanson & Holton, 2001). In this regard, Fenwick (1996) notes that in an historical sense, the phenomenon of *learning organization* needs to be understood in context of three important currents.

> First, the organizational learning is not a new concept. Finger and Woolis argue that five schools of thought about organizational learning led to the appearance of Senge's (1990) learning organization concept. … The second trajectory associated with the emergence of the learning organization concept is the economic shifts of the 1980s. Processes of globalization

> and deregulation had substantially accelerated competition, argue Finger and Woolis (1994), especially among larger international companies. … Continuous learning, of both individual employees, of employee group, and of the organization as dynamic, attracted interest as a survival. … During this period the third contributing influence to learning organization notions, the movement towards Total Quality Management (TQM), gathered momentum among both private business and public bureaucracies. (pp. 4-5)

Actually, the meaning of two similar concepts, learning organization and organizational learning, tends to be confused and are used, inappropriately, as interchangeable. However, these two terms are conceptually distinct. The detailed differences between the two concepts will be discussed. Researchers tend to define the concept of learning organization differently relying on their own personal experiences and perspective. However, many researches do agree that the learning organization is the ideal structure for achieving a continuous change and improvement. Senge (1990) identified its basic objective when proposing his five disciplines: personal mastery, mental model, shared vision, team learning, and system thinking. With his core idea, systems thinking, he defined the learning organization as a place "where people continually expand their capacity to create results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free and where people are continually learning how to learn together" (p. 3). Watkins and Marsick (1993) identified the learning organization as "one that learns continuously and transforms itself" (p. 8). In a learning organization, learning must occur and be facilitated individually, in a team, on the organization as a whole, and even in organizational interactions with external constituents. The adoption of a learning organization management approach is a survival strategy for continuous improvement in a rapidly changing environment.

Gephart, Marsick, Van Buren, and Spiro (1996) defined a learning organization as an "organization that has an enhanced capacity to learn, adapt, and change. . . . It is an organization in which learning processes are analyzed, monitored, developed, managed, and aligned with improvement and innovation goals" (p. 36). Garvin (1993) presented the learning organization as a place that leads creation, acquisition and change of knowledge, and achieves transformation of the actions of the organization based on newly gained knowledge and intuition. Garvin's definition focuses an organization on possessing the agility to transform actions into knowledge and learning.

Other than defining the learning organization as an ideal organization type, there are some who describe it from a unique view. For example, Bierema (1999) defined the learning organization as a change process that occurs through learning. "The learning organization is not a program, but rather a new process for understanding and learning together" (p. 55). Garavan (1997) argued that the learning organization concept can be treated as a variable or something that has significant influence on other organizational outcomes as well as understood as a metaphor to describe an organization. "The learning organization is a means to an end, not an end in itself" (Marsick & Watkins, 1999, p. 12).

In conclusion, the learning organization concept can be defined as the desired type of an organization; one that is developing the capacity to continuously adapt and change through facilitating learning of all entities (e.g., individual, team, and organizational levels) in an organization. This definition includes targeting ongoing change that takes place throughout an organization. It also works toward facilitating learning of all units in an organization. Even so, "there is no single definition of what the learning organization is" (Swanson & Holton, 2001, p. 172). It is noted that defining a common concept of the learning organization is very difficult

(Örtenblad, 2004; Wonacott, 2000). Specifically, an obvious fact is noted that the learning organization concept has received much attention and popularity from the 1990 publication of Peter Senge's book *The Fifth Discipline: The Art and Practice of the Learning Organization* (Bierema, 1999; Cullen, 1999; Diggins, 1997; Fenwick, 1996; Garavan, 1997; Swanson & Holton, 2001).

Theoretical Foundations of Learning Organization

The learning organization literature has not clearly addressed a common theory to explain the concept of learning organization. Nevertheless, a notion from the literature is that both learning theory and organizational theory are embedded in the learning organization concept. In this study, the theoretical foundation for describing the learning organization is illustrated by several theories including systems theory, adult learning theories, action learning theory, general theory of action, and organizational learning theory.

Systems Theory

Systems theory is simply "a theory concerned with systems, wholes, and organizations" (Swanson & Holton, 2001, p. 114). Generally, systems theory explains multiple disciplines on wholes, parts, the organization and connectedness of the various parts, and the relationships of systems to their environment. More specifically, Duffy (2004) identified the properties of systems.

> 1. The whole (e.g., whole school system) has one or more defining prosperities or functions. . . . 2. Each part in the system (e.g., each school in a district) can affect the behavior or properties of the whole. . . . 3. There is a subset of system parts that are essential for carrying out the main purpose of the whole but can not, by themselves, fulfill the main purpose of the system. . . . 4. There is also a subset of parts that are nonessential for fulfilling

> the system's main purpose but are necessary for other minor purposes. . . . 5. If a system depends on its environment for the importation of energy (i.e., human, technical, and financial resources), then that system is said to be an open system. . . . 6. The way in which an essential part of a system affects the whole system depends on its interaction with at least one other essential part. . . . 7. The effect that a particular subset of essential parts has on the whole system depends on the behavior of at least one other subset of parts. . . . 8. A system is a whole entity that cannot be divided into individual parts without loss of its essential properties or functions. . . . 9. Because a system derives its effectiveness from the synergistic interaction of its parts rather than from what the parts do independently of the system, when efforts are taken to improve the individual parts separately from the system (as in school-based improvement), the performance of the whole system, according to Ackoff (p. 9), deteriorates, and the system involved may be destroyed. (pp. 26-28)

Swanson and Holton (2001) agued that "systems theory, or systems thinking, fosters a way of understanding the world in a more holistic way, demanding that the pieces of the world (or whole) are not viewed separately" (p. 116).

Systems theory provides a conceptualization of how to view an organization as a system. It provides important information for deeper understanding of organizational structure, organizational behaviors, and the nature and processes of change in systems (Swanson & Holton, 2001). Through systems theory, we understand the basic structure of systems – the way that their parts are arranged, the interrelation of parts to other parts and of wholes to the environment, and the purposes of the systems design. In relation to change processes, systems theory acknowledges that change is part of the very fabric of systems.

Every organization is a system and every action taken in a system may impact other parts or people of the system (Wyckoff, 1998). Most actions, problems, and practices of and in an organization do not tend to produce a simple linear effect and are not necessarily linked in a linear fashion. They are very complex and interconnected. The complexity of an organizational context and its problems places a priority on the need for systems thinking for a learning organization. Janzen (2001) indicated that systems thinking provides techniques for looking at problems and goals in organizations, "not as isolated event, but rather as components of larger structures" (p. 14). Therefore, systems thinking helps organizational members understand the patterns of complex relationships. It makes organizational members strive to find long-term solutions rather than quick fixes and focusing on preventing problems in organizations. The practice of systems thinking involves how people think about the actions and practices within the organization.

As a result, the essentiality of requiring systems thinking as a discipline draws from an assumption that every organization, organizational behavior, and organizational members' conduct exists as a system. Senge et al. (2000) argued that "the discipline of systems thinking is the study of system structure and behavior" (p. 78). Further more, Senge (1990) believed that "unless a system is changed, it will continue to create the same results: despite personal difference, individuals in a given system are likely to behave in similar ways" (Isaacon & Bamburg, 1992, p. 42). Systems thinking is considered as an operational principle leading to learning and change toward becoming a learning organization (Janzen, 2001; Senge; Watkins & Marsick, 1993).

Systems theory is a key component for most learning organization models. Senge (1990) established his model of learning organization based on systems theory. He suggested using

systems thinking as a main discipline to build the learning organization. Watkins and Marsick (1993) suggested using systems connections as a component out of six action imperatives for their learning organization model. Specifically, in Senge's learning organization model, systems thinking seeks to integrate the other disciplines (e.g., personal mastery, metal models, shared vision, and team learning) as an ensemble in building a learning organization. It functions as a conceptual framework in Senge's model (Bierema, 1999). Regarding the function of systems thinking in creating the learning organization, Senge has indicated that "vision without systems thinking ends up painting lovely pictures of the future with no deep understanding of the forces that must be mastered to move from here to there" (p. 12). This statement emphasizes that we need to consider and deal with organizational events and issues in systems thinking to create a learning organization.

Adult Learning Theories

Learning in the learning organization is different from formal and classroom learning (Redding & Kamm, 1999). Örtenblad (2004) argued that learning in the learning organization is understood as experimental learning in the workplace and acquisition of knowledge and experiences on the job. Learning in the leaning organization is recognized as a daily part of what happens in the workplace, not just attending formal employee education on a regular base. Senge et al. (2000) defined three core concepts about learning in organizations: interconnectedness, contextualized, and derived by vision. "Knowledge and learning–the process by which people create knowledge–are living systems made up of often-invisible networks and interrelationships" (p. 21). Learning and knowledge in the learning organization is never free of a context. Therefore, in this study, major adult learning theories, which critically describe and support the attributes of learning to create the learning organization concept, include experimental learning,

informal/incidental learning, and self-directed learning. The type of learning contained in these theories differs from traditional types of individual formal learning occurring in isolated classrooms.

One experimental learning model has been developed by Kolb (1984). According to Swanson and Holton (2001), learning defined by Kolb is the acquisition or transmission of content, as well as the interaction between content and experience. In experimental learning, knowledge is created through a transformation of experience. Kolb suggested that there are four steps in the experimental learning cycle: concrete experience, observations and reflections, abstract conceptualization and generalizations, and testing implications of concepts in new situations. The experimental learning approach has the benefit of explaining on-the job-training, task activities, and interactions with co-workers as learning phenomena to organization members in the workplace.

Informal and incidental learning occurs through interactions occurring in day to day work. Most learning in the organization is performed through informal and incidental learning (Casey, 1999). The informal and incidental learning model was well established and developed by Marsick and Watkins (1990). According to them, informal learning is defined as "a category which includes incidental learning, may occur in institutions, but is not typically classroom-based or highly structured" (p. 12). Swanson and Holton (2001) indicated that "examples of informal learning include self-directed learning, mentoring, coaching, networking, learning from mistakes, and trial and error" (p. 169). In formal learning, the learning process and content is in control of a learner. On the other hand, incidental learning is defined as "a byproduct of some other activity, such as task, accomplishment, interpersonal interaction, sensing the organizational culture or trial and error experimentation" (p. 7). Incidental learning describes that

organizational members can learn more powerfully through the technical system, policies, and work process of the organization than formal learning interventions or training programs (Casey).

Self-directed learning is rooted in Knowles' (1980) andragogy perspective which provides core principles of adult learning and important assumptions about adult learners. According to Knowles, self-directed learning includes three main components: self-initiated process, learners with personal autonomy, and greater learner control in instruction (Merriam & Caffarella, 1999; Slusarski, 1994). More specifically, first, adult learners are self-initiated and have the ability to plan and manage their own learning. Second, adult learners are more autonomous in their learning. Third, instead of teacher control, adult learners control their own learning. Self-directed learning is important in that most adult learning activities are planned by learners themselves.

The process of personal mastery or development which functions as a component of creating the learning organization is theoretically explained and supported by various components of adult learning theories including experimental learning, informal/incidental learning, and self-directed learning. Adult learning theories also explain organizational learning concepts which contribute to establishing a learning organization.

Action Learning Theory

Action learning is a group–based process for solving pressing business problems. O'Neil (1999) defined the concept as "an approach to working with, and developing people, which uses work on an actual project or problem as a way to learn" (p. 3). Action learning is a form of learning through experience, where the job environment is the classroom. It is understood as "an experience-based group learning process that combines practical field experience using real issues with the appropriate theory" (Smith & Peters, 1997, p. 63). As operating principles, action learning assumes that "people learn best from each other through shared efforts, including truth-

seeking, honest inquiry, questioning, and sharing information. Action learning processes use risk-taking, action and reflection, and openness to change as key strategies for problem solving" (Webster, 2001, p. 2). The process of learning that occurs through the action learning process is often explained as the Kolb learning cycle process of doing, reflecting, consolidating, and planning (Weinstein, 2002).

The learning organization is established by facilitating learning of all units within an organization: individual, team, and organization (Watkins & Marsick, 1993). One of the key components in building a learning organization is the development of organizational learning, often called systems-level learning. Action leaning is also considered a key tool to develop organizational learning (Marquardt, 1996; O'Neil, 1999; Shindell & Dilworth, 1995; Watkins & Marsick). Dilworth (1995) indicated that action learning is the *DNA of organizational learning* in that it directs the learning activities and functions of an organization and allows organizations to better adapt to a continuously changing environment.

The contribution of action learning to the learning organization can be found by examining the operations of major learning organization models' sub-components. In Senge's (1990) model, action learning provides a strategy for building shared vision and team learning because it helps people in organizations expose their own thinking effectively and make that thinking open to others. Action learning and team learning can be considered as two faces of a coin in building learning organizations. Watkins and Marsick (1993) included the term *action* in the name of their learning organization model. Action leaning plays a pivotal role in establishing their model. Continuous learning opportunities, inquiry and dialogue, and collaboration and team learning, which are specific components in Watkins and Marsick's model are directly related to or based on the principles of action learning.

General Theory of Action

Parsons'(1951) *general theory of action* provides a theoretical and empirical foundation for organizational theorists to enhance their understanding of constructs such as organizational effectiveness, organizational change, organizational learning, and organizational culture (Casey, 1999; Johnson, 2000). The *theory of action* is based on systems theory (Katz & Kahn, 1978). Parson's theory of action and social systems postulates that change within all systems–biological, personal, social, and cultural–is a result of two processes: performing and learning (Parsons, Bales, & Shils, 1953).

More specifically, with respect to Parsons' theory of action, Casey (1999) argued that a learning process serves to the capacity of change within an organization.

> Parsons' systems theory of action suggests that both performance and learning processes have the capacity to change or disrupt the equilibrium in the organization-situation relationships. However, change in a social system itself occurs through the learning process, not just the performance process (Schwandt, 1995). The focus of Parsons' general theory of action is the establishment of a systematic relationship between the actions of the members of the social systems (actors) and their collective ability to adapt to both inside and outside environments. (p. 12)

Casey (1999) also indicated that Parsons' four sets of actions (adaptation, goal attainment, integration between parts, and pattern maintenance) are generic functional prerequisites of a system in response to critical issues associated with survival. Through these four actions, survival of the organization is sustained as a system against changing environments. A learning process functions to facilitate these four sets of actions in an organization. As a result, when

using Parsons' general theory of action as a framework, individuals and organizations can be understood as a learning system.

Through a theoretical frame for organizational learning theory, *theory of action* supports creating the learning organization concept. Specifically, it provides key principles related to the achievement of the primary target by a learning organization: a competitive advantage and organizational capacity to continuously adapt to changing environments by facilitating learning in an organization.

Organizational Learning Theory

The concept of organizational learning. Organizational learning gained prominence in the 1970s, largely attributed to work by Argyris and Schön (Fulmer, Gibbs, & Keys, 1998). Argyris and Schön (1978) defined organizational learning in this manner:

> Organizational learning occurs when members of the organization act as learning agents for the organization, responding to changes in the internal and external environment by detecting and correcting errors in the organization…and embedding the results in the shared maps of the organization. (p. 29)

Similarly, Marsick and Watkins (1996) indicated that "organizational learning involves embedding and enhancing long-term capacity to respond to change in the environment" (p. 20). They argued that organizational learning requires three imperatives: a system to capture and share learning, the act of empowerment, and connecting the organization to its environment. Örtenblad (2001) argued that "organizational learning implies two things: being aware of the need for different levels of learning and the storing of knowledge" (p. 132).

Garavan (1997) pointed out that organizational learning can be placed on a continuum from single-loop learning to double-loop learning according to learning types. Double-loop learning

occurs when an organization is willing to question long-held assumption about its missions. As the deepest form of learning, "Double-loop learning requires the development of new ways of looking at the world based on an understanding and relationship that link key issues and events" (p. 23). Swanson and Holton (2001) clarified the concept of single-loop and double-loop learning.

> Single-loop learning is learning that fits prior experiences and existing values, which enable the learner to respond in an automatic way. Double-loop learning is learning that does not fit the learner's prior experiences or schema; generally it requires learners to change their mental schema in a fundamental way. (p. 171)

From a different perspective, Örtenblad (2004) identified organizational learning as a process of making individual knowledge organizational. Organizational learning facilitates the storing of knowledge by individual learning toward establishing and activating *organizational memory*. The organizational memory includes standard operating procedures (SOPs), shared mental models, documents, and manuals. Organizational memory is a key component of organizational learning and regulates an organization's behavior, individual behavior, and individual's learning direction.

Organizational learning resembles individual learning but is also distinguished from it (Marks & Louis, 1999). Argyris and Schön (1978) argued that individual learning is necessary, but insufficient, conduct for organizational learning. Marks and Louis indicated, "Organizations learn in a way that transcends the aggregated learning of their individual members; that is, organizational learning takes place among the individuals as a collective" (p. 711). Garavan (1997) stated that organizational learning is different from individual learning by information dissemination and accomplishing a shared interpretation of the information.

Organizational learning is understood as the intentional use of the learning process and also defined as learning that occurs at the system level to continuously change the organization (Dixon, 1994). In other words, it is a process and its outcome is new knowledge, skills, or tools for increasing learning in business and other organizations (Marks & Louis, 1999). When organizational members make their mental model explicit and develop shared mental models, organizational learning is enabled. Therefore, according to Swanson and Holton (2001), "Organizational learning is embedded in the culture, organizational systems, and work procedure and process" (p. 172).

Differences between learning organization and organizational learning. The terms *learning organization* and *organizational learning* are closely related and sometimes used interchangeably, but they are, in fact, two different constructs (Swanson & Holton, 2001). Basically, organizational learning refers to activities within an organization, whereas a learning organization refers to a form of organization (Garavan, 1997; Tsang, 1997). According to Örtenblad (2001), organizational learning is process, whereas learning organization is organizational form. At the level of amount of normativity, organizational learning is descriptive, naturally existent, neutral, necessary, obtainable, and known, while learning organization is normative, actively needed, preferable, not necessary, unreachable, and unknown. Also, organizational learning targets academics, but learning organization focuses on practitioners and consultants.

Regarding the differences between these two concepts, Örtenblad (2001) criticized that the distinctions defined in the existing literature are not empirical and explicit. As an alternative distinction, he recommended making distinctions between organizational learning and learning organization in terms of the entities of learning and the existence of knowledge. According to his

recommendation, in the concept of learning organization, individuals learn at the level of learning entities. Knowledge is stored both inside and outside individuals. In contrast, in the organizational learning concept, the collective learns and knowledge is not storable.

To avoid conceptual confusion, it is clearly important to differentiate the terms organizational learning and learning organization (Swanson & Holton, 2001). Swanson and Holton have noted that "a learning organization is a prescribed set of strategies that can be enacted to enable organizational learning" (p. 172). Similarly, Finger and Woolis (1994) suggested that the term organizational learning represents the processes by which organizations change and can be changed; whereas the term learning organization implies the active promotion and organization of learning activities. Specifically, becoming a learning organization is the goal organizations seek to achieve, whereas organizational learning is the process through which an organization or institution achieves the goal (Schwandt & Marquardt, 2000).

In conclusion, there exist differences between the two concepts. Nevertheless, organizational learning is at the heart of creating a learning organization (Tsang, 1997). The learning organization model suggested by Watkins and Marsick (1993) clearly presents the position and value of organizational learning. In relation to sculpting the learning organization, they argued that learning must occur, and be facilitated at three levels: individual, teams, and organization. Robbins (2000) asserted that organizational learning is a key to becoming a learning organization.

> Most organizations engage in what has been called single-loop learning. When errors are detected, the correction process relies on past routines and present polices. In contrast, learning organizations use double-loop learning. When an error is detected, it's corrected in ways that involve the modification of the organization's objectives, policies, and standard routine. (p. 270)

Summary

Learning organization scholars did not define clearly a common theory to describe the learning organization concept and its principles. Instead, supporting theories are drawn from the foundation of each model's key components. In this study, the foundation of theoretically describing the learning organization is an amalgamation of several organizational and learning theories: systems theory, adult learning theories, action learning theory, general theory of action, and organizational learning theory. The relationships of these theories in defining the learning organization are conceptually mapped in Figure 2.1.

These theories are all in a complementary relationship in building learning organizations. They are categorized with three pillars for the learning organization. First, adult learning and action learning directly contribute to building the learning organization. They also indirectly support the creation of the learning organization concept via organization learning theory. They play a key role in building personal mastery, organizational learning, and learning culture, which function as an internal mechanism in creating the learning organization concept.

Organizational learning is a second critical axis of the theoretical foundations of the learning organization. Organizational leaning is at the heart of creating the learning organization. It also plays a critical bridging role between learning theory and systems theory in establishing the foundations for the learning organization.

Finally, the third theoretical axis for the learning organization is systems theory and general theory of action. They indirectly support the learning organization via organizational learning. They function as an external mechanism in creating the learning organization concept, which theoretically support the process of a shared vision of organizations and organizational change process.

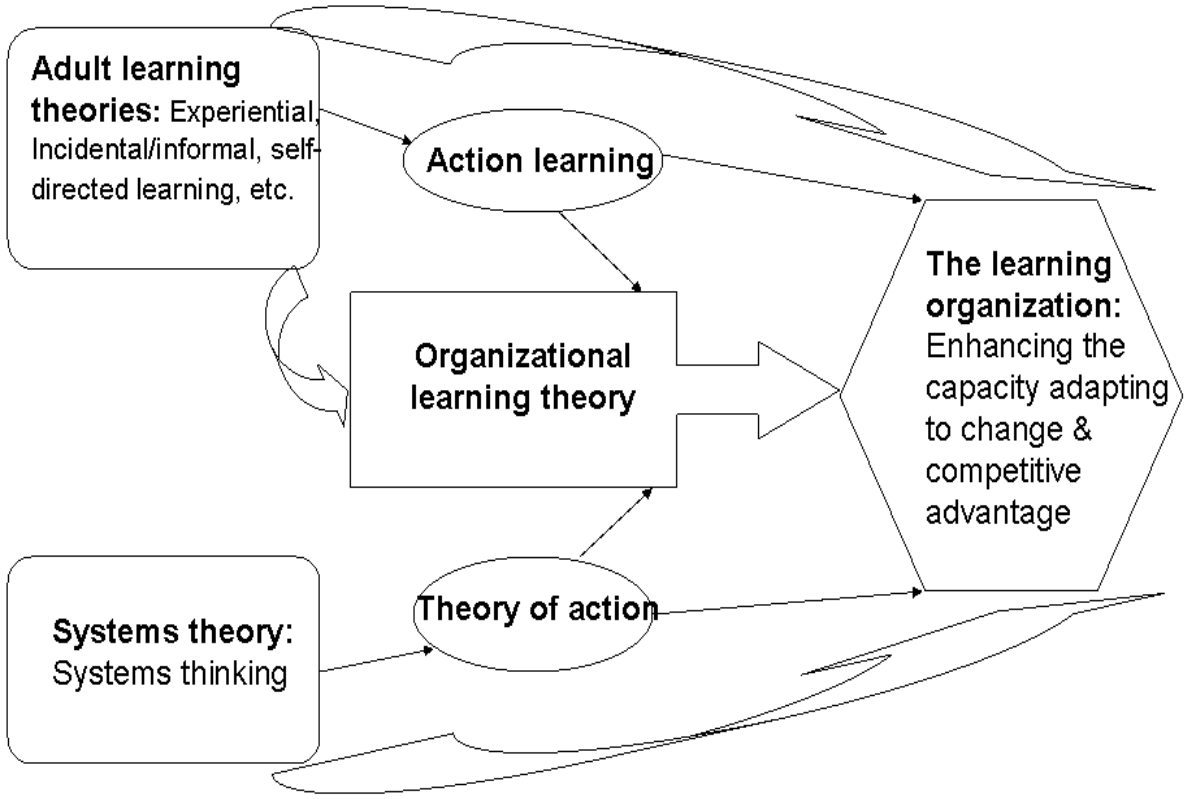

Figure 2.1. Theoretical foundations of the learning organization.

As a result, the theoretical framework of building the learning organization is supported by not just one theory, but by the synthesis of several related theories. These theories all synthetically support the primary purpose of the learning organization, i.e., to gain competitive advantage and increase organizational capacity to continuously adapt to changing environments.

Major Learning Organization Models and Characteristics

Just as there are different definitions of the learning organization concept, learning organization models vary because each organization is unique (Collie, 2002; Örtenblad, 2004; O'Sullivan, 1997). Senge (1990) noted that theoretically, learning organizations are continually evolving and developing and unlikely to be uniform. Existing models have been identified directly from the study of organizational structures and behaviors relative to organizational performance. The following models and researchers' critical arguments about their own models show the various characteristics and components of the learning organization.

Senge's Fifth Discipline Model

Senge's (1990) fifth discipline model was developed from his field work conducted through the Center for Organizational Learning at MIT's Sloan School of Management. Senge suggested that organizations should develop five key disciplines: personal mastery, mental models, shared vision, team learning, and systems thinking. The five disciplines function as vital dimensions necessary to build a learning organization. In the aggregate, mental models, personal mastery, and team learning contribute to the creation of a learning culture in organizations. According to Fenwick (1996), "Central to these disciplines is the assumption that employees need to engage in critical reflection and open dialogue, exposing their own systems and critically challenging others' belief systems, to break free of thinking patterns which perpetuate dysfunction and prevent innovation" (p. 6).

The five disciplines are divided with two categories according to the primary focus of individuals or groups (Senge, 1990). The first category includes personal mastery, mental models, and systems thinking which focus on individual behaviors and practices in an organization. Personal mastery is a discipline of "continually clarifying and deepening our personal vision, of

focusing our energies, of developing patience, and of seeing reality objectively" (p. 7). It is called as a process of personal commitment to vision, excellence, and life-long learning (Bierema, 1999). Mental models are "deeply ingrained assumptions, generations, or even pictures and images that influence how we understand the world and how we take action" (Senge, p. 8). When establishing mental models, Senge highlights that people need to maintain a balance between inquiry and advocacy, "where people expose their own thinking effectively and make that thinking open to the influence of others" (p. 9). Systems thinking is a discipline to integrate all other disciplines and focuses on interconnectedness. It functions as a conceptual framework in Senge's model (Bierema). Senge argued that organizational events and issues should be considered in systems thinking. He also illustrated that system archetypes and simulation are components for the practices of systems thinking.

The second category includes the disciplines of shared vision and team learning. "The disciplines of building shared vision and team learning differ from the other three in that they are inherently collective in nature" (Senge, 1990, p. 375). The practice of these two disciplines is activities engaged in by groups. Shared vision means that individual vision or goals are integrated into a shared organizational vision. Finally, team learning needs to be developed to create a learning organization. According to Senge's argument, "unless teams can learn, the organization cannot learn" (p. 10). Organizations can learn by the way of team learning.

Senge's (1990) model emphasizes strengthening systems thinking and changing the way organizational managers think. A critical implication of this focus can be found at the organization's management level. Specifically, the more people at the top are able to think in terms of a big picture, the better able they are to do all of the myriad things that are required to transform an organizational culture into a learning culture. Bierema (1999) used the image of

DNA or a hologram as a metaphor for Senge's learning organization model emphasizing that the whole is more than the sum of the parts. Robbins (2000) summarized the characteristics of Senge's learning organization model.

> There exists a shared vision which every one agrees on. People discard their old ways of thinking and the standard routines they use solving problems or doing their jobs. Members think of all organizational processes, activities, functions and interactions with the environment as part of system of interrelationships. People openly communicate with each other (across vertical and horizontal boundaries) without fear of criticism or punishment. People sublimate their personal self-interest and fragmental interests to work together to achieve the organization's shared vision. (p. 270)

Watkins and Marsick's Six Action Imperative Dimension Model

In designing a learning organization, Watkins and Marsick (1993) identified and characterized six action imperatives of organizations: creating continuous learning opportunities, promoting inquiry and dialogue, encouraging collaboration and team learning, establishing systems to capture and share learning, empowering people toward a collective vision, and connecting the organization to its environment. These imperatives enhance the movement of organizations toward becoming a learning organization. Like systems thinking in Senege's (1990) model, Watkins and Marsick promoted organizational-level critical reflection at various stages of the problem-solving process. They also argued that reflection constitutes most of the activity in a knowledge-based workplace.

However, unlike Senge's (1990) model, Watkins and Marsick (1993) put the facilitation of learning at all levels in an organization at the forefront in their learning organization model. That is, their model emphasizes characteristics of continuous learners needed in today's organizations

which focus on nurturing creativity, productivity, and critical reflectivity. The heart of their learning organization model is informed by *organizational learning,* rooted in Argyris and Schön (1978). According to Bierema (1999), the metaphor of the Watkins and Marsick to describe the learning organization is sculpting. She summarized the characteristics of their learning organization model as

> leaders who model calculated risk taking and experimentation, decentralized decision making and employee empowerment, skill inventories and audits of learning capacity, system for sharing learning and using it in the business, rewards and structures for employee initiative, consideration of long-term consequences and impact on the work of others, frequent use of cross-functional work teams, opportunity to learn from experience on a daily basis, a culture of feedback and disclosure. (p. 47)

Marquardt's Systems-Linked Organization Model

Marquardt (1996) explained that "learning organizations are companies that are continually transforming themselves to better manage knowledge, utilize technology, empower people, and expand learning to better adapt and succeed in the changing environment" (p. 2). He developed a systems learning organization model which comprises five closely interrelated subsystems: learning, organization, people, knowledge, and technology. These five subsystems interface and support one other.

> Learning is accomplished by the organizational system as a whole. Organizational members recognize the critical importance of ongoing organization-wide learning for the organizational current and future success. Learning is a continuous, strategically used process. There is a focus on creativity and generative learning. System thinking is fundamental. People have continuous access to information and data resources that are important to the

> company's success. A corporate climate exists that encourages, rewards, and accelerates individual and group learning. Workers network in an innovative, community like manner inside and outside the organization. Change is embraced, and unexpected surprises and even failures are viewed as opportunities to learn. It is agile and flexible. Everyone is driven by a desire for quality and continuous improvement. Activities are characterized by aspiration, reflection, and conceptualization. There are well-developed core competencies that serve as a taking off point for new products and services. It possesses the ability to continuously adapt, renew, and revitalize itself in response to the changing environment. (p. 20)

Basically, Marquardt's (1996) model includes all constructs suggested by the two models discussed previously. Bierema (1999) suggests that the metaphor described by Marquardt is a butterfly, which reflects that the transformation to the learning organization is similar to radical change from caterpillar to butterfly.

Pedler, Burgoyne, and Boydell's Model

Pedler, Burgoyne, and Boydell (1991) described the learning organization as a learning company, which facilitates learning activity for all members and continuous organizational transformation. The learning company is not brought about simply by training individuals. It can only happen as a result of learning at the whole organization level. Their model has the following characteristics:

> Takes a learning approach to strategy, engage in participative policy making, uses information, practices formative accounting and control, values internal exchanges, rewards flexibility, fosters enabling structures, employs works as environmental scanners, engage in inter-company learning, foster a learning climate, supports self-development opportunities for all. (Bierema, 1999, p. 48)

As a metaphor of their model, Bierema (2001) used a "fountain tree which represents an ecosystem of interdependence that creates the foundation, support, and conditions to promote learning" (p. 49).

Summary

Each model consists of different dimensions and characteristics. Comparisons of all models previously presented are comprehensively summarized in Table 2.1. On the other hand, some researchers have attempted to establish core components or an integrated model of the learning organization to increase the possibility that the term *leaning organization* would become a more academically-accepted concept (Örtenblad, 2004). Gephart, Marsick, and Van Buren (1997) explored the common ground among a number of learning organization models by identifying and analyzing the core components of each. More than 25 researchers and practitioners who had developed a learning organization model or diagnostic instrument were included in the study. The core components of a learning organization were identified through participants' self-ranks. In considering the components of their own models or diagnostic instruments, they rated learning organization components found in existing models. Highly rated items included organizational learning, communication, information and knowledge system, leadership and management, and organizational culture. Gephart et al. argued that as key components of learning organization, it is important to understand that

> system level learning is characterized by knowledge generation, sharing, management, and utilization. …A culture that values support for learning, collaboration, system thinking, innovation, and trust….Ways to examine and make sense of the changing environment, generate or capture knowledge and information, share ideas, and disseminate, store or retrieve information….Leaders who mode learning and structure vision and strategy….

> Individual learning practices emphasizing feedback, inquiry and dialogue, experimentation, and knowledge creation. (p. 21)

Örtenblad (2004) described four common aspects of the learning organization: organizational learning, realizing learning at work, developing a learning climate, and creating a learning structure. Learning at work is understood as on-the-job learning which focuses on informal and incidental learning. Learning climate means organizational climate that facilitates individual learning. This climate is "a positive atmosphere that makes learning easy and natural" (p. 134). The characteristics of flexibility in a learning structure include decentralized, flat, and team-based. Örtenblad concluded that when these four aspects all are integrated and implemented together in an organization, a learning organization is created.

By reviewing these individual and integrated models, a few common points and assumptions are found. First, the learning organization is rhetorically defined as a desirable workplace and a successful business or service endeavor. In this regard, Smith and Tosey (1999) remark that the learning organization concept is more rhetorical than actual, as well as more of a concept to focus aspiration than some objective state.

Second, at the level of organizational development, the learning organization has a critical implication. Building a learning organization is part of a quest for organizational survival and competitiveness against such changing circumstances as rapid technical advance, information overload, globalizing markets, and fierce competition. Accordingly, the primary purpose of the learning organization is to gain a competitive advantage and to improve performance to continuously adapt to changing environments.

Table 2.1

Comparison of Learning Organization Models

Author(s)	Definition	Core dimensions	Underlying foundations and vantage points	Metaphor
Senge (1990)	Organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurture, where collective aspiration is set free, and where people continually learning how to learn together.	Five disciplines: systems thinking, mastery, mental model, shared vision, and team learning	Focusing on systems thinking Holistic point of view Started from focus on business management Managing and leading as driving forces	DNA or Hologram
Marsick & Watkins (1993)	Organizations that learn continuously and transforms themselves	Six action imperatives: continuous learning, inquiry and dialogue, collaboration and team learning, embedded systems, system connection, and empowerment.	Focusing on action learning and team/ organizational learning Holistic point of view Started from focus on adult learning Partial mention of manager and leader role	Sculpting
Marquardt (1996)	An organization which learns powerfully and continuously transforming itself for corporate success	Five sub-systems: organization people, learning, technology, and knowledge	Synthesis of existing other models	Butterfly
Pedler, Burgone, & Boydell (1991)	A company which facilitates a learning activity for all members and continuous organizational transformation	Eleven characteristics: a learning approach to strategy, participative policy making, information, evaluation, rewarding flexibility, questioning, inter-company learning, internal exchanges, self-development, works as environmental scanners, learning culture.	Holistic point of view Managing and leading as driving forces is not clear Developed in the UK	Fountain tree

Third, most models of a learning organization include the following elements: leadership and management, culture, and systems for communication, information, and knowledge (Gephart et al., 1996). The organizational structure focuses on being permeable to allow for and facilitate the flow of learning and knowledge across organizational boundaries (Collie, 2002). Management support systems include the creation of communication systems and empowering leadership to encourage organizational members to contribute new ideas and ensure the dissemination of knowledge and learning. The organization focuses on creating a culture to promote individual and collective learning through supporting and rewarding learning, promoting inquiry and dialogue, and establishing shared vision.

Fourth, the learning organization attributes have been perceived as desirable characteristics. According to the results of a 1995 National HRD Executive Survey by the American Society for Training and Development, 94% of respondents reported that a learning organization is important to build for their companies (Gephart et al.). Finally, the current popularity of Senge's (1990) five disciplines cross boundaries of various models and practices in the learning organization field (Diggins, 1997).

Schools as Learning Organizations

With school reform movements focusing on reculturing and restructuring schools, educators and researchers have dramatically increased their attention on the necessity and advantages of applying the learning organization concept to schools. This section examines educational literature which advocates for schools to be transformed into leaning organizations. The section also identifies the theoretical constructs of *schools as learning organizations,* based on Senge's (1990) five disciplines. Argument for selecting Senge's disciplines and their characteristics for schools are also presented.

Why the Learning Organization in Schools?

An alternative to the limit of school reform movements. Becoming a learning organization is understood as system changes including both "restructuring and reculturing" (Seller, 2001, p. 256). From a theoretical perspective, developing a learning organization is considered an alterative to the failure of existing school reform movements based on site-based management (SBM). Fullan (1995) criticized existing education reforms and change policies, which often result in "band wagons and rallying cries, but they also represent a debilitating form of dependency and superficiality" (p. 230). Existing school reform efforts have failed, according to Fullan (1993), because they have not considered the complex and intractable attributes of educational problems, as well as not addressing "fundamental instructional reform and associated development of a new collaborative culture among educators" (p. 57). Fullan (1995) also argued that existing school reforms under site-based management have targeted decentralization and increased participation at the school or district level, but they have not affected "the teaching and learning core of schools" (p. 230).

Similarly, Seller (2001) indicated that existing educational research and practices often compartmentalize components of reform to control the scope. Educational reform and research has typically failed to meet its promise of substantial change, often due to such compartmentalization. As a result, for successful school change and meaningful reform, all parts of the educational enterprise must be linked together. We need to treat "school reform as a system requirement that involve both restructuring and reculturing within school organization" (p. 258).

Duffy (1997) criticized major recommendations for current school improvement (e.g., schools of choice, block scheduling, and teaching ethics) because they have not considered that

school systems are complex tapestries of interconnected elements woven together by internal and external organizational environments. As an alternative to cope with the limit of the current school improvement policies, Duffy suggested that school systems should be transformed into "high forming learning organizations that apply their collective knowledge to create and deliver educational services that have true value for all students and parents" (p. 26).

Weller and Weller (1997) argued that the school restructuring and reform movement, which originally started in the 1990s, has begun to consider research findings from human relations and organizational theory, and that implementing the learning organization is the vehicle for school reform to achieve continuous improvement. In a longitudinal quantitative and qualitative research study, Hannay, Erb, and Ross (2001) found that secondary schools which functioned as learning organizations built change capacity into daily operations and were responsive to their goals. The characteristics and patterns of these school organizations include being goal driven, encouraging open communication and dialogue, sharing decision making, supporting teacher leadership and empowerment, and being responsible for action, and transparency. In addition, school change is a complex process that requires both restructuring and recapturing.

Researchers' arguments and suggestions show that the scope of the learning organization needs to be enlarged in overall change strategy in educational organizations and school reform. Existing school reform strategies that focus on SBM can be less effective and too short-lived to lead to change in the teaching-leaning process or new teaching strategies (Fullan, 1993, 1995; Silins et al., 2002). Contemporary schools that do not prepare students for rapidly changing trends will soon become obsolete. Therefore, contemporary schools need to make radical change in pedagogy (e.g., substantive changes in teaching strategies, assessment, and the teaching-

learning process) to improve student achievement and meet the diverse learning needs of students.

Without changing all school staff's own mental models, behaviors, and attitudes relative to schooling and students, it is impossible to effectively drive school reform that focuses on the teaching-learning process and its strategy to improve student achievements. An ultimate way to lead to this change is a coordinated effort, creating an environment where all school staff can continually learn and reflect, connecting individual visions to build a shared vision, and developing the capacity of a group of staff to function as team learners (O'Neil, 1995; Senge et al., 2000). In this vein, Fullan (1995) suggested that it is necessary to create a learning organization leading to fundamental system redesign, which focuses on establishing knowledge and expending skills, a collaborative culture, information sharing and processing, and a reward structure for high performance. It is noted that the application of the learning organization to schools is positively required as a school change strategy against the limit of recent reform movements in education.

A strategy leading to teacher professional development. In a little different angle compared to the arguments of targeting school change and reform, some researchers suggested that learning organizations should be introduced from the point of view of developing teachers' professionalism as a prerequisite for improving student learning (Dilworth & Imig, 1995). Zederayko and Ward (1999) advocated that schools need to be transformed into learning organizations for improving student learning. Specifically, because improving students' schooling depends on "what teachers know and what they do in their classrooms" (p. 35), the opportunity to learn and develop in a regular, on-going manner should be given to teachers.

Waddock (1994) suggested making schools into learning organizations by focusing on extensive staff development. “Teachers isolated within classrooms may depend on what they learned in college because there is seldom time to talk about teaching” (p. 40). Noting that isolated schools and teachers may fail to meet the various needs of students and a rapidly changing society, Waddock advocated that building a learning organization in schools required a focus on extensive staff development.

> Learning in schools can occur with appropriate staff development and training through: dialogue internally about teaching and education’s content; external dialogue with business about the demands of work; conversations with community leaders about solving the community’s problems; and educational programs. (p. 40)

Redding and Kamm (1999) suggested that staff development designed to improve teaching and learning is directly achieved in building a learning organization. For real changes in teaching practices, “teachers need to learn, apply, reflect, correct and learn, apply, reflect, correct over and over” (p. 28). Engaging in this process to change teaching practices leads teachers to improve their teaching ability, and thus, ultimately approach learning organizations in their schools.

Arguments about teacher professional development focus on the benefit of creating the learning organization based on more positive learning culture, personal mastery, continuous learning and development at the individual and team levels. It is specifically noted that building a learning organization can lead teaching staff to become proficient in new forms of instruction, which immediately impacts student learning and behavior.

Summary. Researchers have slightly different angles related to the need for establishing schools as learning organizations. On the other hand, the reform of school systems and educational change requires a new look at staff development (Sparks, 1997). Therefore, the

reform of school systems and improvement of teaching professionalism can be two sides of the same coin in the way of building a learning organization because both of them ultimately target improving students' learning and school performance. Teaching professionalism can be improved through the reform of school systems. Also, improving teaching professionalism can result in school change and reform. As a result, building the learning organization in schools is understood as a strategy to provide appropriate education to students in a rapid ever-changing economic and social context. In a comprehensive meaning including school systems' change and teacher professional development, Dalin (1996) asserted that contemporary schools should be transformed into learning organizations to meet the needs of a shifting paradigm.

> All that has changed for us and for our children. When today's first graders are in their thirties, they will face a world formed by revolutionary forces, some of which are listed below. … The knowledge and information revolution is already overwhelming, changing our daily lives, forming our attitudes, and giving us increasingly more complex issues with which to deal. … The ecological revolution, the reminder that we need to live in harmony with nature, has become clear during the past 20. The globalization revolution is already here, and will become increasingly important for the economic and technological sector. (p. 10)

Selecting Senge's Model to Be Applied in Schools

Different models and various definitions of the learning organization targeting business organizations exist. Each model has different characteristics and dimensions. In the same vein, because each school presents unique conditions in becoming a learning organization, it is natural that a single model of learning organization does not exist for schools either. Nevertheless, theoretical dimensions are needed for measuring and diagnosing the degree of schools as learning organizations. It is necessary that the theoretical dimensions of schools as learning

organizations should be approached on the basis of a specific or integrated model. Therefore, I selected Senge's (1990) five key disciplines because his model has been used most often and extensively to guide educators and school administrators who want to change their own schools.

Several reasons exist for using the concept of learning organizations based on Senge's (1990) five key disciplines. First, the five disciplines model is the most popular model currently available and crosses the boundaries of many other models. "The learning organization as a model has been initially originated from system thinking in the U.S. and this systemic approach is typified by Senge's model" (O'Sullivan, 1997, p. 222). Regarding to the popularity of Senge's model, Garavan (1997) indicated that "the most influential commentator in the U.S. context is Senge (1990)" (p. 24). Fenwick (1996) declared that "the Fifth Discipline was cited so often in seminars and business journals of the early 1990s that its status became not unlike that of a manifesto" (p. 7).

Second, even if comprehensively approaching the transformation of schools into learning organizations at the level of theory and practice is limited, quite a few school models and educational research focusing on building a learning organization are rooted in and explained by Senge's (1990) five disciplines. The five disciplines provide "important insight into how educators can achieve meaningful change and transform schools into learning organization that renew themselves" (Isaacon & Bamburg, 1992, p. 42). For instance, Conzemius and Conzemius (1996) suggested that making a school into a learning organization requires the learning architecture, interconnectedness, and collective intelligence. Their basic concepts are borrowed from systems thinking, team learning, and shared and personal visions of Senge's five disciplines. Weller and Weller (1997) concluded that using teacher teams with common planning time and discussing classroom strategies that lead to instructional improvement was overwhelmingly

positive. It appears that the theoretical foundation of Weller and Weller's conclusion is based on Senge's team learning discipline.

Senge's (1990) model has been used as a theoretical framework in most doctoral dissertations written under the general topic of learning organizations in educational settings. Doctoral dissertations published by University Microfilms (now known as UMI) provide evidence of the popularity of using Senge's model in educational settings. For example, 15 of 30 doctoral dissertations written from 1995 to 2004 with the term *learning organization* in the title, acknowledged Senge's five disciplines as a main theoretical framework. Five other doctoral dissertations relied on parts of Senge's five disciplines in constituting a theoretical framework for their own research.

Third, unlike other learning organization researchers, Senge (1990) himself has shown great concern in transforming school organizations into learning organizations. Although not an educational researcher, Senge's commitment to building learning organizations in schools is well founded in the literature. He advocates that the learning organization model originally developed for business sites is relevant for teachers and schools.

> We started out with a particular focus on corporate senior executives, but soon found that the basic disciplines such as system thinking, personal mastery, and shared vision were relevant for teachers, public administrators and elected officials, students, and parents. (p. 16)

In O'Neil's (1995) article, *On Schools as Learning Organizations: A Conversation with Peter Senge,* Senge argued that transforming schools into learning organizations requires coordinated efforts, creating an environment where school staff can continually learn and reflect, combining individual visions to build a shared vision, and developing the capacity of a group of staff to function as team learners.

Moreover, in 2000, Senge et al. published *Schools That Learn* focusing specifically on schools and education. This text was geared toward teachers, school administrators, parents, and others concerned about education. It presented practices that are meeting success across the country and around the world as schools attempt to learn, grow, and reinvent themselves using the principles of organizational learning. Senge et al.'s work contains many articles "describing tools and methods, stories and reflections, guiding ideas, and exercises and resources that people are adapting to help make institutions of learning more like learning organization" (p. 6).

Theoretical Constructs of Schools as Learning Organizations

In school settings, what critical factors are required to move toward becoming learning organizations? What practices and organizational behaviors should be sustained in becoming *schools as learning organizations?* To answer these questions is to identify the constructs of learning organizations in schools. In this study, the theoretical constructs of *schools as learning organizations* stem from Senge's (1990) five disciplines. To identify the meaning of his five disciplines in schools, existing arguments and evidence for each discipline as applied to schools is presented.

Personal mastery. According to Senge (1990), personal mastery means that organizational members continually clarify and deepen their personal vision, focus their energies, develop patience, and see reality objectively. It is understood as a quest for continual growth and learning in the organization and "a process of personal commitment to vision, excellence, and lifelong learning" (Bierema, 1999, p. 48). The necessity to promote the continuous pursuit of personal mastery is based on a recognition that the organization develops as a result of individual development by its members (Senge, Kleiner, Roberts, Ross, & Smith, 1994; Zederayko, 2000).

Senge et al. (2000) explained that personal mastery is a set of practices that supports people in pursuing their dreams, while cultivating an awareness of the current reality. Organizational members' personal visions (e.g., the results organizational members want most from life and the person they want to be) must be defined to increase personal mastery. Establishing personal vision for educators, parents, and students can produce "deeply held aspirations around their wishes as a teacher and a learner" (p. 61). The practice of personal mastery propels individuals in organizations to set their standards ever higher.

A creative tension exists between individuals' current reality and their future vision in seeking personal mastery (Senge, 1990; Senge et al., 2000). As organization members realize the gap between future vision and current reality, they strive to make change. This reality-vision gap functions as a source of creative energy. Organizational members can move toward their vision by addressing and changing current reality.

Personal mastery needs to be encouraged because organizations can change significantly when people experience success from their own learning initiatives. Therefore, even though the practice of personal mastery is an individual matter and requires personal reflection, organizational leaders can play a key role in increasing individuals' personal mastery within the organization. School leaders can create conditions that encourage faculty members and staff to improve their personal mastery (Zederayko, 2000). Lashway (1998) suggested that school principals and superintendents themselves should be learning leaders. Senge et al. (2000) emphasized organizations' roles for achieving organizational members' personal mastery.

> Schools and other organizations have a key role to play in this discipline, by setting a context where people have time to reflect on their vision, by establishing an organizational commitment to the truth wherever possible, and by avoiding taking a position (explicit or

> implicit) about what other people (including children) should want or how they should view the world. (p. 60)

The development of personal mastery has implications for improving teachers' professional knowledge or skills and individual development to become lifelong learners. Marks and Louis (1999) demonstrated that effective programs of professional development impact schools by increasing their capacity for organizational learning. Fullan (1993) emphasized that teachers must deepen their knowledge of pedagogy to promote ongoing, purposeful reorganization and change of curriculum and instructional practices if they wish to meet the continually changing needs of students.

To establish personal mastery in school contexts, appropriate time to engage in regular reflection, research, collaboration, and innovation is essential for teachers (DuFour, 1997; Lashway, 1998). A lack of time for professional learning during the school day is a significant impediment to the imperative that teachers should be learners and continuously improve their practice as teachers (Zederayko & Ward, 1999). Therefore, it is important that school leaders allow their teachers to allocate time for thinking, preparation, and planning in schools, as well as to make their work teaching and learning.

In addition to the efforts of school leaders, teachers themselves need to change to improve personal mastery. In terms of creating a new leadership for teachers, Bierema (1999) suggested,

> Leader as teacher is not about teaching, but rather about designing the learning processes whereby people throughout the organization can deal productively with the critical issues they face, and develop their mastery in the learning disciplines. The stewardship role means that leaders are willing to be accountable to some larger body than themselves. (p. 53)

Similarly, Fullan (1995) admonished that teachers in a learning organization should continuously seek to acquire new domains of knowledge and skill, compared to the traditional role of teachers. Contemporary teachers are faced with mastery of an ever-broadening and deepening knowledge and skill base. Contemporary teachers need to understand more diverse and multiethnic students' needs, be skilled in technology and information, and be involved in collaborative work cultures inside and outside of school. It is natural that current teachers make an effort to improve personal mastery.

In summary, personal mastery is a discipline practiced at the individual level within organizations. It fosters "the personal motivation to continually learn how our actions affect our world" (Senge, 1990, p. 12). For personal mastery, individuals need to be aware of their current reality and have a personal vision of the future. Considering the fact that there is a tension between reality and future vision, teachers should intensify their future vision, focus on their strengths, and sustain high self-commitment in developing their capacity. To maintain a high level of personal mastery, school leaders should clarify developing teachers' professional knowledge or skills. Specifically, for their work to encompass both teaching and learning, teachers are required to play new roles as lifelong learners, and to seek knowledge beyond their own classroom experiences (Fullan, 1993).

Mental models. Mental models are "deeply ingrained assumptions, generations, or even pictures and images that influence how we understand the world and how we take action" (Senge, 1990, p. 8). Senge et al. (1994) describes mental models as "the images, assumptions and stories which we carry in our minds of ourselves, other people, institutions and every aspect of the world. Like a pane of glass framing and subtly distorting our vision, mental models determine what we see" (p. 235). Wyckoff (1998) also defined mental models as "the discipline which

describes the process of reflecting upon, continually clarifying, and improving our internal pictures of the world, and seeing how they shape our actions and decisions" (p. 22). The process of establishing mental models is crucial for people who want to understand their world, including schools, because their mental models determine what they see (Senge et al., 2000).

Regarding building mental models, Senge (1990) argued that people need to maintain a balance between inquiry and advocacy, "where people expose their own thinking effectively and make that thinking open to the influence of others" (p. 9). Senge et al. (1994) added, "The frontier of this discipline lies with creating innovations in infrastructures where work with mental models can take place" (p. 238).

Reflection and inquiry are two key skills necessary to increase mental models to a conscious level. Senge et al. (2000) defined reflection as slowing down one's thinking process in order to become more cognizant of how mental models are formed. Inquiry is defined as communicating in such a manner as to share views and learn about others' basic assumptions. Learning and thinking in learning organizations is conducted in a cycle of doing, reflecting, thinking, and deciding (O'Sullivan, 1997; Senge et al.). Ultimately, reflection and inquiry function to lead to organizational learning according to the principle of action science.

According to Senge (1990), through mental models, we see our world, make our own thinking processes visible, and recognize what we have in common. Mental models limit our ability to change because we are usually drawn to take in and remember only information that reinforces our existing mental models (Senge et al., 1994). In a similar vein, Knight (1998) stated, "Because people see the world only through their paradigm, their understanding of reality is only partial and incomplete" (p. 3). Mental models were referred to as *paradigm* coined by Kuhn (1970). Kuhn noted that personal perceptions are inescapably shaped by paradigms, the mindsets

of the world that an individual holds. As a result, mental models are considered problematic because they limit people to familiar ways of thinking and acting, as well as limit their openness to new ideas.

It appears that as a discipline applied to educational settings, the need to address mental models is important for school change. Mental models imply that "educators need to keep reinventing their schools by looking at them with the help of still more new ideas" (Knight, 1998, p. 3). In this vein, Isaacon and Bamburg (1992) advocated that the discipline of mental models is able to become a powerful new definition of the role of staff development in schools. Criticizing the current prevailing mental models of schooling as a series of linear events, Conzemius and Conzemius (1996) suggested that "the shift from schooling as an event to learning as a never-ending, continuous process must be made at all levels of the educational endeavor" (p. 24). Fullan (1995) suggested that "teachers need to understand how diverse, multi-ethnic students learn and develop, and must draw on a repertoire of teaching strategies to meet a wide range of individual needs" (p. 232). More specifically, "the practice of reflection appears to be an integral component regarding the examination and revision of teachers' mental models and the promotion of operational variety" (Zederayko, 2000, p. 72). Elmore (1995) noted that in order to teach children effectively, teachers must be able to reflect on and decide between multiple alternative approaches. He also reported that "reflection is also thought to be capable of allowing teachers to improve their mental models by emancipating them from a narrow range of choices of effective pedagogical practices" (as cited by Zederayko, p. 72).

In summary, mental models refer to the development of mental pictures and images of a desired personal vision. Usually, we see our world and reality through our own mental models. Our existing mental models limit our ability to change. Therefore, as a discipline, mental models

focus on maintaining "the openness needed to unearth shortcoming in our present ways of seeing the world" (Senge, 1990, p. 12). Individuals critically create these mental models through reflection and inquiry. To develop mental models conducive to building learning organizations in schools, teachers and other school staff need to share with others and maintain conversations in which they openly share their perceptions and develop knowledge about others' assumptions. Teachers should become reflective learners to promote mental models.

Team learning. Team learning is "the process of aligning and developing the capacity of a team to create the results its members truly desire" (Senge, 1990, p. 236). More specifically, Senge et al. (1994) explain that team learning involves transforming conversational and collective thinking skills to enable groups in organizations to improve intelligence and capacity greater than the sum of individual members. Team learning includes the need to think insightfully about complex issues and our mental models. Namely, it requires that we not only balance the need to be responsive to others with that of advocating our own view, but group members also learn skills to be productive together (Isaacon & Bamburg, 1992).

Team learning is vital in creating a learning organization because teams are the fundamental learning unit in modern organizations (Senge, 1990). According to Isaacon and Bamburg (1992), "The discipline of team learning builds on the disciplines of personal mastery and shared vision" (p. 44). Senge argued that "unless team can learn, the organization cannot learn" (p. 10).

Then, how can team learning be achieved and enhanced in organizations? Watkins and Marsick (1993) argued that "team learning is enhanced when teams learn the skills of framing, reframing, experimenting, crossing boundaries, and creating an integrative perspective" (p. 14). These skills for fostering team learning are demonstrated in the ways or types of more specific conversation among team members. Wyckoff (1998) identified that team learning involves team

member alignment, dialogue, collaboration, and inquiry. Specifically, according to Senge et al. (2000), team learning is based on two critical components, "Alignment–as distinct from agreement and dialogue–as distinct from discussion" (p. 74). They point out that "alignment has the connotation of arranging a group of scattered elements so they function as a whole, by orienting them all to a common awareness of each other and their current reality" (p. 74). In schools or communities, "alignment starts with the ability to see and respect each other, and to establish some common mental models about reality" (p. 74).

The most effective practice for team learning emerges from the engagement of dialogue as "a sustained collective inquiry" (Senge et al., 2000). The objective of dialogue is not to analyze or exchange opinions but to listen to others' opinions and to share understanding with others experiencing ideas in the same way without assumptions. Senge et al. noted that through engaging in dialogue, people can become more aware of the context around their experience, and of the processes of thought and feeling concerning that experience. Knight (1998) indicated that dialogue serves as a cornerstone for organizational learning and a tool for authentic communication. This dialogue is the primary skill necessary for team learning (Senge, 1990; Watkins & Marsick, 1993).

Various suggestions or strategies are considered important to encourage real dialogue. Senge et al. (2000) suggested that we pay attention to three conditions to realize real dialogue. First, we need to surface our assumptions. Namely, we should make ourselves aware of our own assumptions before we can raise them. Second, we need to display our assumptions. Our assumptions should be unfolded so that we and others can see them. Third, we should engage in inquiry. Inquiry allows other people to see new dimensions in what is being thought and spoken,

as well as the assumptions of other people. Also, Ellinor and Gerard (1998) highlighted that dialogue is enhanced through specific strategies such as

> (a) suspension of judgment, (b) release of the need for specific outcomes, (c) inquiry into and an examination of underlying assumptions, (d) authenticity, (e) a slower pace with silence between speakers, and (f) listening deeply to self, others, and for collective meaning. (p. 26)

In contrast, O'Neil (1995) found that current schools and teachers are far from engaging in team learning or collaborative culture toward creating a learning organization.

> Schools are considered institutions of learning, but are most of them learning organizations? Definitely not. A learning organization is an organization in which people at all levels are, collectively, continually enhancing their capacity to create things they really want to create….Teachers don't work together; there's very little sense of collective learning going on in most schools. (p. 20)

Wyckoff (1998) found that "dialogue is limited in many school work places" (p. 31). Teachers' isolation within their classroom and a lack of involvement in team learning may bring negative effects at various levels such as meaningful interactions with colleagues, individual motivation or energy, and school improvement.

Nevertheless, there is considerable agreement that it is essential to enhance team learning and collaboration in creating schools as learning organizations. Through semi-structured interviews with 72 teachers and 6 administrators at six British Columbia schools, Leithwood, Jantzi, and Steinbach (1995) examined the factors that led to organizational learning. The school conditions that were reported to favor organizational learning were collaborative and collegial culture, norms of mutual support with frequent opportunities for group discussion and reflection, open and inclusive decision-making, and support for risk taking. Schools reported to favor

organizational learning through the practice of team learning. In a follow-up study of direct relations between schools and the promotion of team learning, Leithwood, Leonard, and Sharrat (1998) found that collaborative and collegial school culture that encouraged team learning and risk-taking fostered organizational learning. Collaborative culture–which encourages mutual support, respect for other teachers' ideas, the sharing of candid and honest feedback, and an accompanying willingness to take risks–bolsters team learning behavior.

DuFour (1997) described the following major components:

> *Curricular teams/ interdisciplinary teams.* Every teacher in the school as a learning community would be assigned to a team who shared the same assignment . . . . *Study groups.* All teachers would be expected to participate in a study group on a topic of interest to them . . . . *School improvement task forces.* In the school as a learning organization, all teachers would be called upon at several different times in their careers to serve on school improvement task forces . . . . *Professional sharing.* The school as a learning community would create the expectation that staff member shares their insights and findings regarding teaching and learning with their colleagues . . . . *Collaborative structure supported by time.* The one common element of the activities described above is that they require collaboration on the part of the professional staff. (pp. 84-85)

Marks and Louis (1999) suggested that two key conditions are required to encourage team learning. The first is permeable boundaries for the free flow of information. The second is a collaborative school culture. These two conditions are needed if school staff and teachers are to work together to analyze and solve problems, and create knowledge.

Shaping new mental models about teachers' roles or leadership is emphasized to promote team learning. Fullan (1993) identified that learning to work in highly interactive and

collaborative ways with other teachers, administrators, parents, and community members is one of the key components of the new work of teachers. Fullan (1995) suggested teachers' new roles as follows:

> Teachers must become committed to, skilled at, and involved in *collaborative work cultures* inside and outside the school. … teacher leadership also means becoming experts in context. ... It is specific knowledge, understanding, and skills in relation to parents, community…teachers must lead the way in being continuous learners throughout their careers. (p. 233)

In summary, team learning is a key component in building the learning organization. It improves "the skills of groups of people to look for the larger picture that lies beyond individual perspective" (Senge, 1990, p. 12). The facilitation of team learning requires that team members actively engage in team alignment, dialogue, and inquiry. In schools, team learning and collaboration tend to be conceived as preferable strategies to addressing the problem of teacher isolation within classrooms (Fullan, 1993). It is not surprising that success in team learning is very closely related to the development of a shared vision and enhancement of a school capacity. As a result, school capacity depends on teachers' team learning or ability to collaboratively examine and apply new ideas about teaching and learning (Hargreaves, 1995; Leithwood et al., 1998; O'Neil, 1995).

Shared vision. Shared vision is a starting point for creating the learning organization (Knight, 1998; Watkins & Marsick, 1993). Conceptually, Senge et al. (2000) posited that "the discipline of shared vision is the set of tools and techniques for bring all of these disparate aspirations into alignment around the things people have in common" (p. 72).

> Shared vision includes developing a vision, clarifying values, possessing a common mission or purpose, and the setting of organization goals. Shared vision is a building of shared commitment and shared meaning for individuals. Having a shared vision results in sense of purpose and coherence for members of the organization. Shared vision is built with leadership from top management and involvement by individuals in a climate which allows for open and frank dialog. (Wyckoff, 1998, pp. 28-29)

Knight (1998) explained, "If every individual's personal notion of what matters and how to get there is at odds with every other individual's, that state could lead to unprecedented fragmentation, conflict, and disarray" (p. 7). Shared vision is an important component in a learning organization (Marquardt, 1996; Senge, 1990; Watkins & Marsick, 1993).

Traditionally, organizational leaders were assumed to be primarily responsible for providing a vision and then ensuring through artful communication that other members of an organization buy into it (Isaacon & Bamburg, 1992). Therefore, creating vision in organizations was usually understood as just the leaders' work. However, creating shared vision is different from the traditional visioning exercises which are currently engaged in many organizations. Shared vision is never an organizational vision built by only organizational leaders. Moreover, shared organizational vision is not a simple sum of personal visions in an organization. Building shared vision means that individual vision or goals are integrated into a shared organizational vision. Namely, all organizational members are bound through establishing shared vision for a learning organization (Senge, 1990).

To develop a shared vision, Senge (1990) recommended that leaders wishing to create a shared vision begin by encouraging individuals to understand their personal visions. He asserted that true shared vision is never imposed, and that it emerges from people who truly care about

one other and their work, who posses a strong sense of personal vision, and who see the collective vision encompassing all personal visions. In a similar vein, Isaacon and Bamburg (1992) believed that this type of shared vision helps people align what they do with what they say they want, so they feel less pressured.

The existing research regarding shared vision applied to schools presents the concrete conditions and practical importance of its active creation (Keefe & Howard, 1997; Leithwood et al., 1998; Marks & Louis, 1999). In an application of shared vision to schools, Senge et al. (2000) suggested major conceptual conditions to create it. According to them, a group of school staff should build a sense of commitment together. Teachers need to develop images of the future they want to create together, along with "the values that will be important in getting there and the goals they hope to achieve along the way" (p. 72). School systems should be designed to develop and use active communication channels, participative events, and other informal meetings. School systems should allow their staff to freely say what they want about purpose, meaning, and vision with no limits or reprisals.

In summary, shared vision is the key component necessary to foster a commitment to the long term in building a learning organization (Senge, 1990). It appears from the literature that shared vision needs to focus on the process of bringing organizational members together and the enlargement of their participatory roles with commitments in communication and collaboration. To foster a shared vision in school organizations, school leaders' empowerment leadership and teachers' own strong commitment should be required to facilitate collaboration and to freely dialogue with one another.

Systems thinking. In a simple definition, "system thinking is a way of thinking about, describing, and understanding the forces and interrelationships that shape the behaviors"

(Wyckoff, 1998, p. 35). According to Senge (1990), systems thinking is a main discipline which functions to integrate the other four disciplines as an ensemble in building a learning organization. It also needs the other four disciplines to realize its potential. It functions as a conceptual framework in Senge's model (Bierema, 1999). Senge indicated that "vision without systems thinking ends up painting lovely pictures of the future with no deep understanding of the forces that must be mastered to move from here to there" (p. 12). This indication emphasizes that we need to consider and deal with organizational events and issues in systems thinking to create a learning organization.

The essentiality of requiring systems thinking as a discipline draws from an assumption that every organization, all organizational behaviors, and organizational members' conduct and practice exists as a system. In this regard, Senge et al. (2000) argued that "the discipline of systems thinking is the study of system structure and behavior" (p. 78). Furthermore, Senge (1990) believed that "unless a system is changed, it will continue to create the same results: despite personal difference, individuals in a given system are likely to behave in similar ways" (Isaacon & Bamburg, 1992, p. 42). In this vein, systems thinking is considered a key skill leading to learning and change toward becoming a learning organization (Janzen, 2001; Senge, 1990; Watkins & Marsick, 1993).

The practice of systems thinking involves how people think about the actions and practice taken within the organization. Organizational members should consider "the cause and effect relationship of their actions, whereas they need to understand that the cause and effect may not have been close together in time" (Wyckoff, 1998, p. 37). People in organizations are encouraged to think in new ways and use productive reasoning skills systemically in order to see links and feedback loops, and critically in order to identify assumptions. Specifically, Wyckoff

suggested that leaders must recognize their responsibilities in helping members of the organization think systemically.

Systems thinking is clearly emphasized as a discipline in building schools as learning organizations. For example, in a fifth discipline fieldbook for schools, Senge et al. (2000) pointed out that systems thinking must occur with every stakeholder of schooling because all educational practices, behaviors of school districts, and policies within schools have systemic attributes. Emphasizing a systemic view and the vitality of systems thinking, Costa and Kallick (1995) noted that if schools and teachers want to be truly successful, they must totally abandon their old mental models about schools and teaching. Knight (1998) described the implications of systems thinking in terms of illuminating how schools might be better organized to deliver effective service for students with learning disability. He remarked that systems thinking provides "a new way for educators to understand how children learn, how teachers and students interact, and how schools support or suppress the way teachers learn" (p. 10).

The complexity of an organizational context and its problems places a priority on the need for systems thinking for a learning organization (Janzen, 2001). Considering that attributes of educational problems are complex and intractable, it is necessary that school leaders and teachers consider and understand their own actions and practices in systems thinking. To resolve the complex problems which teachers and administrators face, Fullan (1993) strongly advocated a systematic approach for leading to school change.

In summary, the discipline of systems thinking functions as a tool or technology for understanding the context of interrelationships and interdependencies in an organization. It integrates Senge's (1990) other four disciplines. Systems thinking improves the ability to see the whole picture rather than just the parts in dealing with the problems and actions or practices in an

organization. Therefore, systems thinking helps organizational members deal with complex problems and change situations in view of the long-term and larger process. Considering the complexity of educational problems as conflicts and different expectations among various stakeholders about schooling's directions and interests, systems thinking is required to transform schools into learning organizations.

The Learning Organization and Korean Secondary Vocational Education

Whether the learning organization developed in the U.S. can be applied to Korean vocational high schools is a key research issue in this study. As a contextual base and prerequisite to approach this research issue, initially, this section overviews Korean vocational high school systems. Second, a rationale to introduce the learning organization concept is discussed at the level of Korean educational policy, as well as at the theoretical level of connections with existing Korean literature. Finally, specific cultural factors considered in applying the learning organization concept to Korean vocational high schools are presented.

Overview of Korean Vocational High School Systems

The current framework of the Korean education system consists of six-year elementary schools, three-year middle schools, three-year high schools, and four-year colleges. In a broad sense it is called a 6-3-3-4 system which is additionally divided into two educational tracks at the upper-secondary level, academic education and vocational education. Most secondary vocational programs exist as a separate curriculum track within comprehensive high schools (Kim, 2004). Two types of Korean high schools exist in a dual system, like European education systems, where most vocational programs and courses are offered by only vocational high schools separated from general high schools. General high schools primarily focus on offering academic education leading to two- or four-year colleges and universities; whereas vocational high schools

focus on vocational skills and knowledge considered necessary to enter the workplace. After graduating from middle school, Korean students have to decide which type of high school to enter. Students' high school selection is usually based on overall grade point average (GPA) accumulated during middle schools.

In 2004, 729 vocational high schools (35.0% of all high schools) provided programs to 514,550 students (29.5% of all high school students) in Korea (Jang, Jeong, & Lee, 2004). According to the Korea Ministry of Education and Human Resources Development (2003a), there are 427 vocational high schools based on a single-focused occupational program (28 agricultural, 209 trade and industry-technical, 227 business, and 8 fishery). Seventy-three mixed vocational high schools offer two or more vocational program areas. In addition, 206 comprehensive-type high schools offer vocational and academic programs separately. Most of these comprehensive high schools are similar to American comprehensive high schools with vocational programs, but different in the operation of programs. All students beginning the 10th grade are fixed in one of two tracks (academic or vocational), and take their courses separately within the schools. Tables 2.2 and 2.3 show the recently changing number of Korean vocational high schools and their students. The number of vocational schools has slightly decreased or stagnated since 1997. Since 1999, with the decrease of enrollment in most vocational schools, the total number of vocational students has also decreased.

Table 2.2

Major Korean Vocational High Schools and Student Enrollment, 1990-2003

School	1990	1995	1997	1999	2001	2003
Agricultural school	55	29	26	25	27	28
Trade industry-technical school	104	175	192	202	209	209
Business school	208	248	248	251	225	217
Fishery school	9	9	10	5	8	8

School	1990	1995	1997	1999	2001	2003
Mixed vocational high school	16	62	63	68	73	73
Total number including comprehensive-type high schools	-	-	771	-	759	734
Year		1997	2000	2001	2002	2003
The number of enrollment students		336,036	240,809	224,760	200,778	190,524

Note. Abstracted from "*The Policy Research for the Development of Vocational Education Systems,*" by K. O. Jang, C. Y. Jeong, and J. P. Lee, 2004, p. 30.

Table 2.3

Academic and Vocational Students in Korean High Schools

School type	1990	1995	2000	2001	2002	2003
Student of academic schools	61.8%	54.1%	63.9%	65.9%	68.0%	69.3%
Student of vocational schools	38.2%	45.9%	36.1%	34.1%	32.0%	30.7%

Note. Summarized from "*The Policy Research for the Development of Vocational Education Systems,*" by K. O. Jang, C. Y. Jeong, and J. P. Lee, 2004, p. 31.

All vocational high schools are composed of many academic departments which not only function as vocational program units, but also operate as basic units to recruit students. These academic departments are based on traditional industry sectors and specific entry jobs. Based on these academic departments, curriculum and teaching courses are developed and planned. The numbers of detailed academic departments and vocational courses offered by vocational high schools and related programs are presented in Table 2.4.

Table 2.4

Major Programs and Courses Offered by Korean Vocational High Schools

Program focus	Number of major programs	Number of courses
Business education	9 (business information, accounting, secretarial business, etc.)	19
Trade and industry-technical education	20 (mechanic, welding, architect, carpenter, automobile, shipbuilding, ceramics, industrial design, electrics, textile, food processing, etc.)	112
Agricultural education	8 (livestock farming, agronomy, food processing, farm machinery, landscaper, etc.)	40
Health, home, and hospitality education	9 (tourism, cooking, nursing, interior design, costume design, hairdresser, etc.)	31
Fishery education	13 (fishing, aquaculture, freezing work, navigation, ship electric, frozen food, etc.)	36

Note. Summarized from "*The Seventh Korea National Curriculum,*" by Korea Ministry of Education and Human Resources Development, 1998, pp.7-10.

In 10th grade, currently, most students in vocational high schools take general courses such as mathematics, science, Korean, English, physical education, and so forth. In 11th and 12th grade, they usually take selective and compulsory vocational courses offered by their program area, which was selected in 10th grade. According to the guidelines of the National Curriculum addressed by Korea Ministry of Education and Human Resources Development (1998), all students must take at least 40% of the total secondary course units in general academic courses in order to graduate. Therefore, in each vocational high school, 40% to 60% of students' curriculum is comprised of vocational course.

Private vocational high schools make up 42% of all vocational high schools (Kim, 2004). For most private vocational high schools, all teacher payroll money and a part of standardized education costs are supported by the Korean government. Student selection, tuition, curriculum, programs, teacher certification, and the teachers wage system are all conducted under the

authority of central and provincial governments (Korean Primary and Secondary School Law, 2002). Therefore, private and public schools are similar to each other except for employment and staffing. All staff members of private schools are employed by the governing board of each private school foundation, working only for their own school. In contrast, all teaching staff of public schools is employed by the superintendent of each metropolitan or provincial education office, and they work under a regular job rotation system within the area of their provincial schools. Private school teachers do not participate in this periodic school rotation.

Existing Policies and Current Status of Vocational Education

At the national level, the central government, particularly the Korea Ministry of Education and Human Resource Development (KMOEHRD) has played a pivotal role in the growth of vocational education. The central government has strengthened its authority in developing and implementing the vocational education policy to drive Korea's rapid industrialization over the last 50 years. The Korean central government has successfully restructured the vocational education and training system to meet changing industrial and business demands (Korea Research Institute for Vocational Education & Training**,** 1999). Also, in 1963, to facilitate the support and growth of vocational education, the Korean government instituted the Vocational Education Promotion Law that established criteria and set the foundation for both the national and provincial government's vocational education programs. The source of funding for vocational education continues through the 1963 legislation. The Korea Research Institute for Vocational Education and Training (1999) reported what role and policy the central government have historically performed for vocational education in Korea.

> In the early 1960s, the government established a vast economic development plan and restructured vocational education and training system in order to supply the manpower

> necessary to carry out the plan. …The government rapidly expanded enrollment in vocational schools in the 1960s. … During the 1970s, to provide such skilled workers for the development of heavy-chemical industries, the government strengthened technical-vocational education at the secondary level, … In 1990, the government began to implement policies to increase the enrollment of vocational high schools, so that the enrollment ratio of general vs. vocational high schools would increase from 68:32 to 50:50 … Since 1994, the Presidential Commission for Education Reform (PCER) had examined the effectiveness of the policies to expand enrollment figures for vocational high schools and to encourage close industry-school linkages. (pp. 3-7)

In the early 1990s a booming economy brought out severe labor shortages. To overcome this serious problem, the Korean central government expanded the number of vocational high schools, especially technical schools, to 50% of the total number of schools. Ihm (1999) indicated that the attempt to increase students in the vocational track was consistent with "the tradition of manpower planning which had been established in Korea" (p. 313).

In expanding the number of vocational high schools and students, one of the overarching policies was to introduce the 2+1 system as a means of connecting school and workplace. This policy was rooted in the model of the German dual education system (Kim, 2004), and was based on "the needs of the workplace, especially labor shortages in the manufacturing industry sector" (p. 30). The 2+1 system combined the first two years of study in a vocational high school and the last year of study in the workplace. Through numerous government funding incentives to instill the 2+1 system into schools and workplaces, the number of schools participating in the 2+1 system has increased from 20 schools with 3,169 students in 1994 to 90 schools with 12,922 students in 1997 (Lee, 1999). The 2 +1 system still remains one of the vocational high school

systems, but at a much reduced scale, 30 schools involving 4,678 students participated in 2002 (Korea Ministry of Education and Human Resources Development, 2003a). In spite of being strongly initiated by the Korean government, it has been not successful because the foundation for an industry-based training culture was frail (Kim, 2004; Lee).

Despite continuously lucrative scholarships to vocational high school students, the number of students in vocational programs decreased by 276,388 between 1997 and 2002. The number of school also decreased by 30 during the same period (Korea Ministry of Education and Human Resources Development, 2003a). According to Kim (2004), the number of vocational high schools that shifted to general academic high schools rose from 9 in 1999 to 14 in 2002. The number of vocational high schools that transferred to specialized programs such as design or automobile manufacturing increased from 8 to in 1999 to 18 in 2002. These programs are similar to the career magnet schools in the U.S.

Currently, vocational high schools are surrounded by challenges stemming from environmental changes and major systemic problems. First of all, a critical issue is to cope with dramatically increasing numbers of students pursuing higher education, as opposed to vocational training that targets entering specific jobs. According to Jang et al. (2004), this challenge results from a vocational education system including programs, courses, and vocational teacher education that focus on training for entry-level job skills. The educational statistics reported by Korea Ministry of Education and Human Resources Development (2003b) reveal evidence of increasing vocational students on the postsecondary pathway (two-or four-year colleges and universities). The number of vocational high school students who went to two-year colleges and universities has risen from 8.3% in 1990 to 62.3% in 2004.

Table 2.5

Ratio of High School Student Advancement to Higher Education

School type	1980	1990	1995	2001	2002	2003	2004
Vocational schools	11.4 %	8.3%	19. 2%	44.9%	49.8%	57.6%	62.3%
General schools	34.0%	47.1%	72.7%	85.2%	86.9%	90.1%	89.8%
Total	23.8%	33.4%	51.4%	70.5%	74.2%	79.7%	81.3%

Note. Abstracted from "*The Policy Research for the Development of Vocational Education Systems,*" by K. O. Jang, C. Y. Jeong, and J. P. Lee, 2004, p. 32.

Second, the condition of employment for vocational high school graduates is getting worse (Jang et al., 2004). The slow economy seems to be exerting a negative impact on the employment environment for vocational school graduates. Moreover, the increasing influx of foreign laborers also negatively affects employment opportunities for vocational school graduates. Increasing numbers of foreign laborers compete with vocational school graduates for entry-level jobs (see Table 2.6). Many employers prefer East Asian and Korean Chinese workers to fill existing jobs and reduce wage costs.

Table 2.6

Numbers of Foreign Labors

Year	Legal residents	Illegal residents	Total
2003	82,928	287,056	369,984
2004	242,098	181,499	423, 591

Note. Abstracted from "*The Appendix Report for the Renovation of Vocational Education Systems,*" by the Presidential Commission of Educational Innovation, 2004, p. 18, and "*The Policy Research for the Development of Vocational Education Systems,*" by K. O. Jang, C. Y. Jeong, and J. P. Lee, 2004, p. 21.

Third, with the negative stigma on vocational education and schools, changes in internal and external environments more negatively affect their student enrollment and financial condition. They will face a continuous difficulty in their student enrollment based on decreasing birth rate, college preference of students and parents, and mismatch with the demands of the industry and business (Jang et al., 2004). In line with the decrease in numbers of vocational schools and

students, central government subsidies for educational resources and equipment have decreased from 102 billion won (about $102 million) in 1997 to 10 billion won (about $50 million) in 2002 (Korea Ministry of Education and Human Resources Development, 2003a). Regarding the dropout rate at the upper-secondary level, Jang et al. reported that students in vocational high schools drop-out at a higher rate (4%) than their peers in general academic high schools (1.4%).

Policy Rationale to Apply the Learning Organization

The need of systemic change in vocational high schools. A systemic change of schools is understood as fundamental change in the whole educational system. It begins at the deepest level of purpose, vales, beliefs about learning and all corollary components that support student learning in schools, such as curriculum, instruction, assessment, and policy (Jenlink, 1995) A systemic change of schools requires major shifts in commonly held mindsets about school, schooling, and education as well as how we approach educational change. Regarding the necessity of the systemic school change, Jenlink indicated, "Today piecemeal change efforts often characterized as fragmented or tinkering at the edges, have proven less than satisfactory" (p. 6).

Regarding the need for systemic change, Kim (2004) argued that secondary vocational education is at a crossroads because it faces great challenges, not only from evolving workplace change embedded in societal, technological, and economic changes, but also from a growing emphasis on school reforms such as academic excellence and generic workplace skills. In a similar sense, major scholars of vocational education in the United States have addressed the need for change. Gray (2002) discussed a variety of roles in secondary vocational education with regard to the extent of curriculum integration between academic and vocational education, advocating a type of integrated vocational education as the only model which adequately

addresses the shortage of technicians. Lynch (2000) asserted that the fundamental philosophy of vocational education should change to be in line with the new economy, public expectations, new perspective about student learning, and numerous high school reform efforts. As Grubb (1997) argued with respect to the expectation of *education through occupations*, in the same sense, Pucel (2001) advocated that the role and mission of vocational education should shift from skill-specific job preparation for entry-level employment, to a new broad-based, career-focused education and provision of context to enhance academic education leading to both employment and postsecondary education. Arguments by these researchers are consistent with inevitability of a systems change of secondary career and technical education, rather than fragmented change.

In Korea, secondary vocational education and vocational high schools are in similar contexts as those debated by American scholars. The reason why Korean vocational high schools need a systemic change is that they are currently faced with environmental changes including education reforms, the changing needs of students and parents, and an identity crisis regarding its role.

The increase of vocational high school students who enter and want to go to 2-year colleges and universities is expected to continue into the foreseeable future. Also, it is certain that vocational high schools will face increasing difficulty in enrollment of students to satisfy allotted quota (Ihm, 1999; Jang et al., 2004). Nevertheless, much of vocational high schools including programs and curriculum still remain organized around traditional occupational categories (Jang et al.; Kim, 2004). In particular, vocational teacher education still reflects a traditional system that focuses on skill-specific job preparation leading to entry-level employment.

As a result, appropriate school systems including teacher education and program development should be developed to meet the increasing needs of students toward postsecondary education. In this regard, Korea Research Institute for Vocational Education and Training (2000)

argued that systemic changes are needed in the areas of program type, curriculum, and career opportunities in Korean vocational education in accordance with changes in the nature of work, continuing education, and decline in the school-age population. Specifically, beyond teaching of skills and drills which is the focus of traditional vocational education curricular, teaching staff and school administrators need to enlarge understanding about new roles and needs of secondary vocational education and change their own mental models. In conclusion, the argument for systemic changes corresponds with the necessity of developing *schools as learning organizations.*

Expansion of school capacity to adapt to reform movement and social change. It is essential that all people and businesses, as well as schools, increase their capacity to adapt to a dramatically changing environment. Korean schools including vocational high schools also need to address social and educational change. The Korea Ministry of Education and Human Resource (KMOEHRD; 2002) identified features of social changes which every school faces.

> Social values and life style move from standardization and uniformity to diversity and individuality…. With a loosening of regulations, the market expands its role in society… As society moves toward a meritocracy, social conflicts and social alienation resulting from harsh, competition will become more intense…. the culture of individualism will force issues related to youth, women, and middle-aged people to the fore. (pp. 2-3)

The features of these Korean social changes are summarized in Table 2.7.

Table 2.7

Changes in Korean Sociocultural Paradigms

	Present	Future
Value and behavior	Standardized, authoritarian	Variety and autonomy
Organization	Bureaucratic, large scale	Learning organization, optimum size

	Present	Future
Laws	Regulation and input oriented	Deregulation, output oriented
Knowledge	Source of authority and control	Source of quality of life

These Korean social changes require a new capacity within Korean schools and educators. Increasing each school's capacity to adapt to these changes is a key of Korean educational policy at the national level.

There is another force which Korean schools should address more effectively and directly. It is a national education reform policy targeting school change. Since the mid-1990s, KMOEHRD has place emphasis on comprehensive educational reform as a key to national prosperity in the new millennium. Until recently, the transition of these education reforms has been smooth despite changes in government regime (Kim, 1998). Lee (2001) identified major reform agendas and major implementing realities related to K-12 education in Korea.

> For the reform of K-12 education, the proposals included new curricula for humanities and creativity, creation of autonomous school communities, and a new college admission system. ... Each school was also required to organize a school council which involved parents and teachers in school-wide decision making. At the same time, different kinds of high schools and specialized programs were allowed to be established. To hold school districts and schools accountable, the government's administrative and financial support was linked to their performance evaluation results. (¶ 9)

These educational reforms target school change to provide more creative education. These educational reforms are based on the national initiatives and are expected to operate into the future. In Korea, the national reform policy itself functions as a dramatic external change force

to each school. Each school is required to effectively cope with the requirements of the national education reform.

Since the comprehensive vocational education reform in Korea was initiated in 1995, vocational high schools have focused on implementing various new models and goals such as 2+2 systems (programs linking the curriculum of the second and third years of vocational high school with that of vocational colleges), the quality improvement of vocational education, and increasing school-business partnerships in Korea. Kim (2004) indicated that Korean vocational education reform has targeted integrating the curriculum of both vocational and general high schools to enable students to choose from a wide selection of courses during the junior and senior year. Currently, KMOEHRD is in the process of reviewing how to create new integrated high schools that offer both academic and vocational curriculum similar to comprehensive high schools in the United States (Ihm, 1999; Jang et al., 2004; Kim, 2004).

These reform agendas and the future needs surrounding vocational education require a new attitude, new leadership, and different capacity for vocational educators and administrators at each school. Vocational teachers and principals are facing new challenges never experienced in existing traditional vocational education systems. To improve educational quality and realize integration with academic fields, vocational educators should focus on creating internal collaboration and team learning with academic teachers. Also, they need to establish external collaboration and partnerships with postsecondary institutions to effectively administrate 2+2 system models. To effectively overcome these new challenges, new mental models and high personal mastery must be established, as well as the creation of a new culture of collaboration.

The need for systemic change increases concern about transforming vocational high schools into learning organizations comprising systems thinking, visioning, team learning, personal

mastery competencies, and mental model change. By applying learning organization concepts to vocational high schools in Korea, each teacher and principal as well as each vocational school organization is expected to improve the capacity to adapt educational practices. Theoretically, becoming a learning organization is understood as performing systemic school change including both "restructuring and reculturing" (Seller, 2001, p. 258). *Schools as learning organizations* focus on increasing school capacity to adapt environmental changes through building staff members' own new mental models, sharing knowledge, and team and organizational learning. In this vein, by applying the leaning organization concept to Korean schools, specifically vocational high schools, each school will be able to improve organizational capacity to effectively cope with required change issues.

An alternative to the limitation of existing school reforms. Educational reform and school change as a key national policy has been continuously performed in Korean government regimes. Decentralization and deregulation agendas have continuously resurfaced whenever educational reform is seriously discussed (Kim, 2002). Recently, the Korea Ministry of Education and Human Resources Development (2002) included the reduction of regulations and greater local school autonomy as a key agenda of the national plan aiming at a new take-off through the development and utilization of human resources and knowledge.

In Korea, most reform policies for expanding decentralization and school reforms have been taken up with a top-down and hierarchical approach under the authority of the KMOEHRD (Lee, 2001). In this regard, Kim (2002) argued, "Although previous regimes eagerly tacked the issue of educational decentralization in their formulation, there is little evidence to show that educational decentralization has been accomplished to a satisfactory extent in Korea" (p. 3). Lee addressed the characteristics of Korean school reform initiatives and their failures.

> The Presidential Commission on Education Reform (PCER) was established in 1994, and has been instrumental in Korean education reform (Gahng, 1988; Si-gan-gwa-gong-gan-sa, 1995). Beginning May 31, 1995, the PCER made four sequential reform proposals. Reform policies were also under criticism by educators because of their top-down approach and exclusion of teachers (KATO, 1997). While such comprehensive, sweeping school reform efforts have been made, national newspapers have reported so-called 'collapse of classrooms' or 'desolation of education' phenomena across the nation's high schools (Chosunilbo, August 23, 1999; Joongangilbo, October 20, 1999). This includes absenteeism, truancy, resistance to school authority and challenge to teachers, apathy, and other behavioral problems observed in schools and classrooms. (¶ 12)

Lee's observations show that Korean education reforms were not only developed with a highly centralized and hierarchical approach, but their results did not lead to school change. In a similar sense, Chung (2000) identified the problems of KMOEHRD's school reform policy using a hierarchal and bureaucratic approach.

> Teachers deplored the KMOEHRD impositions concerning what school should do and how to do it. Teachers protested that they were deprived of the opportunity to be active in reform. Their response became skeptical and cynical to reform prevailed in schools. (p. 11)

Introducing school-based management councils (SBMCs) show how hierarchical and top-down approaches to Korean education reform are limited in leading school autonomy and educational change. In 1995, KMOEHRD planned and implemented the SBMC model for all secondary and primary schools. The SBMC was introduced as a mandatory body. Autonomy was not allowed. The reform policy of the SBMC disregarded differing levels of parental and community member involvement. Even if the SBMC policy had targeted decentralization and

increased participation in school management, it is doubtful that it has affected "the teaching and learning core of schools" (Fullan, 1995, p. 230).

In Korea, applying the learning organization concept to schools can be an alternative to the failures and limitations which resulted from the centralized and hierarchical approach to school reforms. A systemic school change or systems thinking approach can be appropriate to overcome the limitation of top-down and hierarchical school reforms. In relation to approaching school change, Table 2.8 presents philosophical and foundational differences between the approach of the learning organization and that of existing Korean educational reform policy.

Table 2.8

Comparison of Learning Organization and the Korean Educational Reform Policy Approach

Dimension	Schools as learning organizations	Korean existing reform policy
Initiatives and locus of control	School stakeholders as users; user-designer oriented	Central government, and administration-oriented
Characteristics of change approach	Systemic, holistic, integrative interconnected, and evolutionary,	Liner, mechanistic, fragmented, , and short-term interval
Direction and communication	Bottom-up, open, both vertical and horizontal, more two ways, inquiry, shared vision, and reflection and dialogue,	Top-down, hierarchical, more vertical, and innovation diffusion through formal training and one-way discussion
Stakeholder involvement	Participatory and diverse participation	Limited participatory

A new strategy for improving teacher professionalism. Theoretically, the learning organization in a school context contributes to improving teacher professionalism because it facilitates teacher learning through systemic continuous learning as well as various informal and team learning opportunities. In this vein, learning organization principles will be able to provide a new policy strategy of teacher education for the current Korean government. In relation to the

training policy for improving the current teacher professionalism, the Korea Ministry of Education and Human Resources Development (2003a) reported,

> In-service training, for teachers, aims at helping to improve educational expertise and quality, to enhance the quality of teaching, to establish a desirable view of the teaching profession … It is offered in three categories: training for certificates, general training, and special training. … Each program lasts 30 days (180 hours) or longer. They are provided by regional teacher training institutes. (¶ 90)

For a teacher training policy, it is noted that KMOEHRD and most provincial offices focus on offering formal learning programs called teacher in-service training.

In a philosophy and method related to improving teacher professionalism, the view of Korean in-service teacher training policy is different from that of teacher learning based on the learning organization. Teacher learning within a learning organization is recognized as a daily occurrence in teachers' workplaces, not just attending formal teaching staff development once or twice on a regular basis. Learning foundations in the learning organization stem from inquiry and experimental education (Redding & Kamm, 1999). Therefore, the focus of teacher learning through creating the learning organization provides a new policy strategy for KMOEHRD and provincial governments. Korean educators, policymakers, and school administrators need to consider the learning organization concept with regard to developing a new intervention or training strategy for improving teacher professionalism.

Connections with Existing Korean Literature

Function as new criteria to diagnoses schools. By reviewing prior studies and literature, Lee (2002) identified the existence of several major diagnostic focuses to assess the attributes of Korean school organizations. First, the degree of school bureaucracy was measured and

evaluated as a main interest of Korean scholars. Second, the behavioral characteristics of principals and teachers were assessed by measuring the organizational climate of schools. Third, the extent of teacher participation in decision-making, school leadership, and relationships between teachers and students was approached with regard to a general school culture. Finally, major measures diagnosing the organizational effectiveness of schools were of most popular interest to Korean researchers. Diagnosing the organizational effectiveness of schools dealt with teacher job satisfaction, teacher job performance, and adaptability of the organization including the degree of adapting educational policy, curricula development, and organizational change.

Regarding the structural and cultural features of Korean school organizations, various results and features were reported based on researchers' approaching angles and perspectives. Nevertheless, the salient points of Korean school organizations shown from research are characterized as bureaucratic attributes, professional propensity, open system, and capsuled organization (Lee, 2002).

On the other hand, diagnosing the degree of *schools as learning organizations* provides unique information related to the learning culture and capacity to adapt to change. The characteristics of school climate and teachers' behaviors can be evaluated and analyzed from a different perspective focusing on a learning culture including an individual, team, and organizational learning as well as shared vision or systems thinking. More specifically, the information gathered and analyzed through the learning organization concept will contribute to expanding a knowledge base related to Korean school change including an organizational culture or climate and teachers behaviors.

Function as a new research area for school management and change. By reviewing the literature in relation to school organizations in Korea, a few characteristics are noted. Since the

1980s, a majority of research in the field of school organizations in Korea has focused on management and administrative methods. According to Lee (2002), the purpose of many existing studies relate to identifying or measuring the bureaucratic nature of current schools and finding the relationships between bureaucratic factors and other variables such as organizational effectiveness and organizational behaviors in school contexts. This point indicates that effective school management and change have been key issues to many Korean researchers.

Noting that the learning organization theoretically targets organizational change and capacity to adapt to the environment, identification of the constructs of the learning organization and assessment of its extent in a school context can contribute to building new variables leading to the effectiveness of school organizations. Regarding school change or development, it will provide a new theoretical guide and interest for Korean school researchers.

Several studies related to building a total quality management (TQM) model were noted as a new management model to be used in Korean schools (Choi, 1998; Kim, 1997; Kim, 2003). More recently, Chung (2004) analyzed the levels of knowledge management in Korean elementary and secondary schools on the basis of the knowledge management system model that is composed of five systems: learning, structure, human network, knowledge, and technical. He reported that teachers showed a considerably high level of individual learning, whereas they were very low at the level of team and organizational learning. Schools inefficiently utilized their human and material resources with respect to external networks and relations.

Analyzing TQM and the knowledge management model reflects organizational problems faced by Korean schools. In this regard, Kim (2003) summarized the problems of Korean school organizations well.

> Even though educational reforms have continuously been driven, schools have not met the various needs of students and parents at the level of operating curriculum and educational practices. The level of educational quality is still very low. Teaching and learning focusing on rote memorization is still prevalent as key schooling. School councils or site-based management systems were already introduced, but participation by teaching staff in decision making within each school is very low. The capacity of school autonomy and responsibility lacks coping skills with changing environments. (pp. 3-4)

In a similar sense, Chung (2004) argued that one of the most serious problems found in Korean schools is a stagnant organization rather than a continuously improving and changing organization.

The attempt to apply the learning organization concept to Korean schools can be understood in the same sense with the prior studies that target application of a TQM model or Knowledge management system to Korean schools. Moreover, assessing the applicability of the learning organization to be used to schools will strengthen a theoretical foundation to develop a more effective organizational model for Korean schools.

Characteristics of the Korean Social and Educational Culture

When we refer to applying a new system or theory to a culturally different setting, it is necessary to consider the characteristics of the traditional culture, values, and existing organizational systems. In this respect, it is essential to note Korean social and educational culture, values, attitudes, and priorities at the educational policy level when applying the learning organization to the current school systems of Korea.

Korean collectivism as an advantage. Usually, the cultural characteristics of major East Asian countries, including Korea, include collectivism, a Confucian tradition, and a holistic and

centralization approach. Nisbett, Choi, Peng, and Norenzayan (2001) found that East Asians are holistic, attending to the entire field, making relatively little use of categories and formal logic, and relying on dialectical reasoning, whereas Western people are more analytic, paying attention primary to the object and categories and the use of rules. Youn (2001) indicated that collective and relational orientations are dominant among Korean workers, in contrast to individualistic and utilitarian orientations among Western workers. He also expected more relational, collective, and hierarchical orientations from Korean people rather than individual autonomy and variety.

According to Jung and Sosik (2002), Korea is identified as a collectivistic society and priority is placed on collective goals and cooperative action in Korean work group settings. In contrast, priority is placed on personal goals, autonomy, and supremacy of self interest in American work group settings. Strong group orientation as a unique cultural attribute tends to help organizational members develop and/or strengthen positive attitudes toward group work and collective confidence in Korean workplaces

Theoretically, there can be a question of whether the learning organization developed in the U.S. can be applied to Korean school settings embedded by the culturally different characteristics. However, the learning organization theory and concept that was developed to overcome the limitation of American individualistic society includes cultural attributes of a collectivism society. For example, team learning and shared vision for learning organizations emphasiz a group sprit that is better considered as a cultural attribute of a collectivism society. Therefore, it may be noted that the Korean context can possess some advantages in applicability of the learning organization.

Confucianism and educational culture. According to Youn (1977), the ethical view of Confucianism is defined as self-effacing, patriarchal, and family-centered. Son (2000) summarized the key principles of the Confucian tradition embedded in Korean society.

> The educated persons became member of the ruling class by passing examinations based on the Confucian classics. They then exercised power according to the Confucian prescriptions. … The stability of society is based on unequal relationships between people. These relationships are mutual, which is a complementary obligation. The family is the prototype of all social organization. A person is not primarily an individual; rather he or she is a member of a family. (pp. 17-18)

This Confucian tradition has contributed to culture difference between Korean society and that of Western countries, particularly America, and is embedded in all domains of Korean society (Shinn, 1986; Son, 2000; Sorensen, 1994).

Confucian ethic places great emphasis on scholarship, the education system, and parents' attitudes or value about education in Korea. Confucianism strongly affects Korean zeal for education (Shinn, 1986). According to Sorensen (1994), the key principles of the Confucian tradition in Korea foster a status orientation and have provided Korea with "high levels of social capital in the form of strong family structure and norms of frugality, hard work, and a high valuation of education" (p. 11). He also indicated that structural characteristics of the Korean family based on the Confucian tradition make parental pressure on the education of children more intense. As a result, class and social status are not only very closely related to educational success, but the struggle for upward mobility, to a large extent, is also played out in the examination competitiveness for admission to colleges and universities in Korea.

In a cross-culture study, Shinn (1986) found that the effects of educational achievement on the perception of quality of life are significantly different between Korea and the United States. According to his findings, the probability that college graduates become a member of the highest income group in their society was more than two and half times greater in Korea than in America. He concluded that the reason why education serves as a more powerful and positive force influencing the quality of life in Korea than America is because in Korea "the Confucian concept of self development through education is still widely shared" (p. 369). In a similar perspective, Rosenbaum and Kariya (1989) found that educational success and socioeconomic status in Korea correlate much more highly than in the United Status.

As evidence of a practical influence on education, Ellinger and Carlson (1990) revealed the effects of Confucianism in Korea.

> Teaching that only persistence and hard work yield results in school as well as life. It is the role of the family, usually the mother, to ensure that a youngster studies and most Korean families take this responsibility very seriously. It is a matter of family honor for the son or daughter to succeed. (p. 17)

Ellinger and Carlson (1990) also found features of the Korean education system which are radically different from those found in the United States. Korea takes a lock-step approach to education, requiring students to pass a series of completive exams on an educational ladder system (e.g., college applicants must pass very rigorous entrance examinations). The Korean educational system stresses rote memorization, which pays off on standardized tests. In high schools, Korean students concentrate all day on studies and do not have extracurricular distractions built into the American system. In contrast, after school, American students usually participate in sports, music, and art activities. On the other hand, in the Korean context of

education fever, teaching to the tests in most high schools is common with a high concern found among students and their parents. Sorensen (1994) argued that "there is no doubt that teachers teach to tests" (p. 33). Therefore, as a goal of schooling, most high schools in Korea overemphasize students' academic achievement rather than their balanced development including emotional, social, and intellectual dimensions.

In conclusion, when interpreting and applying the learning organization concept developed in the United States to the context of Korean high schools, it is essential to reflect or note the value and attributes of the Confucian tradition embedded in Korean teachers, principals, students, and their parents, as well as in the school climate. For example, since the Confucian tradition has institutionalized hierarchy in Korean schools and educational administration, the relational and hierarchical constructs between teachers and principals, rather than autonomy and variety, should be noted in analyzing faculty's responses on the dimensions of the learning organization such as teaming learning, shared vision, and systems thinking. Analyzing the organizational behaviors of vocational teachers and the climate of vocational high schools should recognize a strong negative stigma as associated with vocational education, affected by Confucianism's strong status orientation. Regarding schooling and its process, Korean teachers' mental models, participation in building shared vision, and personal mastery need to be analyzed considering that high schools focus on standardized academic achievements or the results of testing student performance as their primary goal.

High centralized educational administration systems. Korea is a highly centralized country about educational policy including school reform initiatives (Lee, 2001). Unlike the United States, the Korean constitution addresses that "fundamental matters pertaining to the educational system, including schools and lifelong education, administration, finance, and the status of

teachers are determined by law" (The Constitution of the Republic of Korea, 1987, ¶ 32). Based on the constitution, the authority and power to operate public and private schools are delegated to the government at the state level, KMOEHRD. Chung (2000) presented evidence of the high centralization in Korean education.

> KMOEHRD forged a series of secondary school reform programs named as the New School Culture Movement. Virtually, KMOEHRD provided schools with detailed instructions that clarified what to do and how to do it. Schools are given seven majors topics to pursue: more discussions in schools, moral education focusing on behaviors guidance with emphasis on human relations, individualized teaching and learning, learning by experience, diversifying assessment methods, ... it was like a mandated package program for school change. (p. 10)

In previous government regimes and administrations in Korea, reducing the degree of educational centralization has been a key issue of educational reforms (Chung, 1990). Nevertheless, decentralization and deregulation is still a hot issue. Kim (2002) argued that there is little evidence to show that educational decentralization has been accomplished to a satisfactory extent in Korea.

High centralization in education affects building school bureaucracy with a rigid hierarchy and the styles of principal leaderships and teacher behaviors in each school. Regarding negative effects from a high centralization in education, Kim (2003) indicated that each school has low autonomy in its own organizational operation, is very passive to change, and shows a dependency tendency on instructions or orders from the national government or provincial offices. School principals also have a low responsibility attitude and only lead the operation of their schools according to traditionally bureaucratic administrative styles such as autocratic, directive, and transactional leadership.

In conclusion, the attributes of current school climate and organizational behaviors derived by a high centralization in education should be considered in interpreting or using the learning organization concept in Korean schools. School bureaucracy intensified by a high educational centralization prevents teachers and other stakeholders from productively interacting with each other (Dodd & Konzal, 2002). As school bureaucracy advocates a formal process and one-way communication, it prevents teachers from engaging in the informal interactions necessary for building trusting relationships. As a result, the current behavioral styles and organizational climates of Korean schools can be contrary to organizational or individual conditions and practices required by major disciplines of the learning organization. For example, Korean teachers and principals can show a relatively low tendency to engage in active dialogue with others, reflections in working, participation in decision-making, team learning, and shared vision because they often engage in a short-term perspective and efficiency, formalization, specification of job, and serious dependence on external administrative authority or power.

Personnel management system of principals and teachers. There are two unique management systems for school administrators (including principals and vice principals) and all teaching staff in Korean pubic schools. The first one is the teacher promotion system, which consists of 2nd grade teachers, 1st grade teachers, Vice-Principal, and Principal (Korea Ministry of Education and Human Resources Development, 2003a). Each class requires different certificates for a promotion to an upper class. Most teachers and school administrators maintain their jobs until the retirement age of 62. The opportunity to obtain each certificate and promotion is given through performance appraisal, the period of job experience, and in-service training. Second, in order to ensure equality in job conditions and a reforming job climate, all teachers and school administrators of public schools work under a job rotation system. All teachers and school

administrators regularly move their workplace from one school to another every 5 years. The superintendent of each metropolitan or provincial office in education plans and implements the job rotation rule for all teachers and school administrators every year.

Chung (2004) criticized the teacher job rotation system because its operation prevents each school from establishing a systemic training program for new teachers and a system of sharing knowledge among teachers. Since the movement of school administrators tends to change the procedure and way of existing school management, it might cause a serous impediment in knowledge transfer and accumulation at the level of each school organization. Hwang (2000) indicated that the job rotation system for teachers brings both negative and positive effects for school change. A positive effect happens according to being fresh by moving into a new school, whereas existing planning or work within a school is stopped or interrupted by moving workplaces.

In conclusion, interpreting the learning organization concept based on Korean teachers' perceptions, effects derived by the promotion and job rotation system should be considered to understand their responses more meaningfully. Chung (2004) summarized the characteristics of Korean teachers' attributes through reviewing the prior research.

> Teachers show behaviors focusing on individualism. They prefer working without interruptions by other people. Teachers have a strong conservatism. They like maintaining the status quo and seeking safety. Teachers are subordinated to an administrative framework and bureaucratic control. They are in a low autonomy and participations. Teachers have low motivation and are in a sluggishness context. (p. 3)

The promotion and job rotation system for all school staff, including teachers, contributes to intensifying a hierarchical climate and negative bureaucratic attributes in Korean schools.

CHAPTER 3

METHOD

Described in this chapter are the major components of the research method including research design, participants, data collection and procedures, and instrumentation.

Research Design

I used a cross-sectional survey research design to collect and analyze information about how high school teachers in Korea react to the concept of learning organization. Specifically, I collected data from a sample drawn from a predetermined population. Conducting survey research requires the following major steps: (a) defining the research problem, (b) identifying the target population, (c) choosing the mode of data collection, (d) selecting the sample from the population of interests, and (e) preparing the instrument (Fraenkel & Wallen, 2003). By using factor analysis, I tested and confirmed the extent to which the five disciplines of the learning organization coined by Senge (1990) would apply to high schools in Seoul Megalopolis which consists of Seoul City, Gyeonggi Province, and Incheon City in South Korea. The main purpose of the study was to measure and evaluate the extent to which Korean vocational high schools are involved with enacting the concepts associated with learning organizations.

Survey research is the most common type of research associated with theses and dissertations in social science and education. Its advantages include wide coverage for relatively low expense, ease of managing the data collection process, quick results, stable consistent measurement, and greater assurance of anonymity. Disadvantages of survey research include inflexibility, partial respondent responses, and low response rate. Respondent attitude toward questionnaires and

little opportunity for follow-up questions or probing of responses are also indicated as disadvantages in survey research (Hill, 2001; Miller, 1991). While a number of threats to internal validity exist when using survey research design, four main threats include mortality, location, instrumentation, and instrument decay. According to Fraenkel and Wallen (2003), a location threat to internal validity can occur if the collection of data is carried out in places that may affect responses. However, their threat may not cause serious problems in cross-sectional surveys based on mailed questionnaires.

On the other hand, the following errors that may affect this survey needed to be considered: sampling error, selection error, measurement error, and non-response error. Sampling error, yielding a nonrepresentative sample, can be problematic when the selected sample does not represent the population of interest. Some of the factors that enhance response rate are "(1) the length of the questionnaire, (2) the cover letter, (3) the sponsorship of the questionnaire, (4) the attractiveness of the questionnaire, (5) the ease of completing it and mailing it back, (6) the interest aroused by the content, (7) the use of incentives, and (8) the follow-up procedures used" (Ary, Jacobs, & Razavieh, 1996, p. 436). Measurement error can also be a critical issue if response data are not valid or reliable. This threat occurs when respondents' answers to a questionnaire are untruthful or imprecise (Salant & Dillman, 1994). The problem of sampling error is carefully discussed in the next section on participant selection. Non-response error may be a threat in collecting data for this study. This particular threat becomes an issue when respondents cannot be located, fail or refuse to answer, or do not return the questionnaire. To reduce this threat, I made efforts to get as many responses as possible (see the section detailing data collection procedure).

Participants

The population consisted of full-time vocational and academic teachers in public trade industry-technical and business high schools located in Seoul Megalopolis. Seoul Megalopolis includes 3 (Seoul metropolitan city, Gyeonggi province, and Incheon metropolitan city) of 16 municipal and provincial government agencies in education (7 metropolitan cities, 9 provinces) in South Korea. This region was selected because it functions as a hub in politics, the economy, social-culture matters, and education in South Korea. More than half of the total South Korean population (about 25 million people) lives within this defined area. Participants of the study, vocational and academic teachers in public vocational high schools, were employed by city and provincial Offices of Education during the 2005-2006 academic year. In Seoul Megalopolis, vocational high schools aim to provide basic general education and specific vocational education on the basis of what was learned at the middle school level. Schools can be further divided by private, public, and diverse program status.

The main independent variable in this study was gathered from teachers at the public vocational high school level. School administrators and other staff were not included as participants. Most Korean high schools have a principal and vice principal as administrators who do not teach in the classroom. Table 3.1 shows the number of Seoul Megalopolis' all public trade industry-technical and business schools and their full-time teachers employed by each city and provincial Office of Education during the 2005-2006 academic year. Participants were selected from both vocational full-time teachers and non-vocational full-time teachers working in 65 public trade industry-technical and business school schools. The number of teachers employed in each school varied based on the nature of programs or the number of classes and students. The number of teachers in each individual school ranged from 54 to 144. Table 3.1 outlines the

number of schools and teachers for the population of this study. In Gyeonggi, there are two comprehensive vocational schools which provide both trade-technical and business programs. These two schools were counted in the business school area.

Table 3.1

Public Vocational High Schools and Teachers in Seoul Megalopolis, 2005

Area	Number of high schools			Number of teachers
	Trade technical	Business	Total	
Seoul	13	6	19	1590
Gyeonggi	17	17	34	2575
Incheon	12	4	16	1081
Total	42	27	69	5246

In determining sample size and sampling strategy, I considered two focal points. The first point was to focus on the research purpose and questions (i.e., to identify the constructs of the learning organization in vocational high schools, to test hypothetical constructs of the learning organization through cross-validation, and to analyze the fit of the factor model between academic and vocational teacher groups). The second part considered the needs associated with using factor analysis. Necessary sample size in factor analysis is theoretically dependent on several aspects of any study, including communality of selected variables and the level of overdetermination of factors (MacCallum, Widaman, Zhang, & Hong, 1999). However, these criteria can not be actually recognized before the analysis of data.

Gorsuch (1983) pointed out that since sampling theory for factor analysis is not extensively developed, sample sizes used in factor analysis need to be sufficiently large so that sampling error can be ignored. Comrey and Lee (1992) proposed the following scale when sampling for factor analysis: n=100 (poor), n=200 (fair), n=300 (good), n=500 (very good), and n=1,000 (excellent). They also urged that as a rule of thumb, researchers should obtain samples of 500 or

more observations whenever possible in factor analytic studies. Noar (2003) suggested that to use a split-half procedure and perform both exploratory and confirmatory factor analyses, a sample size of 500 or more would be preferable. Crocker and Algina (1986) indicated that "a common rule of thumb for the minimum sample size in factor analysis is to use the larger of the following: 100 examinees or 10 times the number of variables" (p. 296).

In this study, considering the use of two factor analyses (exploratory and confirmatory), the number of items to be analyzed (n= 41), and the rule of thumb for determining sample size, the size of the sample needed to total, at a minimum, 900 teachers. Therefore, to obtain at least 900 teachers, I selected 17 schools (24.6%) from the total of 69 public vocational high schools located in the Seoul Megalopolis area. For sampling, by means of direct contact, lists of vocational high schools were obtained from each city and provincial Office of Education. After numbering each school, schools included in this sample were randomly selected by using a random numbers table. All full-time teachers working in the selected 17 schools were included in the sample. Table 3.2 presents detailed sampling information about the number of schools and teachers.

Table 3.2

Target Population and Sampled Numbers

Area	Trade industry-technical schools		Business schools		Teachers sampled
	n	Number sampled	n	Number sampled	
Seoul	13	3	6	2	407
Gyeonggi	17	4	17	4	651
Incheon	12	3	4	1	311
Total	42	10	27	7	1369

Data Collection and Procedures

There were several specific activities to collect data in this study. First of all, necessary contacts with Seoul and Incheon Metropolitan Offices of Education and Gyeonggi provincial Office of Education in Korea were made to obtain permission to collect data (see Appendix J). Then, approval to conduct the survey was granted by the University of Georgia Institutional Review Board for Human Subjects Research in order to protect all participants.

Data collection occurred from August 25, 2005 to September 20, 2005. To obtain a higher response rate, I identified one administrative staff member in each public vocational high school to serve as a data collector. I directly contacted the related superintendents of the Offices of Education to assign school staff members as data collectors. A phone call was then made to selected school staff by the related superintendents. Through a direct visit, survey questionnaire packets were delivered to the identified support staff member in each school. The staff members served in receiving, disseminating, and returning packages of survey questionnaires.

Each packet of survey questionnaires contained two parts: content for the teachers and a cover letter for the administrative staff member. Teachers' content included a sealed envelope containing a cover letter and questionnaire. The cover letter addressed the background, purpose, significance of the study, and confidentiality information (see Appendix F). A code number was assigned to each copy of the instrument for follow-up purposes with non-respondents.

School staff members distributed each questionnaire packet to all full-time teachers at her/his school. After completing the questionnaire, each teacher placed it in the return envelope, sealed it, and returned it to the staff member. Finally, each staff member mailed the large sealed envelopes to the researcher. A phone call reminder was made to the support staff member and school administrator in each school.

Based on the strategies and procedures of data collection, 976 teacher respondents returned usable surveys, which yielded a final response rate of 71.29%. The corrected full sample (*N*=976) was divided into two portions. To avoid systemic error, respondents of the odd case numbers (*n*=488), coded with keeping sequence of each sampled school by using the Statistical Package for the Social Science (SPSS 11.0), and respondents with even case numbers (*n*=488) composed the two groups. Data of odd case numbers was used for exploratory factor analysis. The sample portion of even case numbers was used in confirmatory factor analysis.

Instrumentation

Necessity for Instrument Development

The focal point of this study was to test the validity of Senge's (1990) learning organization model in public vocational high school settings of Seoul Megalopolis in South Korea. Given this purpose, I was required to measure and evaluate the degree of the learning organization's *five disciplines* through teachers' attitudes or perceptions about educational practices and organizational behaviors. As such, an attitude survey instrument was needed to measure teachers' responses. Usually, perceptions and attitudes are not directly observable or measurable, but are inferred from reactions to particular stimuli (Rosenberg & Hovland, 1980). Measurment instruments serve as stimuli to elicit the attitudes desired. In this study, participants' responses to questionnaire items reflected the extent to which they perceived their school as a learning organization.

A literature review was conducted to determine the possibility of using existing instruments. Several instruments were found that purported to measure the dimensions of learning organizations, e.g., Marquardt's (1996) *Learning Organization Profile*, the *Dimensions of Learning Organization Questionnaire* by Watkins and Marsick (1997), *Learning Organization*

Assessment by Kline, Saunders, and Kline (1995), and Wyckoff's (1998) *Learning Organization Inventory*. However, the first three instruments were developed for business and industry, and the constructs they measure were different from Senge's learning organization model. Even though Wyckoff's instrument was developed for school contexts and based on Senge's five disciplines, a critical fault in construct validity was noted. The factors and loading structures derived from survey data differed from Senge's five theoretical constructs and the item structures he defined. Therefore, a new instrument had to be created to test Senge's learning organization model in Korean vocational high school settings. In other words, the identification of indexes (variables) to specifically test Senge's five discipline model was necessary.

The Process of Instrument Development

The survey instrument served as a tool to determine individual teachers' perceptions toward the psychological constructs of Senge's (1990) learning organization. Results had to provide a technically adequate way to examine teachers' attitudes and perceptions about the learning organization in their school organization. Crocker and Algina (1986) called this type of instrument a "subject-centered measurement" (p. 66). Table 3.3 lists the major steps they recommended. This process was used for developing the instrument.

Table 3.3

Survey Instrument Development Process

1. Identify or define the domain that represents the construct of interest
2. Construct an initial pool of items based on the domains of the construct
3. Use an expert panel to review items and revise them as necessary
4. Item format and conduct a pilot study, and revise the instrument as necessary
5. Field-test the items on a large sample of the population for whom the test is intended
6. Design and conduct reliability and validity studies for the final instrument

Operational Definition of the Construct Domains

Establishing the operational definition of each construct domain was necessary to obtain judgmental evidence of validity. According to Gable and Wolf (1993), evidence of validity is generally gathered prior to the actual administration of the items to the target group and consists mainly of methods for examining the adequacy of the operational definition for each construct domain in light of its conceptual definition.

The creation of operational definitions for each construct domain was based on two steps. The first step was to define the theoretical basis of each domain. Chapter 2 represented the basis of this first step. The literature regarding Senge's (1990) five disciplines (personal mastery, mental models, shared vision, team learning, and systems thinking) was utilized in identifying the domains and served as the basis for re-conceptualizing and writing specific survey items. The second step was to construct operational definitions, which would result in empirical observation representing the constructs in the real world (see Table 3.4).

Table 3.4

Operational Definition of Each Construct

Construct	Operational definition
Personal mastery	At the school, teachers expand personal growth and capacity by having a strong desire to improve professionally, engaging in continual learning, and focusing on the future vision in order to make choices about their development.
Mental models	At the school, teachers continually reflect on assumptions about schooling; openly dialogue, share views and develop knowledge about each other's assumptions; and engage in their own work with flexibility.
Shared vision	Vision and goals of school are planned and created through a process of shared commitment, participatory activities, and consensus of all school members including students and parents; and a teacher's personal vision is aligned with the school vision and goals.

Team learning	At the school, various group or team activities are encouraged to address schooling issues or teacher's professional work; teachers become committed to, skilled at, and involved in collaborative work.
Systems thinking	Teachers understand and manage their own work in an interrelationship within the school environment that includes processes of change; they consider the impact of their own work on the entire school organization and the stakeholders' interests.

Development of Survey Items

I generated an initial pool of 70 items to reflect the concepts covered in each construct domain. According to Crocker and Algina (1986), each domain on a pilot instrument should be represented by a fairly large number of items. Noar (2003) mentioned that an initial item pool should consist of "two to three times the number of items that will make up the final scale" (p. 626). A large pool of the initial items enabled me to refine the item pool in several stages during instrument development: Review by an expert panel for content validity, reliability analysis, and factor analysis to assess construct validity. Although the initial pool of 70 items was thought to be sufficiently large, several items for each construct were added or revised in the process of establishing content validity.

All items were generated by writing statements characterizing the principles of each construct domain definition. Therefore, development of most items was based on the theoretical dimensions of *schools as learning organization* (see Chapter 2). Most initial items included in the item pool were derived from the literature and existing instruments that purport to measure learning organizations. Two items for systems thinking were generated by myself to maintain a balance among the number of items for each construct.

The issue of whether to include negatively worded items was considered as a part of item development. The use of negatively worded items is generally employed to eliminate or attenuate

response pattern bias (Young, 1996). However, according to the literature, reverse-scored items can reduce the validity of questionnaire response (Schriesheim & Hill, 1981) and result in system error (Jackson, Wall, Martin, & Davids, 1993). Hinkin (1995) indicated that in factor analysis, negatively worded item loadings were lower than positively worded items loaded on the same factor. Moreover, considering that respondents in this study were all high school teachers with a bachelor's degree or higher and a high ability to discriminate, negatively worded (or reverse-scored) items might have been more of an annoyance or burden to respondents. Therefore, all items in this study were developed with positively worded statements.

Construction of Content Validity and Item Refinement

Content validation has the highest priority during instrument development (Gable & Wolf, 1993). According to Crocker and Algina (1986), "The purpose of a content validation study is to assess whether the items adequately represent a performance domain or construct of specific interest" (p. 218). Establishing content validity is viewed to be primarily a judgment process. Use of a panel of qualified experts in the content domain is usually strongly recommended (Noar, 2003).

In this study, poor or redundant items from the initial item pool were continually deleted and refined to establish content validity. Specifically, several new items as well as operational definitions for each theoretical construct were added or refined based on experts' comments. Two procedures to construct *content validity* were used. First, the initial pool of 70 items was reviewed and refined by a panel consisting of a professor and four doctoral students who were high school teachers or had teaching experience in American high schools. In the item refinement process, all initial items were reviewed for ease of understanding in the context of a school setting, consistency in wording and academic colloquialisms, and proper classification of

each item into subscales. I examined proper wording for a high school setting, deleted improper questions in each construct, and related each question to the schooling environment. Specifically, 23 items were deleted through this process.

In the second round of constructing content validity, the 47 items refined by the first panel were reviewed by three experts including a scholar in the learning organization field, Dr. Karen Watkins, and two professors at the University of Georgia (one with a human resource development emphasis, other with a social and contextual learning background). These three experts separately reviewed items to ensure that (a) the meaning of each item was clearly stated and comprehensible, (b) all items appropriately reflected the intended domains, and (c) a broad perspective of the construct domain was covered. To effectively perform the work of the expert review, I utilized *the content validity rating form* (see Appendix A) suggested by Gable and Wolf (1993). The rating form first listed instructions regarding the rating task, and then defined each construct domain. Judges were asked to assign each item to the listed construct domain it best fit and to indicate how they felt about their assignment of the items to each construct domain.

In the expert review, one reviewer commented that several initial items and operational definitions represented the theoretical constructs based on a blended learning organization model rather than Senge's (1990) original model. Accepting this, the operational definitions of two constructs (personal mastery and metal models) and a few items for each construct were revised or newly developed to more closely reflect the concept of Senge's five disciplines. As a result, the expert panel reviewed the instrument twice. In this process, based on the judgmental ratings of construct categories by the experts on *the content validity rating form*, a criterion level of unanimous agreement was employed for an item to be returned in a construct category. Through

the experts' second rating procedure, 43 items were finally selected for the five constructs. Table 3.5 summarizes the refinement of items and the procedure of content validity.

Table 3.5

Summary of Item Refinement and the Procedure of Content Validity

Procedures	Developer/Reviewer	Results/Activities	Items remaining (*n*)
Original item pool	Researcher	Item pool development	70
First item pool refinement	Four doctoral students and one professor	Refined item wording Classified items Deleted improper items Deleted duplicated item	47
First item judgment	Three content experts	Judged item categorization Required revision of some items and operational definitions	47
Second item pool refinement	Researcher	Redefined constructs Reworded and deleted several items	45
Second item judgment	Two content experts	Judged item categorization Deleted items	43

Table 3.6 shows the 43 final items developed through item pool refinement and establishing content validity. Theoretical sources and references from the professional literature related to these 43 items are presented in Appendix B. These 43 items were used for the pilot survey and the back translation used to obtain the validation of Korean version.

Table 3.6

Items for the Five Subscales

Subscales	Items
Personal mastery	1. Our teachers at the school engage in continuous learning and reflection activities to achieve personal growth. 2. Our teachers continually work to clarify their professional goals at the school. 3. Our teachers view the current reality more clearly in terms of targeting their caree goals.

Subscales	Items
	4. Teachers' individual growth is truly valued in the school. 5. Our teachers have learning opportunities in their teaching or other professional work. 6. At the school, our teachers continually learn to bridge the gap between their current reality and the desired future. 7. Our teachers strive to supplement their lack of skills and knowledge in their teaching and subject area. 8. Our teachers are motivated to learn from mistakes in their work. 9. Our teachers clearly understand the process of pursuing their professional development. 10. At the school, the evaluation system of teachers contributes to their personal growth and career development.
Mental model	11. Our teachers often reflect on assumptions about schooling activities with other teachers to ensure that they are in line with educational principles. 12. At the school, clearly revealing different perspectives or educational assumptions of teachers is encouraged as a reflective loop process. 13. Our teachers inquire about the appropriateness of their own course or program with respect to the goals of schooling. 14. Our teachers learn and change as a result of students' reactions during teaching. 15. Our teachers often use the significant events of classrooms to think about their beliefs about education and educational practices. 16. Our teachers change their own pattern or unique teaching style to implement new approaches. 17. Our teachers and colleagues actively explore their assumptions and ideas with each other about educational practices. 18. Our teachers are very aware of how their beliefs and assumptions affect their educational practices. 19. Our teachers at the school can effectively explain their assumptions underlying their reasoning.
Shared vision	20. Our teachers and staff together build the school's vision and goals. 21. Our teachers involve students in formulating school and classroom policy. 22. Our teachers develop their personal goals to align with the whole school vision or goals. 23. Our teachers align personal class or teaching goals with the school vision and goals. 24. Our teachers feel comfortable in sharing ideas with other teachers about the school vision. 25. Our teachers are committed to a shared vision for the future of our school. 26. Our teachers agree on the principles necessary to achieve the school vision. 27. When changing educational practices, our teachers consider the impact on the school vision and goals.

Subscales	Items
Team learning	28. Our teachers feel free to ask questions of other teachers or staff regardless of gender, age, and professional status at the school. 29. In conversation, our teachers accept other colleagues' mistakes without criticism. 30. In our school, group or team activities are used in teacher professional development activities. 31. Small group or team activities are encouraged at our school as a method of dealing with school issues. 32. Our teachers are treated equally in team or committee activities. 33. Our teachers share information across course subjects and grade levels with other colleagues. 34. Our teachers believe that sharing information or knowledge through team activities is useful for solving complex schooling problems. 35. Our teachers respect other colleague's ideas and opinions by viewing them from their colleague's perspective. 36. Our teachers participate in open and honest conversations to share their educational best practices.
Systems thinking	37. When developing lesson plans, our teachers consider the different needs and abilities of students. 38. When changing educational practices, our teachers consider the impact on their results to the inside and outside of the school. 39. When dealing with a student discipline problem, our teachers consider the impact on other teachers. 40. At the school, our teachers regard educational issues as a continual process rather than with a snapshot or event. 41. Our teachers attentively link the current schooling with students' career pathways. 42. When changing and creating school rules, consistency with the policy of the governments and educational Acts is considered. 43. Our teachers consider the effect on students when dealing with school challenges.

Validation of Korean Version

I first translated the originally-developed English version of the questionnaire into an initial Korean version. Then, I conducted a review process to construct validation of the Korean version. One Korean visiting professor in the College of Education, University of Georgia and 3 Korean graduate students in the University who have had teaching experiences in Korean high schools participated in the review of the Korean questionnaire to examine appropriateness, utility, and

clarity of items. I asked the review group to indicate any words or phrases of the Korean translated items that were inappropriate or unclear compared with those of the English version. Based on their responses, the Korean version of the questionnaire was refined (see Appendix E). Corrections were made based on the comments of participants. In addition, the revised Korean version was back-translated into English by a Korean American who was a graduate student at the University of Georgia (see Appendix C). The back-translated result was compared to the English version. Most items showed similar meanings in their content between both versions.

Response Format

The instrument developed and used in this study is a psychometric or attitude survey instrument. Measuring attitudes through a paper and pencil instrument means locating each respondent's "position on an affective continuum ranging from very positive to very negative toward an attitudinal object" (Mueller, 1986, p. 8). The Likert scaling technique can accommodate this requirement. For this reason, I determined to use the item format of a Likert type scale to elicit value positions for each item. According to the literature, 5- or 6-point scales are most reliable and appropriate (Gable & Wolf, 1993; McKelvie, 1978; Noar, 2003). For this study, I used a 5-point Likert-type scale format (see Table 3.7) which consisted of 1=Almost never true, 2=Usually not true, 3=Sometimes true or sometimes not true, 4=Usually true, 5=Almost always true.

Table 3.7

Instance of Response Scale

	Almost Never True				Almost Always True
Our teachers continually work to clarify their professional goals at the school.----------	1	2	3	4	5

The instrument, in its final form, consisted of three parts, including an introduction and instructions, demographic questions, and item statements measuring beliefs or attitudes. The introduction gave participants a brief presentation of the purpose of the questionnaire and how to provide responses to its items. The demographic portion included items that would categorize respondents and school types (teaching subject, gender, age, year of teaching experience, and program of school). Such categorization was necessary to determine how the instrument performed and provided additional evidence of construct validity. The final portion of the instrument included statements designed to elicit respondents' attitudes and perceptions with respect to schools as learning organizations. Items developed to reflect each construct were not randomly ordered, but sequenced because the main point of this study was to evaluate a model by identifying a theoretical index rather than to soberly develop an instrument.

Pilot Testing and Item Analysis

Before administering the instrument, I conducted a small-scale study, a pilot test, to obtain information about how well the instrument would work to elicit the types of responses desired. A total of 147 teachers from the three Korean vocational high schools in the same population voluntarily participated in this pilot test. The questionnaire was e-mailed to each principal or vice principal from selected schools with a request that they ask their school teachers to complete the questionnaire. Based on recommendations from Litwin (2003), I conducted the pilot test in order to (a) identify errors on the instrument, (b) pinpoint sections of the instrument that need to be reformatted, and (c) anticipate possible problems that may be encountered when using the instrument with a larger sample of respondents. Results obtained from this pilot study helped me evaluate the format and content of the instrument.

Through the pilot survey, the construct reliability of the instrument, as well as item analysis, was ascertained by using SPSS 11.0. As a usual rule of thumb in selecting items, Streiner (2003) recommended that an item should correlate with the total score above .20 and any item with a lower correlation should be discarded. The corrected item-total correlations of all items for each construct were above .20.

From the analysis of item reliability, I deleted 2 poor items because when deleted, the Cronbach alphas of their subscales (constructs) were actually higher. One of them was relative to the operation of teacher evaluation system associated with personal mastery. The other one was an item for shared vision, which reflected student involvement in formulating school and classroom policy. The reason for deleting these two items was based on their inadequacy to reflect the educational culture of South Korea. Currently, teacher evaluation system based on job performance or professional development has not been performed in South Korea. Korean school bureaucracy with a rigid hierarchy might negatively affect the reliability of the item relative to student involvement in formulating school and classroom policy.

As a result of the pilot test and item analysis, a Cronbach alpha for each subscale was obtained, ranging from .819 to .881 (see Table 3.8). The internal consistency of all subscales from this pilot study was considerably higher than the minimum level of .70 recommended by Nunnally (1978). This result showed that developed itmes could be appropriately responded by a large sample of respondents without occurring any problem.

Table 3.8

Reliability Statistics from Pilot Test and Item Reduction

Construct	Number of items	Cronbach alpha
Personal mastery	9	.857(.845)
Mental model	9	.839

Construct	Number of items	Cronbach alpha
Shared vision	7	.891(.881)
Team learning	9	.865
System thinking	7	.848
Total Items	41	.951

Note. ( ) is Cronbach alpha before the elimination of an item.

Field Test for Confirmation of Construct Validity, Reliability, and Model

Analysis of data collected for the field test (i.e., actual study) targeted developing and identifying the constructs of the learning organization suggested by Senge (1990) in the context of vocational high schools in South Korea. A hypothesized learning organization model, i.e., the measurement model, was established from results of the exploratory factor analysis (EFA). More specifically, the field test focused on achieving three purposes. Through performing EFA, the first purpose was to find evidence of construct validity to ascertain that the proposed content categories and items reflected theoretical and empirical meaning. In other words, EFA was conducted to examine the relationships between the judgmentally developed content categories and the empirically derived constructs. The second was to examine reliability for the final sets of items (and scales) that were supported empirically and statistically. Based on evidence of both construct validity and reliability, the third was finally to establish the measurement model consisting of the empirical constructs and their sub-items. As a result, in this study, both the establishment of the measurement model and the development of the instrument function as two faces of a coin. The substantial analysis of the field test is presented in Chapter 4.

CHAPTER 4

ANALYSIS AND RESULTS

Tinsley and Tinsley (1987) indicated that "factor analysis is used most frequently in the development or validation of psychometric instruments and in testing theories about instruments or the theories on which instruments are based" (p. 414). The primary purpose of this study was to test the theory of learning organization (or the learning organization model) in a Korean vocational high school context. To achieve this purpose, development of an instrument (or indexes) able to test the theory of learning organization was required. As part of instrument development, a statistical method to establish construct validity of the instrument was also necessary. Factor analysis offered a clear solution to these demands.

This chapter describes three different factor analysis procedures required to address the research questions of this study. As a preliminary analysis, *normtest macro* developed by DeCarlo (1997) was used to screen the dataset for normality and outliers. For Research Question 1 the theoretical constructs and questionnaire items comprising Senge's (1990) learning organization model are analyzed to build a hypothesized or measurement model through exploratory factor analysis (EFA), which simultaneously functions as a test of instrument construct validity. Mean scores of items and reliability for each construct are also included in this analysis. Results provide evidence of how Korean vocational high school teachers perceive the constructs of the learning organization in their school organizations. Half of the sample (respondent cases with odd numbers, n=488) was used to conduct the EFA using SPSS 11.0. To statistically test the measurement model defined by EFA, the second analysis used sample data

from the other half (respondent cases with even numbers, *n*=488) by using confirmatory factor analysis (CFA) with LISEREL 8.3 (Jöreskog & Sörbom, 1996). This analysis served as a cross-validation test of the instrument. Specifically, this statistical analysis provided the information necessary to answer Research Question 2, "To what extent can the learning organization model be derived and confirmed from Korean vocational high school teachers' responses in their school settings?" The third section describes results of multiple-group analysis designed to explore the fit of the learning organization model between two different Korean teacher groups (academic and vocational) by using CFA with LISEREL 8.3. Results address Research Question 3, "Does invariance exist across vocational and academic teacher groups regarding the underlying factors and factor loadings of a measure of learning organizations?" The multiple group analysis investigated if differences in factor structure and factor loadings between the two teacher groups existed. Invariance of the factor structure or factor loadings between the two groups was identified from this analysis.

Exploratory Factor Analysis

Preliminary Analysis

Preliminary analyses, i.e., descriptive statistics, were conducted to describe the characteristics of the sample. Next, the dataset was screened to check for normality and outliers by using *normtest macro* developed by DeCarlo (1997).

Demographic variables. Table 4.1 displays the characteristics of half the sample (*n*=488) using teaching subject, gender, age, year of teaching experience, and school type as descriptors. There were more vocational (59.6%) than academic teachers (40.4%), and more male (54.6%) than female teachers (45.0%). Young teachers, 40 years of age or younger, with teaching experience of less than 15 years comprised about 45% of the sample. At age level, the sampling

group had a mean age of 40.05 and standard deviation (SD) of 9.073. In teaching experience variable, there was a mean of 13.81 and SD of 9.193. Almost half of the teachers were employed at trade-industry or technical high schools (*n*=238, 48.7%), while over one-third (38.2%) were located at business high schools. Sixty-three teachers worked at comprehensive vocational high schools.

Table 4.1

Demographic Variables of EFA Sample

Variable	Category	*n*	%
Teaching subject	Vocational	291	59.6
	Academic	197	40.4
Gender	Male	267	54.8
	Female	220	45.2
	Missing	1	–
Age	Less than 29 years	74	15.1
	30-39 years	150	30.7
	40-49 years	188	38.7
	50-59 years	70	14.3
	More than 60 years	6	1.2
Teaching experience	Less than 5 years	133	27.3
	6-10 years	68	13.9
	11-15 years	75	15.4
	16-20 years	84	17.2
	21-25 years	77	15.7
	More than 26 years	51	10.5
School/program type	Trade-Industry and technical	238	48.7
	Business	187	38.2
	Comprehensive vocational	63	13.1

Descriptive statistics. Means, standard deviations, skewness, and kurtosis for questionnaire items are depicted in Table 4.2. Skewness and kurtosis were examined as a data screening process to check the overall distribution of variables.

Table 4.2

Descriptive Statistics for Questionnaire Items with EFA Sample (n=488)

Item	Mean	SD	Skewness		Kurtosis	
			Statistic (g1)	Std. error	Statistic (g2)	Std. error
1p	3.88	.749	-.504	.110	.559	.220
2p	3.89	.708	-.612	.110	1.317	.220
3p	3.71	.765	-.217	.110	.035	.220
4p	3.87	.927	-.790	.110	.507	.220
5p	3.84	.763	-.813	.110	1.467	.220
6p	3.78	.750	-.516	.110	.684	.220
7p	4.05	.704	-.667	.110	1.313	.220
8p	3.51	.883	-.435	.111	-.036	.221
9p	3.58	.819	-.306	.110	-.081	.220
10m	3.60	.847	-.402	.110	.230	.220
11m	3.27	.877	-.307	.110	-.106	.220
12m	3.73	.726	-.368	.110	.417	.220
13m	3.86	.820	-.761	.110	.788	.220
14m	3.55	.803	-.237	.110	-.172	.220
15m	3.60	.775	-.387	.110	.332	.220
16m	3.58	.822	-.526	.110	.749	.220
17m	3.77	.736	-.756	.110	1.303	.220
18m	3.53	.792	-.247	.110	.109	.220
19v	3.28	.930	-.288	.110	-.118	.220
20v	3.38	.824	-.181	.110	-.038	.220
21v	3.34	.784	-.087	.110	.227	.220
22v	3.36	.832	-.403	.110	.336	.220
23v	3.24	.859	.056	.110	-.081	.220
24v	3.45	.778	-.332	.110	.473	.220
25v	3.56	.779	-.280	.110	.217	.220
26t	3.53	.949	-.542	.110	.001	.220
27t	3.38	.845	-.149	.110	.043	.220
28t	3.31	.860	-.334	.110	.119	.220
29t	3.18	.865	-.346	.110	.057	.220
30t	3.37	.901	-.438	.110	-.028	.220
31t	3.51	.847	-.422	.110	.377	.220
32t	3.60	.767	-.603	.110	.930	.220
33t	3.71	.770	-.501	.110	.604	.220
34t	3.54	.807	-.446	.110	.539	.220

Item	Mean	SD	Skewness		Kurtosis	
			Statistic (g1)	Std. error	Statistic (g2)	Std. error
35s	3.69	.706	-.378	.110	.488	.220
36s	3.66	.704	-.540	.110	.811	.220
37s	3.69	.719	-.599	.110	1.050	.220
38s	3.76	.729	-.428	.110	.513	.220
39s	3.76	.821	-.424	.110	.109	.220
40s	3.72	.773	-.398	.110	.476	.220
41s	3.94	.775	-.660	.110	1.113	.220

Note. Items 1p to 9p measure personal mastery. Items 10m to18m measure mental models. Items 19v to 25v measure shared vision. Items 26t to 34t measure team learning. Items 35s to 41s measure systems thinking.

DeCarlo's (1997) normtest was used to screen the dataset for normality and outliers. Skewness and kurtosis values of all items are less than |2.0|. According to Fabrigar, Wegener, Maccallum, and Strahan (1999), variables can be considered normally distributed unless skewness (g1) is greater than |2.0| and kurtosis (g2) is greater than |7|. In light of this guideline, there were no items that were non-normally distributed.

DeCarlo's (1997) normtest identified five outliers (Cases 292, 391, 316, 10, 242) using Mahalanobis distances with F values bigger than the critical F (critical $F_{(05/n)\,(df=41,\,446)} = 79.77$; critical $F_{(.01/n)\,(df=41,\,446)} = 84.73$). The five cases had considerably large F values of 133.62, 122.25, 118.32, 117.64, and 114.37 respectively. These five outliers were significant at both.05 and .01 levels. Nevertheless, the five outliers were not deleted in the EFA dataset because when analysis with the outliers was compared to analysis without the outliers, there were no salient differences regarding the identification of factors, factor structures, or loading patterns of items. Moreover, factor analysis results that included the outlying cases were actually more reflective of the theoretical construct than the factor analysis without the outliers. Finally, the presence of missing data was checked. Fortunately, missing values for variables included in this study, which can affect EFA, were not found.

Exploratory Factor Analysis for a Five-Factor Solution

In this study, EFA was conducted twice to ensure that the most appropriate five-factor solution was precisely found to reflect the theoretical constructs and judgmental categories identified during the content-validity stage. The initial EFA analysis was based on the 41 items defined from the pilot test. The final analysis was then conducted after dropping 6 items from the original item set of 41.

KMO and Bartlett's tests. The EFA analysis began with examining the Kaiser-Meyer-Olkin (KMO) statistic to determine if the original dataset reflecting the initial 41 items was a good candidate for factoring. According to Kaiser's guideline, a result of .959 is extremely good. According to results of the Bartlett's test of sphericity (see Table 4.3), the correlation matrix (see Appendix G) was worth factoring since the H_0 (null hypothesis that the correlation matrix = an identity matrix) was rejected (p=.000).

Table 4.3

KMO and Bartlett's Test

Kaiser-Meyer-Olkin test of sampling adequacy		.959
Bartlett's test of sphericity	Approx. chi-square	10795.176
	df	820
	Sig.	.000

Communality and factor extraction method. Communalities, which are proportions of variance in a variable accounted for by the identified factors, ranged between .253 and .704. Items 4 and 27 produced communalities less than .30. Regarding the factor extraction method, Gorsuch (1983) recommended the use of common factor analysis if communalities are low

(< .70). Therefore, instead of using principal component analysis, a method of common factor analysis known as principal axis factoring, was employed.

Table 4.4

Communalities Matrix

Item	Initial	Extraction	Item	Initial	Extraction
1	.659	.657	22	.580	.530
2	.676	.704	23	.597	.596
3	.493	.506	24	.584	.564
4	.359	.285	25	.547	.518
5	.440	.385	26	.417	.389
6	.595	.598	27	.334	.253
7	.584	.563	28	.553	.498
8	.386	.304	29	.571	.523
9	.500	.438	30	.557	.584
10	.441	.413	31	.545	.570
11	.521	.495	32	.487	.444
12	.527	.482	33	.555	.545
13	.463	.436	34	.530	.517
14	.347	.314	35	.524	.455
15	.523	.512	36	.546	.497
16	.509	.497	37	.447	.420
17	.521	.496	38	.524	.559
18	.537	.496	39	.520	.553
19	.613	.604	40	.464	.433
20	.640	.622	41	.512	.533
21	.605	.589			

Note. Extraction method: Principal axis factoring.

Principal axis factoring is better suited for investigating the nature of underlying theoretical constructs, while principal components analysis is more useful for determining dimensions or test scales contained within an assessment instrument (Blais, Otto, Zucker, McNally, Fava, & Pollack, 2001; Tinsley & Tinsley, 1987). The initial communality of each variable in a principal component analysis equals 1.0 in matrix diagonals, indicating that 100% of the variance is to be factor analyzed. In contrast, initial communalities in principal axis factoring are not 1.0,

reflecting the fact that the whole correlation matrix is not factored and the communalities of variables are estimated.

Method of factor rotation. Based on a theoretical assumption that high correlations exist between the theoretical constructs of learning organization, an oblique rotation method was used. Fabrigar et al. (1999) argued that if latent variables are correlated, an oblique rotation will produce a better estimate of the true factors compared to an orthogonal rotation. The five disciplines of Senge's (1990) model are theoretically interactive and correlated based on the ensemble function of systems thinking. It was natural to consider that high correlations existed between the latent factors. In this light, selecting an oblique rotation method was viewed as more effective than an orthogonal method.

After several oblique rotation techniques were tested on the original 41 items, Promax of Kappa=5 was finally selected as the most appropriate factor rotation. Two methods of oblique rotation types were compared to select the best rotation method. One was the Promax method, which tries to make low and moderate loadings lower while maintaining high loadings. The other was the Direct Oblimin method, which produces factors with the smallest number of cross-loadings. Direct Oblimin has a parameter called delta which ranges from -7 to .8 in SPSS with a default vale of 0. Promax has a parameter called Kappa in SPSS with a default value of 4. The Promax (Kappa=5) method used in this study can be compared to the Direct Oblimin (Delta=.1) method. Initially, both Promax of Kappa=5 and Direct Oblimin of Delta=.1 were run. These two methods produced very similar results in terms of the number of factors, item loadings on each factor, and factor structure. However, as reported in Table 4.5, the loading values produced by Promax (Kappa=5) were higher overall, which presented higher correlations between items and factors. Promax (Kappa=5) also produced fewer double-loadings between .25 and .4. Six items

(Items 25, 11, 7, 9, 28, 29) double-loaded on the factors rotated by Promax (Kappa=5), whereas in the Direct Oblimin (Delta= .1) rotation, eight items (Items 12, 7, 9, 24, 22, 25, 29, 11) double-loaded. Factors by Promax (Kappa=5) produced higher loading values and fewer crossing loadings. The factor structure and loadings by Promax of Kappa = 5 were also clearer and more conservative than those of Direct Oblimin (Delta=.1). Based on these results, Promax (Kappa=5) was selected as the factor rotation method for this study.

Table 4.5

Comparison of Promax's and Direct Oblimin's Pattern Matrices

Promax (Kappa=5)						Direct Oblimin (Delta=.1)					
Item	Factor					Item	Factor				
	1	2	3	4	5		1	2	3	4	5
19	.814	.065	.103	-.180	-.053	15	.634	.091	-.069	.017	.011
20	.783	.144	-.041	-.020	-.068	16	.620	.038	.027	.016	.124
23	.775	-.139	-.031	.015	.130	17	.600	.039	-.020	-.112	.001
21	.769	.046	-.147	-.012	.121	13	.540	.033	.126	-.202	-.002
24	.671	.050	-.069	-.012	.158	14	.526	-.042	-.011	-.079	.010
22	.557	-.128	.271	-.011	.051	10	.488	.095	-.087	.081	.152
25	**.525**	-.113	-.062	.131	**.285**	18	.400	.137	-.171	-.130	.047
11	**.374**	-.027	.242	**.351**	-.220	**12**	**.371**	**.298**	-.170	-.046	-.026
2	.046	.958	.018	-.190	-.040	8	.238	.190	-.124	.019	.161
1	-.008	.939	.059	-.171	-.064	2	-.091	.891	-.031	.028	.008
3	.042	.732	-.015	-.119	.074	1	-.082	.870	.010	.058	.041
6	.002	.624	-.037	.189	.028	3	-.048	.688	-.029	-.085	-.021
7	-.103	**.501**	-.036	**.368**	.037	6	.189	.620	-.013	-.055	-.026
5	-.155	.455	.091	.182	.075	**7**	**.314**	**.516**	.057	-.060	-.029
9	**.299**	**.328**	-.086	**.269**	-.101	5	.160	.445	.109	-.077	.075
4	.004	.325	.055	.123	.096	**9**	**.266**	**.372**	-.237	.032	-.019
30	.216	.017	.738	-.211	-.011	4	.121	.328	-.005	-.113	.061
31	-.127	.036	.725	.077	.060	19	-.049	.113	-.584	-.052	.221
34	-.064	-.086	.656	.238	-.035	20	.077	.205	-.575	-.045	.084
32	-.195	.085	.618	.091	.087	21	.073	.115	-.565	-.229	-.025
26	.069	.100	.600	-.220	.090	23	.088	-.056	-.564	-.239	.094
33	-.189	.030	.589	.148	.201	**24**	.065	.112	**-.489**	**-.253**	.036
28	**.358**	-.013	**.517**	-.074	-.071	**22**	.053	-.069	**-.394**	-.130	**.358**
29	**.406**	-.091	**.513**	.019	-.147	**25**	.156	-.036	**-.385**	**-.366**	.029
27	.065	-.003	.428	.009	.031	38	.022	.006	-.033	-.761	-.067

Item	Promax (Kappa=5) Factor					Item	Direct Oblimin (Delta=.1) Factor				
	1	2	3	4	5		1	2	3	4	5
15	.046	-.013	-.054	.784	-.083	39	-.042	.041	.009	-.708	.058
16	-.077	-.057	.081	.782	-.064	41	-.104	.137	.021	-.680	.047
17	-.016	-.061	-.049	.752	.059	37	.084	-.116	-.068	-.608	.034
13	-.207	-.045	-.017	.701	.180	40	-.004	.012	-.028	-.602	.059
14	-.023	-.133	-.034	.667	.034	36	.115	.063	-.129	-.492	.048
10	.088	.015	.094	.590	-.140	35	.119	.082	.024	-.455	.130
18	.209	.059	-.019	.464	.064	30	-.124	.012	-.119	-.012	.752
12	.203	.237	-.088	.419	-.019	31	.072	.037	.120	-.055	.704
8	.160	.150	.117	.258	-.066	34	.199	-.055	.064	.021	.659
38	.061	-.022	-.068	.018	.753	26	-.145	.078	-.016	-.091	.589
39	.014	.031	.071	-.064	.711	32	.076	.079	.166	-.074	.587
41	.001	.145	.068	-.146	.689	**29**	.069	-.048	**-.279**	.084	**.579**
37	.107	-.161	.018	.097	.589	33	.119	.038	.160	-.192	.562
36	.184	.021	.017	.112	.457	27	.027	.007	-.030	-.045	.436
35	-.021	.057	.131	.139	.446	**11**	**.328**	.050	**-.281**	.138	**.329**

Number of factors. To determine the number of factors in EFA, the *eigenvalue-greater-than-1* and scree tests have often been used (Fabrigar et al., 1999). After inspection of the rotated factor matrices, a five-factor solution with eigenvalues greater than 1.0 were found, accounting for 49.7% of the total variance. An examination of the scree plot of factor variances also supported the five-factor solution. Generally, the scree test directs researchers to examine the graph of eigenvalues and stop factoring at a point where eigenvalues begin to level off forming a straight line with a horizontal slop (Kim & Mueller, 1978). The scree plot shows that the size of eigenvalues after the fifth factor drops off most dramatically (see Figure 4.1).

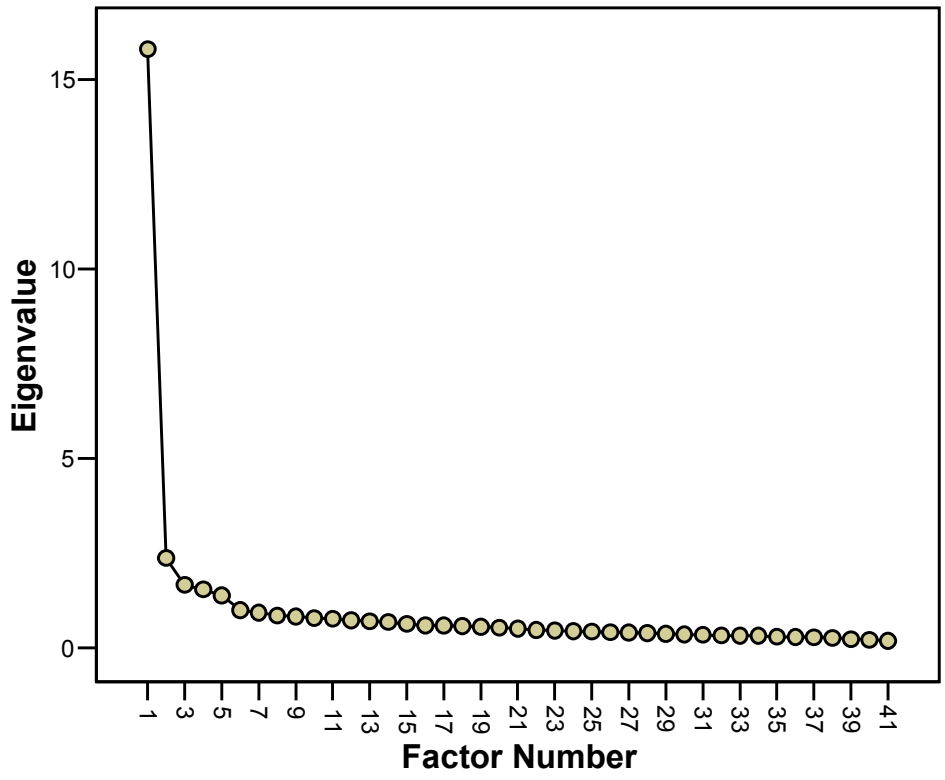

Figure 4.1. Scree plot.

Second analysis and interpretation of factors. Results of the Promax (Kappa=5) EFA (see Table 4.5) revealed five factors. As a rule of thumb, an eigenvalue cut-off score of either .30 or .40 is usually used to decide whether a variable loading is meaningful (Hair, Anderson, Tatham, & Black, 1998). The eigenvalue cut-off score for judging items in this analysis was set at .40 to achieve a more conservative approach in identifying and interpreting factors and factor loadings.

Several items were problematic for producing an appropriate factor interpretation. *Items 4 and 27*, which had communality values less than .30, were not good items because the amount

of factor variance accounted for by these items was very small (see Table 4.4). *Item 8* never loaded on any factor. *Item 11* improperly loaded on an unexpected factor and its loading value (.374) was also lower than the cut-off value. The loading values of *Items 9 and 4* were also less than the cut-off value of .4. *Item 29* double-loaded on both Factor 1 and Factor 3. In order to achieve a more precise factor solution, these 6 items were dropped and a further analysis was conducted. The elimination of these 6 items was also based on three additional criteria often used when seeking an appropriately rotated factor solution, including simplicity, i.e., each item should load on a single factor (Harman, 1976; Kim & Mueller, 1978; Sethi & King, 1991), interpretability (Kachigan, 1982; Lederer & Sethi, 1992), and percent of variance explained (Bernstein, 1988; Straub, 1989).

Table 4.6

List of Items Dropped from Analysis

Item	Construct	Content
4	Personal mastery	Teachers' individual growth is truly valued in the school
8	Personal mastery	Our teachers are motivated to learn from mistakes in their work
9	Personal mastery	Our teachers clearly understand the process of pursuing their professional development
11	Mental model	At the school, clearly revealing different perspectives or educational assumptions of teachers is encouraged as a reflective loop process
27	Team learning	In conversation, our teachers accept other colleagues' mistakes without criticism
29	Team learning	Small group or team activities are encouraged at our school as a method of dealing with school issues

As a result of initial data examination, an EFA consisting of 35 items was re-run using Principal axis factoring and Promax rotation of Kappa=5. A five-factor solution was found to be the most conceptually meaningful representation of the data, accounting for 51.66% of the total variance. Total variance accounted for by the five factors composed of the reduced number of

items was larger than the total explained variance (49.7%) of the five factor solution including all 41 original items. Even so, results for both original and reduced item EFAs produced very similar results in terms of factor structure and loading patterns. Table 4.7 presents the five factors and factor loadings for the 35 item in the EFA.

Table 4.7

Loaded Items and Rotated Factor Matrix Using Refined Item Pool (n=35)

Item	Content	Factor				
		1	2	3	4	5
V19	Our teachers and staff together build the school's vision and goals.	**.837**	-.142	.067	-.101	.086
V20	Our teachers develop their personal goals to align with the whole school vision or goals.	**.804**	.029	.124	-.129	-.029
V23	Our teachers are committed to a shared vision for the future of our school.	**.780**	.054	-.122	.053	-.022
V21	Our teachers align personal class or teaching goals with the school vision and goals.	**.775**	.043	.059	.057	-.153
V24	Our teachers agree on the principles necessary to achieve the school vision.	**.670**	.004	.041	.123	-.049
V22	Our teachers feel comfortable in sharing ideas with other teachers about the school vision.	**.577**	-.009	-.109	-.011	.296
V25	When changing educational practices, our teachers consider the impact on the school vision and goals.	**.502**	.142	-.113	.274	-.055
M15	Our teachers change their own pattern or unique teaching style to implement new approaches.	.073	**.784**	-.010	-.136	-.023
M16	Our teachers and colleagues actively explore their assumptions and ideas with each other about educational practices.	-.044	**.746**	-.040	-.111	.129
M17	Our teachers are very aware of how their beliefs and assumptions affect their educational practices.	.009	**.741**	-.054	.023	-.032
M13	Our teachers learn and change as a result of students' reactions during teaching.	-.182	**.663**	-.040	.183	-.010
M14	Our teachers often use the significant events of classrooms to think about their beliefs about education and educational practices.	-.003	**.628**	-.115	.033	-.030
M10	Our teachers often reflect on assumptions about schooling activities with other teachers to ensure that they are in line with educational principles.	.110	**.546**	.022	-.157	.141

Item	Content	Factor				
		1	2	3	4	5
M18	Our teachers at the school can effectively explain their assumptions underlying their reasoning.	.222	**.478**	.050	.042	-.013
M12	Our teachers inquire about the appropriateness of their own course or program with respect to the goals of schooling.	.205	**.409**	.247	-.020	-.078
P 2	Our teachers continually work to clarify their professional goals at the school.	.053	-.153	**.933**	-.041	.026
P 1	Our teachers at the school engage in continuous learning and reflection activities to achieve personal growth.	.007	-.142	**.931**	-.059	.045
P 3	Our teachers view the current reality more clearly in terms of targeting their career goals.	.048	-.062	**.675**	.083	-.030
P 6	At the school, our teachers continually learn to bridge the gap between their current reality and the desired future.	.015	.215	**.584**	.035	-.031
P 7	Our teachers strive to supplement their lack of skills and knowledge in their teaching and subject area.	-.090	.389	**.486**	.041	-.046
P 5	Our teachers have learning opportunities in their teaching or other professional work.	-.125	.189	**.426**	.070	.096
S38	At the school, our teachers regard educational issues as a continual process rather than with a snapshot or event.	.004	.004	-.019	**.803**	-.075
S39	Our teachers attentively link the current schooling with students' career pathways.	-.049	-.087	.025	**.803**	.046
S41	Our teachers consider the effect on students when dealing with school challenges.	-.043	-.150	.136	**.753**	.038
S40	When changing and creating school rules, consistency with the policy of the governments and educational Acts is considered.	.027	-.028	-.001	**.650**	.021
S37	When dealing with a student discipline problem, our teachers consider the impact on other teachers.	.067	.086	-.154	**.620**	.010
S36	When changing educational practices, our teachers consider the impact on their results to the inside and outside of the school.	.165	.123	.010	**.449**	.032
S35	When developing lesson plans, our teachers consider the different needs and abilities of students.	-.005	.155	.041	**.404**	.153

Item	Content	Factor				
		1	2	3	4	5
T31	Our teachers share information across course subjects and grade levels with other colleagues.	-.060	.082	.015	-.013	**.750**
T34	Our teachers participate in open and honest conversations to share their educational best practices.	-.013	.219	-.083	-.092	**.689**
T30	Our teachers are treated equally in team or committee activities.	.253	-.191	.006	-.010	**.681**
T32	Our teachers believe that sharing information or knowledge through team activities is useful for solving complex schooling problems.	-.138	.098	.076	.017	**.635**
T33	Our teachers respect other colleague's ideas and opinions by viewing them from their colleague's perspective.	-.148	.124	.015	.170	**.619**
T26	Our teachers feel free to ask questions of other teachers or staff regardless of gender, age, and professional status at the school.	.115	-.208	.073	.099	**.545**
T28	In our school, group or team activities are used in teacher professional development activities.	.363	-.030	-.011	-.043	**.420**

Note. P = Personal mastery; M = Mental models; V = Shared vision; T = Team learning; S = Systems thinking.

Factor 1 accounted for 38.29% of the variance with item loading values ranging .499 to .818. Factor 1 contained 7 items (Items 19, 20, 23, 21, 24, 22, 25) that reflected the s*hared vision* construct as determined during the content-validity stage of this study. These 7 items were retained as the primary loadings for Factor 1. Factor 1 was named s*hared vision*.

Items 15, 16, 17, 13, 14, 10, 18, and 12 loaded on Factor 2. The variance explained by Factor 2 equaled 4.97% with item loading values ranging from a low of .409 to a high of .784. These 8 items were included in the *mental model* construct as determined during the content-validity stage of this study. Thus, Factor 2 was labeled *mental model*.

Factor 3, explaining 3.22% of the total variance, had 6 loaded items (Items 2, 1, 3, 6, 7, 5). Item loading values ranged from .426 to .933. All 6 items were included in the *personal mastery*

construct identified during the content-validity stage of this study. Item 7 also loaded relatively high on Factor 2 (.389). However, for a more conceptually meaningful interpretation, Item 7 was retained on Factor 3 because its primary loading was on Factor 3. Factor 3 was labeled *personal mastery*.

Factor 4, which accounted for 2.74% of total variance, had 7 items load (Items 38, 39, 41, 40, 37, 36, 35). The loading values of these 7 items ranged from a low of .406 to a high value of .809. All 7 items had been identified as reflecting the *systems thinking* category during the content-validity stage of this study. Therefore, in terms of interpretation, Factor 4 was named *systems thinking*.

Factor 5 had 6 primary loadings (Items 31, 34, 30, 32, 33, 26, 28) and accounted for 2.45% of the variance. The item loading values ranged from .420 to .750. These items represented the *team learning* construct as identified during the content-validity stage. Item 28 had a considerably high loading weight (.363) on Factor 1. In terms of a conceptually meaningful interpretation, however, it was appropriate that Item 28 be retained on Factor 5 because its loading value (.420) on Factor 5 was more salient than on Factor 1. Factor 5 was labeled *team learning*.

Factor correlation. The EFA resulted in high correlations between the five identified factors. Correlation coefficient values ranged from .542 to .713 (see Table 4.8). According to Gorsuch (1983), "Factoring the correlations among the factors gives rise to higher-order factors" (p. 239). The existence of these high correlations between factors warrants that higher-order factors can be extracted from the data.

Table 4.8

Factor Correlation Matrix

Factor	1(PM)	2(MM)	3(SV)	4(TL)	5(ST)
1(PM)	1.000				
2(MM)	.654	1.000			
3(SV)	.550	.710	1.000		
4(TL)	.680	.713	.614	1.000	
5(ST)	.685	.675	.542	.692	1.000

Note. PM= Personal mastery, MM = Mental models, SV = Shared vision, TL = Team learning, ST = Systems thinking.

Confirming Reliability and Measurement Model (Final Instrument)

Based on the interpretation of data in Table 4.7, I found that the construct-related evidence of validity for the learning organization instrument consisted of 35 items loaded on five factors that were derived from teachers in the context of Korean vocational high schools. In other words, the test items could be considered to reflect an appropriate operational definition of the theoretical construct of Senge's (1990) learning organization.

SPSS 11.0 was used to produce internal consistency reliability coefficients for the five factors derived by EFA. Reliability (alpha) coefficients ranged from .856 to .897, with an overall value of the internal consistency for all 35 items equal to .954. As a rule of thumb, Nunnally (1978) suggested that the reliability coefficient of each subscale in scale development should be more than a minimum level of .70. The reliability coefficients of the five factors derived from the EFA were all much higher than .70.

Table 4.9

Reliability Coefficients of the Subscales Obtained from EFA (n=488)

Factor	Primary loaded items	Cronbach's alpha
Personal mastery	6 items: 2, 1, 3, 6, 7, 5	.874
Mental model	8 items: 15, 16, 17, 13, 14, 10, 18, 12	.856
Shared vision	7 items: 19, 20, 23, 21, 24, 22, 25	.897
Team learning	7 items: 31, 30, 34, 26, 32, 33, 28	.858
System thinking	7 items: 38, 39, 41, 40, 37, 36, 35	.866
Total items	35 items	.954

Obtaining evidence of reliability and construct validity based on EFA resulted in the final psychometric instrument I used to measure the degree of learning organization in Korean vocational high schools. EFA results also produced an empirical measurement model to be tested by confirmatory factor analysis (CFA). A measurement model emerged from the 35 items. Figure 4.2 depicts a hierarchical model of the learning organization achieved by the field test. In this diagram, the five factors of the *learning organization* suggested by Senge (1990) are latent constructs, whereas the 35 items loading on one of the factors are observed variables. I can assume that the *learning organization* concept functions as a higher-order factor in this model because high correlations between the five factors existed (Gorsuch, 1983). This model was based on testing the CFA and multi-group CFAs.

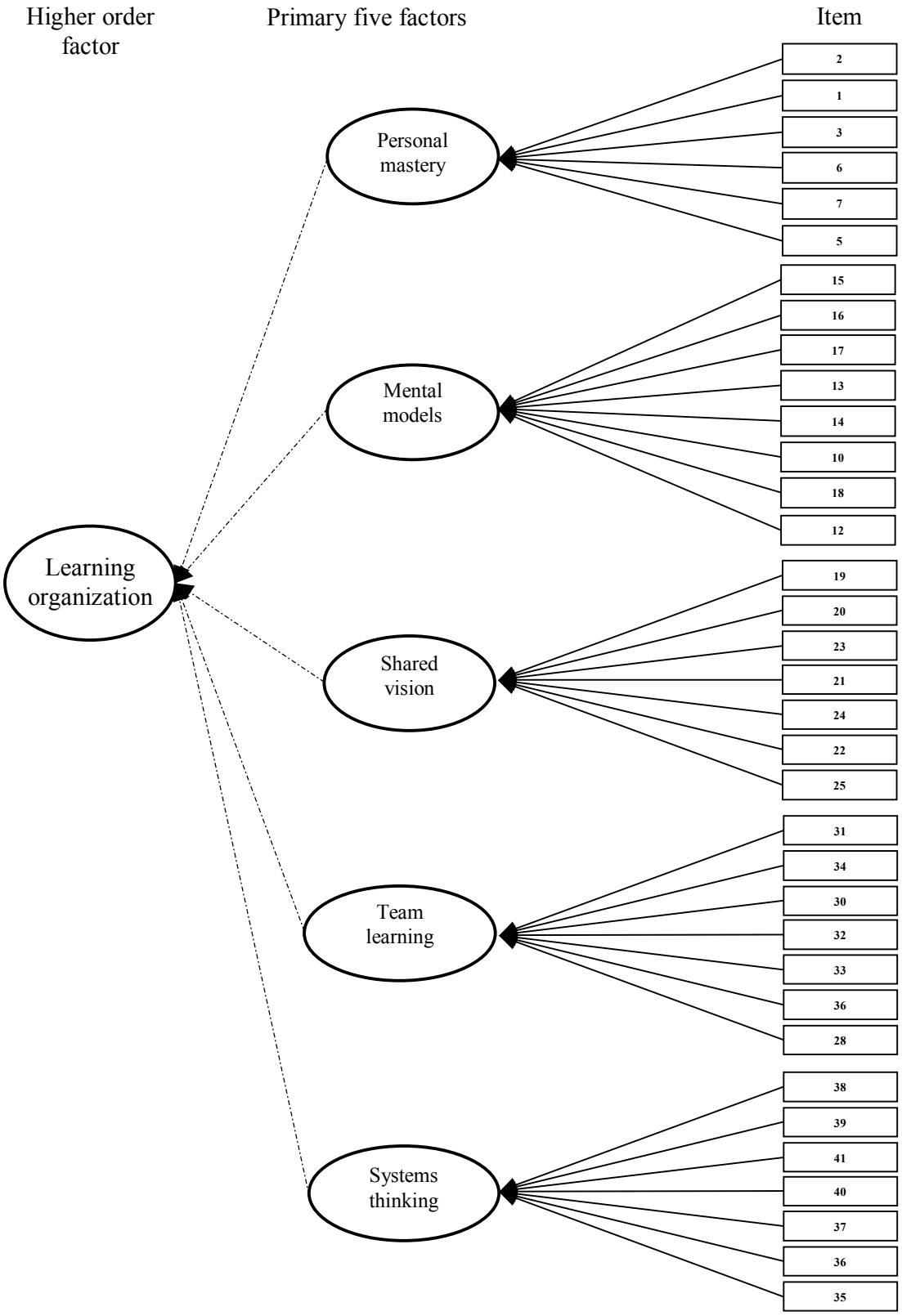

Figure 4.2. A measurement model of learning organization.

Confirmatory Factor Analysis

One of the major differences between exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) is that more aspects of a model can be specified *a priori* in CFA. In EFA, the model (i.e., which items load on which factors) is not specified in advance, but emerges from analysis. In contrast, Bagozzi, Yi, and Phillips (1991) pointed out that CFA is a powerful method for addressing construct validity and provides more diagnostic information about reliability and validity. For assessing construct validity, CFA has four advantages including (a) allowing methods to affect measures of traits in different degrees and to correlate freely among themselves, (b) providing measures of the overall degree of fit, (c) providing estimates as to if and how well convergent and discriminant validity are achieved, and (d) partitioning variance into trait, method, and error components. CFA also provides a strong test of theoretical models, gives further confirmation about the powerfulness of a scale's psychometrics, and provides additional information about the dimensionality of a scale (Noar, 2003).

The purpose of conducting CFA was to answer Research Question 2, "To what extent can the learning organization model be derived and confirmed from Korean vocational high school teachers' responses in their school settings?" To validate the theoretical model of the learning organization suggested by Senge (1990), the measurement model found in EFA was tested using CFA with LISEREL 8.3 (Jöreskog & Sörbom, 1996). Sample data with even numbers, coded by SPSS (n=488), was split from the full sample (N=976) for this analysis. As a rule of thumb, Crocker and Algina (1986) suggested that a sample size greater than 200 is needed to perform CFA and structural equation modeling. Thus, the sample size of 488 was deemed sufficient to conduct the CFA.

Preliminary Analysis

Before conducting CFA to test the measurement model, some preliminary analyses were conducted. First, basic descriptive statistics provide the characteristics of the sample. Second, to check for normality and outliers, the dataset was screened using *normtest macro* developed by DeCarlo (1997) via SPSS 12.0. Third, the existence of collinearity among items was checked.

Demographic variables. Table 4.10 presents characteristics of the 488 participants used in the CFA analysis through the categories of teaching subject, gender, age, year of teaching experience, and school type. The number of vocational teachers (59.8%) was more than academic teachers (40.2%). Male teachers (54.3%) were more than female teachers (45.7%). Teachers who were 39 years of age or younger and those with teaching experience of less than 15 years composed about 45% of the sample. At age level, the sampling group had a mean age of 39.97 and SD of 8.799. In teaching experience variable, there was a mean of 13.90 and SD of 9.024. Teachers of trade-industry and technical high schools composed almost half of the group (49%), while teachers in business high schools represented slightly more than one-third of the sample (38.3%). Just under one-quarter of the sample (22.7%) were teachers who worked in comprehensive vocational high schools.

Table 4.10

Frequencies for Demographic Variables of CFA Sample

Variable	Category	*n*	%
Teaching subject	Vocational	292	59.8
	Academic	196	40.2
Gender	Male	265	54.3
	Female	223	45.7
Age	Less than 29 years	73	15.1
	30-39 years	152	31.4
	More than 60 years	9	1.9
	Missing	4	–

Variable	Category	*n*	%
Teaching Experience	Less than 5 year	123	25.5
	6-10 years	69	14.3
	11-15 years	72	14.9
	16-20 years	95	19.6
	21-25 years	76	15.8
	More than 26 years	48	9.9
	Missing	5	–
School/program type	Trade-Industry and technical	239	49.0
	Business	187	38.3
	Comprehensive vocational	62	12.7

Descriptive statistics, outliers, and collinearity. Means, standard deviations, skewness, and kurtosis for scale items are depicted in Table 4.11. There was no invalid or missing data. The values for skewness and kurtosis were examined as part of a data screen process to check the distribution of scores and were all less than |2.0|. As a rule of a thumb, unless the value of skewness for any item is greater than |2.0| or kurtosis is greater than |7.0|, the item is not seriously nonnormally distributed (Fabrigar et al., 1999). Considering this rule, there were no items found to be nonnormally distributed. Specifically, the multivariate normality test was conducted using PRELIS 2. 53, with a relative multivariate kurtosis value of 1.112. This result indicated there were no serious deviations from multivariate normality. It also verified appropriateness of maximum-likehood estimation used in this study (Bandalos, Finney, & Geske, 2003).

Table 4.11

Descriptive Statistics for the CFA Sample (n = 488)

Item	Mean	SD	Skewness		Kurtosis	
			Statistic (g1)	Std. error	Statistic (g2)	Std. error
1p	3.94	.711	-.290	.111	-.073	.221
2p	3.92	.703	-.596	.111	1.349	.221
3p	3.66	.755	-.173	.111	-.109	.221
5p	3.83	.739	-.518	.111	.476	.221

Item	Mean	SD	Skewness		Kurtosis	
			Statistic (g1)	Std. error	Statistic (g2)	Std. error
6p	3.86	.717	-.223	.111	-.156	.221
7p	4.06	.700	-.621	.111	.998	.221
10m	3.58	.819	-.528	.111	.447	.221
12m	3.65	.770	-.415	.111	.448	.221
13m	3.83	.760	-.657	.111	1.043	.221
14m	3.54	.746	-.252	.111	.062	.221
15m	3.61	.798	-.256	.111	.021	.221
16m	3.57	.793	-.279	.111	.276	.221
17m	3.78	.754	-.397	.111	.329	.221
18m	3.51	.736	-.020	.111	.049	.221
19v	3.23	.892	-.126	.111	-.073	.221
20v	3.35	.832	-.351	.111	.262	.221
21v	3.32	.789	-.138	.111	.124	.221
22v	3.36	.854	-.299	.111	-.033	.221
23v	3.27	.833	-.045	.111	.031	.221
24v	3.46	.794	-.409	.111	.230	.221
25v	3.52	.758	-.247	.111	-.017	.221
26t	3.49	.922	-.323	.111	-.152	.221
28t	3.29	.857	-.313	.111	-.186	.221
30t	3.33	.886	-.429	.111	-.021	.221
31t	3.48	.810	-.330	.111	-.053	.221
32t	3.61	.759	-.428	.111	.321	.221
33t	3.66	.722	-.293	.111	.115	.221
34t	3.49	.795	-.182	.111	.048	.221
35s	3.66	.757	-.375	.111	.361	.221
36s	3.62	.757	-.401	.111	.324	.221
37s	3.68	.785	-.656	.111	.752	.221
38s	3.80	.713	-.465	.111	.699	.221
39s	3.79	.817	-.523	.111	.384	.221
40s	3.67	.797	-.399	.111	.050	.221
41s	3.98	.777	-.539	.111	.233	.221

Note. Items 1p to 9p measure personal mastery. Items 10m to18m measure mental models. Items 19v to 25v measure shared vision. Items 26t to 34t measure team learning. Items 35s to 41s measure systems thinking.

DeCarlo's (1997) normtest identified five outliers (Cases 261, 405, 156, 292, 464) with *F* values bigger than the critical *F* values (critical $F_{(05/n)\,(df=41,\,446)} = 79.77$; critical $F_{(.01/n)\,(df=41,\,446)} = 84.73$). The five cases had considerably large *F* values of 140.13, 134.71, 127.15, 118.55, and 116.37, respectively. These five outliers were significant at both.05 and .01 levels. These five

outliers were not included in the dataset used for the CFA because a few model fit indexes (e.g., Comparative Fit Index and Incremental Fit Index) were slightly different when outliers are included. A final screening procedure to check for missing data did not detect any missing values for variables included in this study.

CFA requires an assumption of the non-existence of collinearity among variables. Collinearity exists when "absolute values of one or more of the zero-order correlation coefficients between independent variables are relatively high, say .70 or larger" (Mueller, 1996, p. 21). Inspection of the correlation matrix showed no correlation coefficients larger than .70. Therefore, the problem of collinearity did not exist seriously.

Test of the Hypothesized Model

One of the major differences between EFA and CFA is that in CFA more aspects of the model can be specified a priori. However, in EFA, the model (i.e., which items load on which factors) is not specified in advance, but emerges from data. Before conducting the CFA to test the hierarchical model, two methodological decisions had to be made. First, maximum likelihood was selected as an estimation method. Gable and Wolf (1993) argued that maximum likelihood is the most frequently used estimation method and its estimates are very robust. Second, the relational form for data analysis was the covariance matrix, which was generated using PRELIS 2.53.

A hypothesized model. The hypothesized learning organization model was created using EFA with SPSS 12.0. The model tested in this CFA was higher-order factor model established in the EFA. The higher-order factor model (hierarchical model) consisted of 35 observed variables (items), five primary factors, and a second-order factor (see Figure 4.3). The second-order factor accounts for the relationships between the five primary factors.

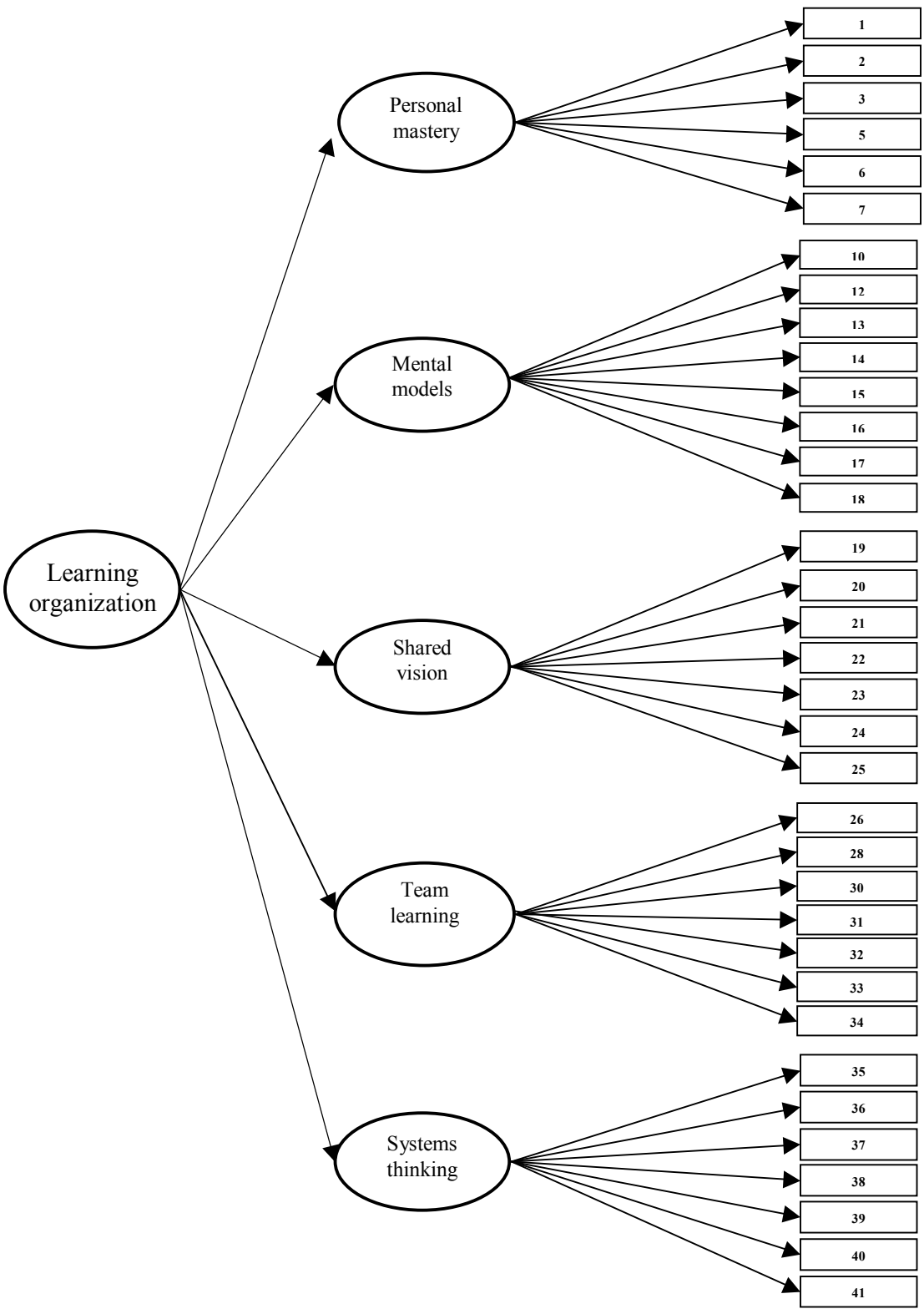

Figure 4.3. A hypothesized learning organization model for the CFA.

Examination of parameter estimates. The initial steps of this analysis assessed the model using CFA with LISREL 8.3 (Joreskog & Sorbom, 1996). The first step was to determine if parameter estimates were reasonable (Byrne, 1989; Mueller, 1996). According to the parameters estimated by LISREL, there were no negative variances, standard errors ranged from .02 to .05, and all covariance matrices were positive definite. Next, the adequacy of both the measurement and structural part of the model were determined by examining the squared multiple correlations (R^2) and loading values for the 35 observed items and five latent primary factors (see Table 4.12).

Table 4.12

Major Parameter Estimates and Loading Values

Factor	Item	Factor loading	*t*-value	Error variance (SE)	R^2
		Primary factors			
Personal mastery	1	0.52		0.23 (0.017)	0.55
	2	0.53	16.01	0.21 (0.017)	0.58
	3	0.49	13.74	0.33 (0.023)	0.43
	5	0.48	13.73	0.31 (0.022)	0.43
	6	0.52	15.24	0.24 (0.019)	0.52
	7	0.53	15.89	0.21 (0.017)	0.57
Mental models	10	0.51		0.39 (0.028)	0.39
	12	0.55	12.91	0.29 (0.022)	0.51
	13	0.42	10.77	0.37 (0.025)	0.33
	14	0.42	10.73	0.37 (0.025)	0.32
	15	0.51	12.15	0.34 (0.024)	0.44
	16	0.56	12.92	0.30 (0.022)	0.51
	17	0.46	11.54	0.34 (0.024)	0.38
	18	0.47	11.93	0.31 (0.022)	0.42
Shared vision	19	0.63		0.39 (0.028)	0.51
	20	0.61	15.43	0.31 (0.023)	0.55
	21	0.60	15.94	0.25 (0.019)	0.59
	22	0.63	15.52	0.32 (0.023)	0.55
	23	0.62	15.73	0.29 (0.021)	0.57
	24	0.58	15.45	0.27 (0.020)	0.55
	25	0.55	15.36	0.25 (0.019)	0.54

Factor	Item	Factor loading	*t*-value	Error variance (SE)	R^2
Team learning	26	0.50		0.58 (0.039)	0.30
	28	0.53	10.38	0.43 (0.031)	0.39
	30	0.60	10.95	0.41 (0.030)	0.46
	31	0.55	11.06	0.33 (0.024)	0.48
	32	0.55	11.42	0.26 (0.020)	0.54
	33	0.52	11.31	0.25 (0.019)	0.52
	34	0.56	11.22	0.31 (0.023)	0.50
Systems thinking	35	0.50		0.31 (0.022)	0.45
	36	0.55	14.17	0.25 (0.019)	0.54
	37	0.48	12.27	0.36 (0.025)	0.39
	38	0.50	13.58	0.26 (0.019)	0.49
	39	0.59	13.94	0.32 (0.024)	0.52
	41	0.55	13.81	0.29 (0.022)	0.51
	40	0.53	12.98	0.35 (0.025)	0.44
		Higher-order factor			
Learning organization	SV	0.84	14.92	0.30 (0.043)	0.70
	PM	0.74	13.67	0.45 (0.058)	0.55
	TL	0.84	11.33	0.29 (0.056)	0.71
	MM	0.90	13.50	0.20 (0.041)	0.80
	ST	0.81	13.59	0.34 (0.052)	0.66

Note. SV= Shared vision, PM= Personal mastery, TL= Team learning, MM= mental models, and ST= Systems thinking.

The path values of item loadings were moderately high. Seven items loading values possessed less than .50. Path values of the 5 latent factors were considerably high to the learning organization, e.g., the higher-order factor. Except for personal mastery factor, r= .74, the path values of 4 latent factors were more than .80. Latent factors correlated highly with each other, ranging from .60 to .90 (see Table 4.13). Figure 4.4 outlines the loading values of 35 observed variables and 5 latent factors, as well as their whole loading structure.

Table 4.13

Correlation Matrix of Latent Factors

Factor	PM	MM	SV	TL	ST	LO
PM	1.00					
MM	.66	1.00				
SV	.62	.75	1.00			
TL	.62	.75	.71	1.00		
ST	.60	.73	.68	.68	1.00	
LO	.74	.90	.84	.84	.81	1.00

Note. PM=Personal mastery, MM=Mental models, SV=Shared vision, TL=Team learning, and LO=Learning organization.

Assessment of overall model fit. CFA with LISREL 8.3 (Jöreskog & Sörbom, 1996) was used to produce various fit indexes to assess model fit. Fit indexes in CFA are often divided into two types; stand-alone fit indexes and incremental fit indexes. Incremental fit indexes evaluate fit by comparing the model to the fit of a baseline model, whereas stand-alone indexes are not based on any type of model comparison (Marsh, Balla, & McDonald, 1988). Stand-alone indexes include Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), Root-Mean Square Residual (RMR), Standardized RMR (SRMR), Akaike's Information Criterion (AIC), and Root-Mean Square Error of Approximation (RMSEA). Incremental fit indexes include Normed Fit Index (NFI), Non-Normed Fit Index (NNFI), Parsimonious Normed Fit Index (PNFI), Incremental-Fit Index (IFI), Comparative Fit Index (CFI), and Relative Noncentrality Index (RNI).

Incremental fit indexes can be categorized into 3 types (Hoyle & Panter, 1995). Type 1 indexes represent the proportion of increased fit the hypothesized model shows over the null baseline model (NFI and PNFI). Type 2 indexes use the same information as Type 1, but incorporate expected chi-square values under the central chi-square distribution (NNFI and IFI). Type 3 indexes provide the same information as Type 1, but incorporate expected chi-square values under the noncentral chi-square distribution (RNI and CFI).

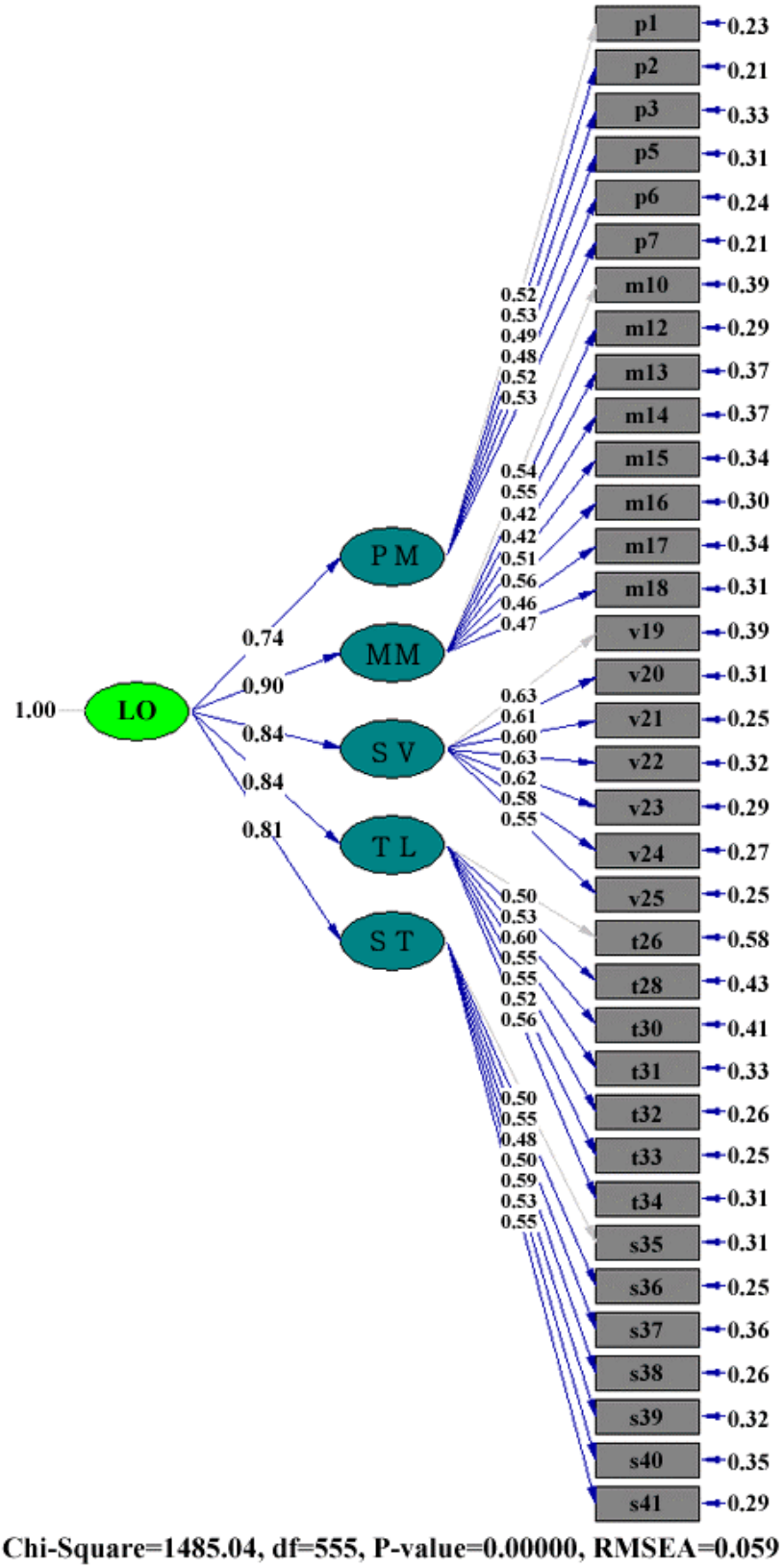

Figure 4.4. The path diagram as a hierarchical facture structure.

Gable and Wolf (1993) suggested that to answer the question of whether or not the empirical data confirm the existence of the hypothesized constructs, researchers need to examine four indications: chi-square, two Goodness-of-Fit values (GFI and AGFI), and the Root-Mean Square Residual (RMR). They argued that these are indexes of how well the actual data fit the proposed model. Regarding the results of structural equation model analysis, Hoyle and Panter (1995) recommend the chi-square and GFI as stand-alone indexes, the NFI, NNFI, or IFI for Type 2 indexes, and the CFI or RNI for Type 3 indexes. Hu and Bentler (1998) did not recommend using the GFI and AGFI because these two indexes are not sensitive to model misspecification and are sensitive to sample size. Instead, they recommended a 2-index strategy, which includes reporting the SRMR or RMSEA and supplementing it with either the NNFI, IFI, or CFI.

Regarding evaluation of overall model fit, Vandenberg and Lance (2000) found major recommendations from their review of relevant literature. The first one was to interpret the chi-square value to infer support for a well-fitting model. The second was to select a variety of practical fit indexes to supplement the chi-square test. They recommended using four fit indexes, including (a) TLI, often referred to as the nonnormed fit index (NNFI), (b) RMSEA, (c) RNI, and (d) SRMR.

No index of model fit is generally accepted as superior to the others, so several fit indexes are needed to ensure that multiple aspects of model fit can be captured (Hu & Bentler, 1995). Accordingly, five fit indexes were selected as criteria to assess the fit of the hypothesized model in this study (see Table 4.14). There were two general reasons for selecting these five indexes. First, there was consistent support for them from the literature in terms of their ability to examine well-fitting models. Second, they appropriately represented the range of classes into which fit indexes are categorized: SRMR and RMSEA are stand-alone indexes; NNFI (TLI) is included in

incremental fit indexes and is a Type 2; and, CFI is included in incremental fit indexes but is a Type 3.

Table 4.14

Model Fit Indices of the Hypothesized Hierarchical Model

Index	Value
Chi-square	1528.50*
Standardized RMR (SRMR)	0.052
Root Mean Square Error of Approximation (RMSEA)	0.060
Non-Normed Fit Index (NNFI)	0.970
Comparative Fit Index (CFI)	0.980

Note. **df* = 555, *p* value = 0.000.

Gable and Wolf (1993) recommended using specific criteria to assess the ratio of a chi-square value to its degrees of freedom. Specifically, "If the ratio is larger than 5:1, the model is seriously flawed. If the ratio is less than 2:1, break out the champagne! Ratios between 2:1 and 5:1 are in the gray area of model fit" (p. 163). The ratio of the chi-square value to its degree of freedom in this study was 2.75:1. Thus, the chi-square ratio reflects an adequate fit for the hypothesized model.

The Root-Mean Square Residual (RMR) is the square root of the average of the residual element. LISREL also provides a standardized RMR (SRMR) value which essentially puts this index into a correlation-type metric. Hu and Bentler (1998) recommended reporting SRMR because it is the most sensitive to simple model misspecification and also moderately sensitive to complex model misspecification. They suggested a cutoff of .08 or less for RMR and SRMR. The SRMR value of .052 in this study is a very reasonable value to reflect a good model fit.

Root-Mean Square Error of Approximation (RMSEA) is a standardized measure of the lack of fit of the population data to the model. It represents the discrepancy per degrees of freedom. A

cutoff close to .06 is recommended as a reasonable value to indicate a close fit (Hu & Bentler, 1998). The RMSEA value of .06 obtained in this analysis indicates that the data reasonably fit the model.

Non-Normed Fit Index (NNFI) and Comparative Fit Index (CFI) are both considered incremental fit indexes. The NNFI or Tucker–Lewis Index (TLI) is a variation on the Normed Fit Index where the difference between the fit of the target and baseline models is compared to the difference in fit between the baseline model and its expectation. CFI compares the noncentrality parameters of the target and baseline models. Hu and Bentler (1998, 1999) recommended the fit criteria for these two indexes to be .95 for NNFI and CFI≥ .95. Compared to these cutoff values, obtained values for NNFI = .97 and CFI = .98 both indicate adequate model fit.

In conclusion, the analysis for this portion of the study revealed that the learning organization model hypothesized in this study adequately fit the actual data. Based on the 2-index strategy recommended by Hu and Bentler (1998, 1999), the empirical data strongly confirmed the existence of the hypothesized constructs and model of Senge's (1990) learning organization. In terms of cross-validation, results from the assessment of model fit supported the construct validity of the learning organization instrument in Korean vocational high school contexts.

Multiple Group Analysis

Multi-group CFA is a well-established technique to examine group differences in means and covariances within a common factor model (Jöreskog, 1971; Little, 1997; Marsh & Grayson, 1990). Factorial invariance tests using multi-group CFA are not tests of mean differences among groups, as would be tested with traditional *t*-tests or analysis of variance (ANOVA), but are tests to determine whether or not certain relationships are the same for all groups being analyzed. They generally investigate measurement invariance or equivalence across populations or groups

(Vandenberg & Lance, 2000). Using techniques of multi-group CFA with LISEREL 8.3 (Jöreskog & Sörbom, 1996), I estimated the hypothesized model to examine the equivalency of the factor structure and loadings across two different teacher groups (vocational and academic teachers) in Korean vocational high schools.

Through the techniques of multi-group CFAs, factorial invariance tests across multiple groups are often conducted in a hierarchical fashion that consists of subsequent procedures (e.g., invariant tests of factor structure, factor loadings, factor covariance, and measurement error variance; Vandenberg & Lance, 2000). Invariance of factor structure implies that the same items load on the same factors, the same factors are correlated, and the same structure holds for the measurement error variance across groups. The test to examine invariance of factor structure is called *a test of configural invariance*. Invariance of factor loadings means that the value of factor loadings must be the same for all groups in terms of statistical meaning. An invariant test of factor covariance determines whether factor covariances are the same for all groups, in addition to invariance of the factor structure and factor loadings. The common procedure for these invariant tests involves conducting an initial run of multi-group CFAs in which the only invariance constraint imposed is that the same parameters must exist for all groups. In the next step, subsequent runs add more and more invariance constraints. Consequently, this procedure results in a series of nested models that can be tested against each other, using the chi-square difference tests.

The purpose of conducting factorial invariant tests was to examine invariance of the learning organization model's factor structure and factor loadings across two different teacher groups in Korean vocational high schools. For this purpose, both factor structure and factor loadings invariance tests were required. However, in this study, to explore the overall factorial invariance

for the two teacher groups, the multi-group CFAs included the four factorial invariant model tests reported earlier.

Preliminary Analysis

Data used for this multiple group analysis was the same sample data (n=488) used in the previous CFA model test. Therefore, preliminary analyses to screen the dataset collinearity, normality, and outliers were not repeated. As previously reported (see Table 4.9), 59.8% of the sample (n=292) were vocational teachers and 40.2 % (n=196) were academic teachers. The five outliers described in the earlier analyses were not included in the sample data for this multiple group analysis. Demographic variables for the two teacher groups were compared to examine the characteristics of each group (see Table 4.15).

Table 4.15

Comparison of Demographic Variables for Two Teacher Groups

Variable	Category	Type of teacher			
		Vocational[a]		Academic[b]	
		n	%	*n*	%
Gender	Male	193	66.1	72	36.7
	Female	99	33.9	124	63.3
Age	Less than 29 years	33	11.3	40	20.8
	30-39 years	74	25.3	78	40.7
	40-49 years	155	53.1	55	28.6
	More than 50 years	30	9.9	21	10.3
	Missing	–		2	
Teaching experience	Less than 5 year	55	19.0	68	35.2
	6-15years	88	30.3	53	27.5
	16-25 years	117	40.4	54	28.0
	More than 26 years	30	10.3	18	9.3
	Missing	2	–	3	–
School/program type	Trade-industry and technical	162	55.5	77	39.3
	Business	103	35.3	84	42.9
	Comprehensive vocational	27	9.2	35	17.9

Note. [a]n=292. [b]n=196.

The two teacher groups differed overall on some demographic measures. In the vocational teacher group, 66.1% (*n*=193) were male, whereas 63.3% (*n*=124) in academic teacher group were female. In regard to age and years of teaching experience, the younger-to-older teacher ratio in the academic group was higher than in the vocational group. In the academic group, 61.2% of the teachers (*n*=118) were less than 40 years old, whereas only 36.6% of vocational teachers were less than 40 years of age. At age level, the vocational teacher group had a mean age of 41.62 years and standard deviation (SD) of 8.475, whereas the academic teacher group had a mean age of 37.47 and SD of 8.709.

Teachers with more than 16 years of experience exceeded 50.7% (*n*=147) in the vocational group, but only 37.3% (*n*=72) of the academic group. The vocational group had a mean of 15.19 years and SD of 8.583 in teaching experience variable. In contrast, the academic group had a mean of 11.94 years and SD of 9.329. Regarding school/program type, 55.5 % of vocational teachers (*n*=162) and 39.3% of academic teachers worked for trade-industry and technical schools. About 43% (*n*=84) of the academic group worked for business high schools. Table 4.16 shows the means and standard deviations of the 35 items for the two teacher groups.

Table 4.16

Means and Standard Deviations on Items for Vocational and Academic Teacher Groups

Item	Vocational teachers		Academic teachers	
	Mean	SD	Mean	SD
1p	3.95	.725	3.93	.691
2p	3.93	.697	3.90	.713
3p	3.68	.755	3.63	.757
5p	3.86	.749	3.79	.725
6p	3.93	.736	3.76	.678
7p	4.09	.700	4.01	.698

Item	Vocational teachers		Academic teachers	
	Mean	SD	Mean	SD
10m	3.55	.813	3.62	.829
12m	3.64	.780	3.66	.758
13m	3.78	.776	3.89	.733
14m	3.54	.761	3.55	.725
15m	3.66	.781	3.54	.819
16m	3.53	.788	3.62	.798
17m	3.77	.716	3.80	.810
18m	3.54	.724	3.47	.754
19v	3.30	.848	3.11	.943
20v	3.44	.791	3.22	.877
21v	3.36	.768	3.27	.817
22v	3.40	.825	3.32	.896
23v	3.32	.784	3.20	.898
24v	3.50	.744	3.40	.863
25v	3.53	.724	3.49	.807
26t	3.47	.879	3.53	.984
28t	3.35	.796	3.19	.935
30t	3.41	.806	3.20	.981
31t	3.50	.748	3.46	.896
32t	3.60	.723	3.63	.810
33t	3.67	.704	3.63	.750
34t	3.47	.775	3.52	.826
35s	3.65	.751	3.67	.768
36s	3.66	.708	3.56	.824
37s	3.68	.767	3.68	.813
38s	3.79	.728	3.80	.691
39s	3.80	.813	3.77	.825
40s	3.71	.728	3.62	.889
41s	3.99	.760	3.96	.803

Note. Items 1p to 9p measure personal mastery. Items 10m to18m measure mental models. Items 19v to 25v measure shared vision. Items 26t to 34t measure team learning. Items 35s to 41s measure systems thinking.

A Hypothesized Model

The hypothesized test model in the multigroup CFAs comprised five latent factors and 35 observed variables (see Figure 4.5). This model, as a measurement model, differs from the higher-order factor model previously using CFA (see Figure 4.3).

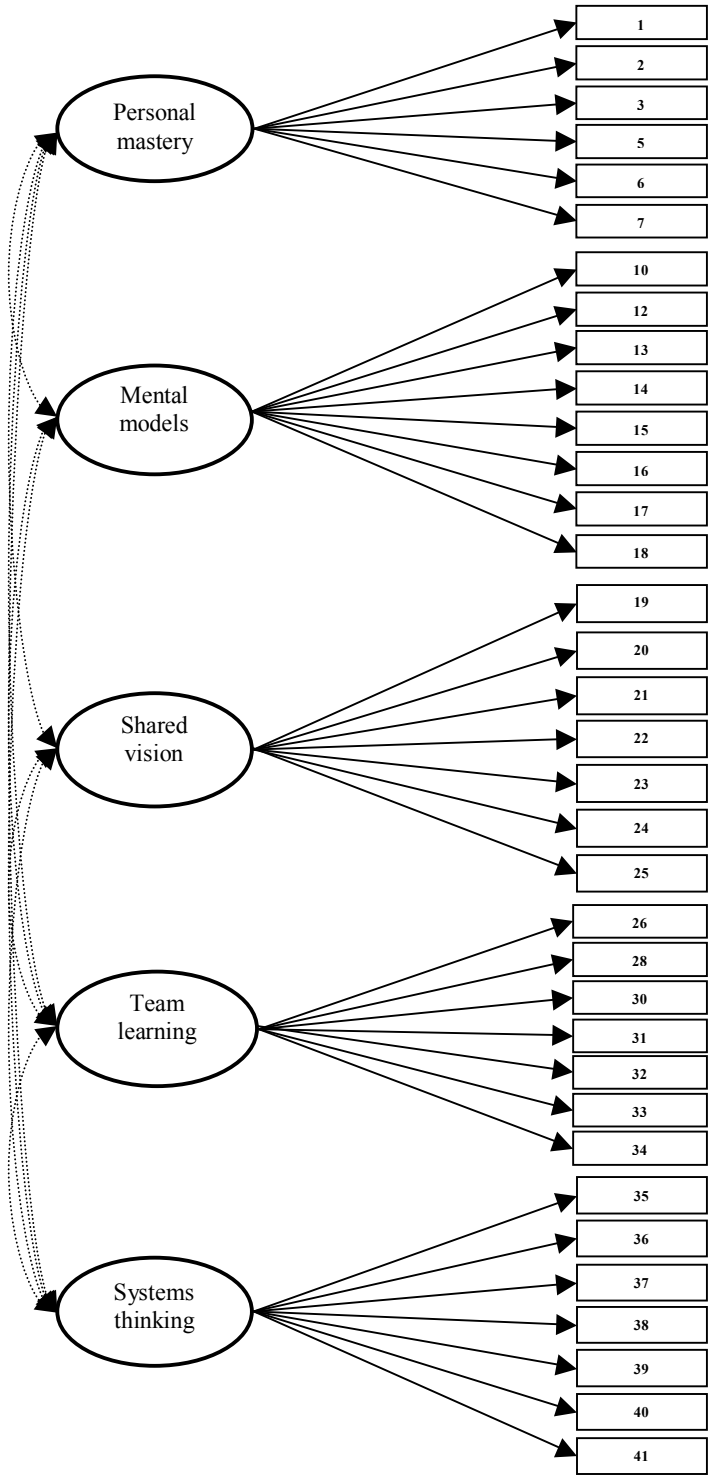

Figure 4.5. The hypothesized model for multi-group CFAs.

Factorial Invariant Tests of Hypothesized Model

To test factorial invariance, the initial step involved examining separate covariance matrices for the two teacher groups, using PRELIS 2.53. Then, four multi-group CFAs were conducted in a hierarchical procedure. In each multi-group CFA, the metric of the factors was established by setting the loading of one variable from each factor to a value of 1. Setting the factor variance to a value of 1 was avoided because factor variances were not assumed to be identical across groups. The variables set to a value of 1 were Items 19v, 15m, 2p, 31t, and 38s. These items were selected because they each had the highest loading values in the 5 identified factors identified by the EFA.

According to the hierarchical fashion, the initial multi-group CFA was to run *invariant tests of factor structure* across the two different teacher groups. Then, three subsequent invariant tests from *invariance of factor loadings* to *invariance of factor variances* were computed. Subsequent runs imposed increasingly restrictive constraints across the two teacher groups. Imposing increasingly restrictive invariance constraints was incorporated into the LISREL syntaxes (see Appendix I). As an initial step, the *invariant test of factor structure,* referred to as *tests of configural invariance* (Vandenberg & Lance, 2000), included the following specifications: (a) the same numbers and patterns of both factors and their loadings were freely estimated factor loadings for each teacher group, (b) factor variances and correlations were freely estimated and allowed to be heterogeneous across the two teacher groups, and (c) the error variances of all items were freely estimated and allowed to be heterogeneous across the two teacher groups. The second step in the analysis tested the *invariance of factor loadings*. In this design, the factor loadings of all items were constrained to be equal across the two teacher groups, whereas the error variances for all items, factor variances, and factor correlations were freely estimated and

allowed to be heterogeneous across the two teacher groups. The third step as the *invariant test of measurement errors* tested the invariance of factor loadings and measurement error variances. In this third step design, as additional constraints, the factor loadings and the error variances for all items were held to have the same values across the two teacher groups, whereas factor variances and factor correlations were freely estimated and allowed to be heterogeneous across the two teacher groups. The fourth step as the *invariant test of factor variances* tested invariance of factor loadings, measurement error variances, and factor variances. In this test design, the factor loadings and error variances for all items, as well as factor variances were additional invariance constraints. Thus, they were held equal across the teacher groups. Only the parameter of factor correlations in the fourth test design was freely estimated and allowed to be heterogeneous across the two teacher groups. Table 4.17 shows results of these four invariant four tests which were all designed to examine factorial invariance across the academic and vocational teacher groups.

Indices for evaluating the overall model fit included the chi-square (χ^2), SRMR, RMSEA, NNFI, and CFI. The rationale for selecting these indices and their criteria are the same as used for estimating the higher-order CFA factor model. The chi-square-to-degree of freedom ratio in all models of the factorial invariant tests was less than 2:1. In evaluating the results of CFAs, the chi-square-to-degree of freedom ratio is one of the most important values (Gable & Wolf, 1993). In this study, these chi-square ratios all fell within a range reflecting excellent model fit. All other fit indexes also supported well-fitting models.

Table 4.17

Results of Factorial Invariant Tests across the Vocational and Academic Teacher Groups

Tested model	χ^2 (*df*)	χ^2/df	$\Delta\chi^2$ (Δdf)	SRMR	RMSEA	NNFI	CFI
Invariant test of factor structure	2127.23* (*df* =1111)	1.92		.070	.061	.97	.97
Invariant test of factor loadings	2152.36* (*df* =1141)	1.89	25.13 (30)	.086	.060	.97	.97
Invariant test of measurement errors	2201.90* (*df*=1176)	1.87	49.54 (35)	.090	.061	.97	.97
Invariant test of factor variances	2201.90* (*df*=1176)	1.87	0.0 (0.0)	.090	.061	.97	.97

Note. Chi-square difference tests were conducted between each subsequent test and the previous test.
* $p < .01$.

Although all values of SRMR were moderately high, they did not exceed the cut-off value of .10 or less recommended by Kline (1998). The values of RMSEA in the five invariant tests were less than .061. Compared to a cutoff value close to .06 cited by Hu and Bentler (1998), or a cutoff value of less than .08 recommended by Vandenberg and Lance (2000), these values are acceptable and indicate well-fitting models. The values of NNFI and CFI were .97 in all test models and indicate reasonable model fit. Consequently, results of the good fit indices indicated that the hypothesized learning organization models to test factorial invariance should not be rejected. Thus, the four parameters (factor structure, factor loadings, measurement error variances, and factor variances) were equivalent across the vocational and academic teacher groups in Korean vocational public high schools.

In addition to evaluating overall model fit, differences in chi-squares were examined to determine the invariance of related parameters across the two teacher groups from the four

subsequent invariance tests (Cheung & Rensvold, 1999, 2000; Vandenberg & Lance, 2000). As an assessment of invariance constraints in factorial invariant tests, the most frequently used approach for testing the difference between any two adjacent test models is the chi-square difference test (Vandenberg & Lance). In this study, the invariance in the model of each subsequent test was determined by examining whether adding invariance constraints to the model resulted in a statistically significant increase in the chi-square statistic between any two adjacent test steps. For example, a statistically significant difference in the chi-square statistic between the invariant test of factor structure and the invariant test of factor loadings indicates that at least one of the factor loadings has significantly different values for the two teacher groups. Similarly, a significant increase of the chi-square statistic from the invariant test of factor loadings to the invariant test of measurement error may lead to a conclusion that at least one of the error variances for each item is significantly different across the two teacher groups. In this study, the tests of χ^2 differences between adjacent models were not all statistically significant at the .01 level (see Table 4.17). These results strongly support a finding of no statistical differences between the invariance test models. Conversely, adding the invariance constraints imposed by each subsequent test model did not produce a significantly poorer model fit compared to the test models with fewer constraints. This indicated that the factor structure, factor loadings, error variances, and factor variances are not significantly different across the two teacher groups.

Additionally, the change of CFI statistics between the invariance test models was examined as a criterion of factorial invariance. Regarding the factorial invariance tests, Cheung and Rensvold (1999) argued that changes in CFI of -.01 or less indicate that the invariance hypothesis should not be rejected, but when differences lie between -.01 and -.02, the existence

of differences between groups should be suspected. Distinct differences between invariant test models exist when the change of CFI values are greater than -.02. Data reported in Table 4.17 reveal that CFI values between the four invariant test models are consistently at .97. The consistency of the CFI values between the models supported the factorial invariance of the hypothesized models across the teacher groups. Specifically, the consistency of the CFI values in this study additionally evidenced that the factor structure, factor loadings, measurement error variances, and factor variances were not significantly different across the two teacher groups.

It should be noted that the factorial invariance that resulted from these tests was determined on an entire set of parameters such as all factor loadings or measurement errors of all items. For example, in this study, the invariance test of factor loadings revealed the equivalency of factor loading values across the two teacher groups. However, the loading values on each item and some parameters, which were produced from the invariance test of factor loadings, were not the same between the two groups, although they were very similar (see Table 4.18).

Table 4.18

Item Loadings, t-values, and R^2 of Vocational and Academic Teacher Groups

Item	Vocational teacher group		Academic teacher group	
	Loading (*t*) value	R^2	Loading (*t*) value	R^2
1p	0.73 (15.98)	0.53	0.76 (15.98)	0.57
2p	0.75	0.56	0.77	0.59
3p	0.66 (14.00)	0.43	0.65 (14.00)	0.42
5p	0.65 (14.01)	0.42	0.66 (14.01)	0.44
6p	0.72 (15.86)	0.51	0.76 (15.86)	0.57
7p	0.77 (16.49)	0.59	0.75 (16.49)	0.56
10m	0.64 (12.30)	0.41	0.61 (12.30)	0.38
12m	0.73 (13.96)	0.53	0.73 (13.96)	0.53
13m	0.57 (11.40)	0.33	0.58 (11.40)	0.34
14m	0.55 (11.06)	0.31	0.57 (11.06)	0.32
15m	0.68	0.46	0.64	0.41
16m	0.71 (13.71)	0.51	0.71 (13.71)	0.51
17m	0.63 (12.06)	0.40	0.59 (12.06)	0.35
18m	0.66 (12.50)	0.43	0.61 (12.50)	0.37

Item	Vocational teacher group		Academic teacher group	
	Loading (*t*) value	R^2	Loading (*t*) value	R^2
19v	0.71	0.50	0.70	0.49
20v	0.75 (15.19)	0.56	0.71 (15.19)	0.51
21v	0.75 (15.85)	0.56	0.80 (15.85)	0.63
22v	0.75 (15.45)	0.57	0.74 (15.45)	0.55
23v	0.75 (15.61)	0.56	0.76 (15.61)	0.58
24v	0.75 (15.30)	0.56	0.72 (15.30)	0.52
25v	0.76 (15.30)	0.57	0.71 (15.30)	0.50
26t	0.56 (11.20)	0.32	0.55 (11.20)	0.30
28t	0.65 (12.69)	0.42	0.61 (12.69)	0.38
30t	0.69 (13.60)	0.48	0.67 (13.60)	0.45
31t	0.70	0.48	0.68	0.47
32t	0.74 (14.45)	0.55	0.72 (14.45)	0.51
33t	0.73 (14.14)	0.53	0.69 (14.14)	0.48
34t	0.71 (14.05)	0.50	0.71 (14.05)	0.50
35s	0.67 (13.58)	0.45	0.67 (13.58)	0.45
36s	0.76 (14.85)	0.58	0.69 (14.85)	0.48
37s	0.64 (12.61)	0.40	0.60 (12.61)	0.36
38s	0.70	0.48	0.71	0.50
39s	0.72 (14.57)	0.52	0.73 (14.57)	0.53
40s	0.69 (13.48)	0.48	0.62 (13.48)	0.38
41s	0.72 (14.45)	0.52	0.71 (14.45)	0.51

Note. Loading vales are completely standardized loading values. * p <.05. An absolute *t*-value of greater than or equal to 2.0 was employed as a cut-off value criterion for determining statistical significance.

In conclusion, the overall goodness-of-fit indexes, the nonsignificant statistical difference of χ^2 between adjacent invariant models, and a consistent value of CFI, supported inferences of factorial invariance in the learning organization measures across the two teacher groups. Vocational and academic teacher groups in Korean vocational high schools were invariant or equivalent with respect to the parameters (factor structure, factor loadings measurement error, and factor variance) on which constraints were imposed. Therefore, in measuring the learning organization model suggested by Senge (1990), I can conclude that there were no statistically significant differences in factor structure, factor loadings, and factor correlations between the academic and vocational teachers in Korean vocational high school contexts.

CHAPTER 5

DISCUSSION AND CONCLUSION

This chapter discusses the results of the study with attention given to the relevance of my findings to the measurement and application of learning organization theory in a Korean educational context. Both theoretical and practical implications are considered. Additionally, limitations of this study and suggestions for future research are presented.

Research Questions and Findings

Summary and Discussion Related to Research Question 1

An exploratory factor analysis (EFA) was used to answer the first research question, *How do Korean vocational high school teachers perceive the constructs of the learning organization in their school organizations?* Responses from 488 Korean vocational high school teachers to questionnaire items designed to test the theoretical constructs and indices of Senge's (1990) learning organization theory were analyzed to establish a measurement model. Korean vocational school teachers held relatively high mean scores on the five subscales. Mean scores for the constructs were 3.79 for *personal mastery*, 3.61 for *mental models*, 3.37 for *shared vision*, 3.46 for *team learning*, and 3.75 for *systems thinking*. Considering each item was measured using a 5-point Likert-type scale, Korean vocational teachers' responses were positive. Korean vocational school teachers were likely to perceive their school as possessing the primary components of a learning organization. In addition, they were likely to engage in some positive behaviors that reflected Senge's five disciplines. Even so, the *shared vision* factor had items with the lowest mean scores when compared to other constructs.

The EFA resulted in five distinct factors being derived from a total of 35 items. Six items were eliminated from the original group of 41 items because of double-loading, low communalities, or loading values of less than the cutoff value of .40. The derived five factors and 35 items matched precisely with the content categories developed to ensure content validity. The names of the five factors coincide with the five disciplines (i.e., personal mastery, mental models, shared vision, team learning, and systems thinking) coined by Senge (1990). The 35 items which loaded on the five factors possessed a high level of internal consistency (α=.954). Reliability coefficients were also high for each of these items with values ranging from .866 to .897. These results indicate that I was able to measure the five disciplines of Senge's learning organization theory and that they could be elicited from Korean vocational high school teachers. Thus, the validity of Senge's learning organization theory was demonstrated and extended to a Korean vocational high school context. However, noting that ordinarily, the five disciplines suggested by Senge are focused on varying behavioral practices at individual, group, and organization levels, I found that there is uniqueness in vitalizing these disciplines for an organization of any type (e.g., a business organization and a non-business organization). The existence of this uniqueness created some difficulty when developing common items (indices) to represent the five disciplines.

The presence of high correlations between the five factors empirically supported a theoretical argument advanced by Senge (1990) about the interrelationship of the five disciplines. Correlation coefficients of relationships among the five factors ranged from .542 to .713. Correlations between *systems thinking* and the other four factors were from .542 to .692. In discussing interrelationships among the five disciplines of the learning organization, Senge argued that "the five disciplines develop as an ensemble" (p. 12). As an example, he described how the *systems thinking* discipline not only integrates the other four disciplines, but is also

dependent on them to realize its potential. Isaacon and Bamburg (1992) claimed that the *team learning* discipline builds on the disciplines of *personal mastery* and *shared vision.* The high factor correlations found in this study provide empirical evidence to verify this key assumption.

Two additional outcomes from the EFA possibly reflect the bureaucratic and hierarchical nature of Korean education cultural dimensions (see Chapter 3). First, the means of items for *shared vision* were lower than those of the other four dimensions. Second, four of the six items deleted during factor interpretation related to teacher learning activities or dialogues that are typically encouraged by school leaders. These two issues are likely the result of the current organizational culture found in Korean vocational high schools, which is less participative and does not support the idea of empowering leadership to encourage teacher learning at the organizational level. This situation is similar to research findings by Chung (2004) who recently analyzed levels of knowledge management in Korean elementary and secondary schools. He reported that while Korean teachers engaged in considerably high levels of individual learning, they were very low when considering team and organizational learning.

Empowering leadership and a participatory organizational culture are generally considered critical to creating a shared vision within an organization (Senge 1990; Wyckoff, 1998). Encouraging teacher learning activities and dialogue within schools ultimately depends on the kind of leadership exhibited by school administrators and the type of organizational culture found in the school. Participatory and empowering leadership and stronger school autonomy may serve as necessary prerequisites to the effective transformation of Korean vocational high schools into learning organizations.

Summary and Discussion Related to Research Question 2

The EFA was performed first to establish a hypothesized model of (and verify a psychometric instrument to measure) the learning organization concept in the context of vocational high schools. To answer the second research question, *To what extent can the learning organization model be derived and confirmed from Korean vocational high school teachers' responses in their school settings?*, the hypothesized model was tested using confirmatory factor analysis (CFA). While the EFA extracted five factors from 35 items, there was no evidence to determine whether the pattern of item loadings confirmed the identified factor structures. Therefore, the CFA was conducted to examine whether or not the hypothesized model fit the data both conceptually and empirically (Noar, 2003). The hypothesized test model was a hierarchical factor model that comprised a higher-order factor (i.e., learning organizations) and five primary factors (i.e., personal mastery, mental models, shared vision, team learning, and systems thinking) derived from responses to 35 items.

The hypothesized higher-order factor model was, in fact, supported by the teacher data collected from 17 vocational high schools located in the Seoul Megalopolis. The empirical data fit the hypothesized learning organization model well. From conceptual and measurement perspectives, the five primary factors could be examined individually (as subscales).

CFA results offer two insights into the study of learning organizations in educational contexts. First, as latent variables, the 5 primary factors and one higher-order factor all correlated at levels greater than .60. Similar to results obtained for the first research question, the presence of high correlations between the five latent factors supports Senge's (1990) learning organization theory. Therefore, it appears that the measurement model defined in this study is able to detect a characteristic of Senge's learning organization theory, i.e., the interconnection of the five

disciplines. The use of latent factors' loading values in describing the learning organization model and its structure proved beneficial because it provided a means of reducing the number of parameters being estimated, and it reduced the number of observed variables. Specifically, in further research like structural equation modeling, measurement errors can be reduced by using the factor loading values rather than item loading scores. Their use can also be parsimonious for indices to measure learning organizations.

The overall good model fit produced by the CFA confirms that the 35 items used in this study precisely detected the theorized constructs. Thus, results provide strong evidence for the construct validity of the measurement model (i.e., instrument) to measure the learning organization concept in Korean school contexts. In terms of cross-validation, CFA results strengthen the evidence of construct validity through precisely confirming, *a priori*, the model structure defined by the EFA.

Summary and Discussion Related to Research Question 3

The third research question investigated whether the factor structure and loadings of the hypothesized learning organization model were equivalent across two different teacher groups (vocational and academic teachers) in Korean vocational high schools. This analysis was conducted using multi-group CFA. The multi-group CFA referred to the factorial invariance tests that examined how generalizable the hypothesized learning organization model was for the two teacher groups. Two invariance tests were required, one for the factor structure and another for factor loadings. Two additional invariant tests (invariance tests of measurement error variances and factor variances) were also performed. The hypothesized model for the multi-group CFA was a measurement model that included the five latent factors loaded by 35 items found previously by the EFA.

Results of the four invariant tests produced reasonable fit between the model and data. Further, the overall model fit of each invariant test reflected the significant role of each factor in appraising the test for invariance across groups (Vandenberg & Lance, 2000). The four factorial invariant tests indicate that the factor structure, loadings, and all other parameters underlying the set of questions used to measure learning organization were equivalent between the Korean vocational and academic high school teacher groups. Thus, a measurement model for learning organization is plausible across the two teacher groups. At level of a practical implication, using a measurement model to two different groups can be less intricate, and it is not problematic regarding validity of measuring the degree of the learning organization.

Results of the four invariant tests provide evidence that Senge's (1990) five disciplines of the learning organization model provide the same understanding and meaning for Korean teachers regardless of teaching group. In terms of measuring learning organization theory, the presence of factorial invariance means that the same items loaded on the same factors, and that the same factor structure held across the two different teacher groups. Importantly, results of the four invariance tests verify the generalizability of Senge's theory of learning organization as a manifestation of five factors in Korean vocational high schools.

Use of the multi-group CFA and examination of invariance tests of the factor structure and loadings for the two teacher groups clearly demonstrated the validity of the instrument for measuring the learning organization model. If non-factorial invariance was detected, I would have concluded that the instrument was measuring the construct differently for different groups in the same population, or that the construct did not exist in the same form for all groups. This, however, was not the case. Differences in the factor structure or factor loadings might have resulted if indices (i.e., questionnaire items) for the learning organization model had different

relevance or meaning to the different teacher groups. This is an issue of validity in that constructs underlying the learning organization model are, to some degree, not the same for everyone in the population. Ultimately, in this study, evidence of factorial invariance across the two groups, each with some common and some critically different characteristics and professional experiences, provides empirical support for the construct validity of the measurement model to adequately describe (and of the instrument to measure) the theory of learning organization.

Implications at Theory and Practice Levels

Contributions to Theory and Empirical Validation

The need for empirical research on the theory of learning organization as a measurement issue has been established (Griego & Gerory, 1999; Moilanen, 2001; Silins, et al., 1998; Yang, et al., 1998; Zedrayke, 2000). Results of this study provide strong evidence that the five disciplines of Senge's (1990) learning organization theory can be operationalized, measured, and applied in Korean educational contexts. More specifically, an empirically-based system that can be used to identify and measure the constructs of Senge's learning organization theory has been developed. The measurement model (instrument) has also allowed me to identify and study the relationships between the five theoretical constructs of the learning organization model and to test the generalizability of the hypothesized model.

The learning organization, conceptualized as an organization's desired state of operation, develops capacity to continuously adapt and change through facilitating learning at all levels (e.g., individual, group, and organization). Based on this concept, building the measurement model began with a basic assumption that it is possible to measure the extent to which any organization is keeping and activating the attributes of the learning organization. The learning

organization concept is conceptually different from organizational learning that occurs when members of an organization act as learning agents.

The five disciplines of Senge's (1990) learning organization model were employed as theoretical constructs for the measurement model I defined and confirmed. Therefore, all indices (items) developed to reflect and represent theoretical constructs represented varying practices of achieving the five disciplines in organizations. In addition, the measurement model targeted school organizations as learning organizations. Thus, all indices (items) for the measurement model focused on activities and behaviors conducted by the teachers or the school organization in relation to educational practices within schools. In these model indices, teacher activities or organizational behaviors for educational practices were conceptualized as practices for achieving the five disciplines of Senge that are the targets of measuring the learning organization concept. They were also formatted with model indices (items) to be measured through teacher perceptions. The statements of model indices are related to the beliefs and attitudes that teachers may have about activities and behaviors conducted by themselves, their colleagues, or school organization. As a result, the measurement model established in this study measured teachers' range of recognition of their school as a learning organization.

The measurement model (instrument) defined in this study is similar to other existing instruments–e.g., Marquardt's (1996) *Learning Organization Profile*, and *Dimensions of Learning Organization Questionnaire* by Watkins and Marsick (1997)–that measure some aspect of learning organization. However, two points may be noted regarding the characteristics of this measurement model that distinguish it from these other approaches. First, successful establishment of the measurement model shows that Senge's (1990) learning organization theory could be appropriately applied to school organizations, as well as culturally different contexts. At

the level of extending and generalizing learning organization theory, the creation of a measurement model related to the idea of "schools as learning organizations" and confirmation of the generalizability of Senge's learning organization theory to culturally different organizations are important contributions to the literature on learning organizations.

Results of this study support the notion that the theory of learning organization and related concepts, initially developed against the background of Western culture, can also apply to a South Korean school context, which reflects Asian culture. This is interesting and useful information since past research on Senge's (1990) work has been conducted primarily in the U.S. Based on my results, it does not appear that the learning organization model was unduly influenced by cultural differences. From a cross-cultural perspective, *individualism* refers to an emphasis on personal goals, autonomy, and supremacy of self-interest, and is noted as an acceptable attribute in Western countries, particularly the United States; whereas *collectivism* is a pervasive attribute embedded in all domains of Korean society (Shinn, 1986; Son, 2000). In Korean society, collectivism is a unique cultural attribute where strong group orientation encourages organizational members to develop and strengthen positive attitudes toward group work and collective confidence in the workplace. The Confucian tradition in Korea, an additional cultural characteristic, fosters high levels of social capital in the form of hard work and a high premium on education (Sorensen, 1994). Confucianism affects Korean zeal for seeking individual learning and vision. These two Korean cultural attributes (the strong group orientation of collectivism and zeal toward individual learning/personal mastery by Confucianism) fit well overall with the behavioral practices of the five disciplines for Senge's learning organization theory. As a result, the validity of Senge's learning organization theory that was demonstrated by the EFA and CFA empirically explain the consistency between practices of the five disciplines

developed with American cultural backgrounds, and the cultural characteristics of both Korean collectivism and Confucianism.

Second, through several factor analyses of this measurement model, the internal validity of the instrument was demonstrated. In many psychometric instruments, including the measurement model in this study, construct validity is perhaps the most fundamental of all types of measurement validity (Gable & Wolf, 1993; Messick, 1989). Successfully establishing and confirming a measure of learning organization has supported the construct validity of the constructs which underlie the learning organization model. Use of the EFA as an initial step helped ensure that the psychometric properties related to Senge's (1990) five disciplines were appropriate for creating a measurement model. Use of the CFA and multi-group CFAs then provided subsequent validation of the hypothesized learning organization model. In the CFA, results showed that the estimated correlations between the five latent constructs supported the theoretical hypothesized relationships, and thus, provided a means of cross-validation to initial construct validity established by the EFA. Results of the multi-group CFAs indicated the presence of factorial invariance across two different teacher groups, also strengthening claims of validity for the learning organization model.

Leading and Guiding Schools Toward Becoming Learning Organizations

The effort to improve educational quality or reform schooling has been a key agenda to many educators and school administrators in both the U.S. and Korea as the education authority of these and other counties continue to push for improvement in school performance. Application of the learning organization concept to schools has been considered as a strategy to address the failure of education and school reforms to improve school performance, often measured by student academic achievement (Duffy, 1997; Fullan, 1995; Hannay, et al., 2001; Seller, 2001).

Actually, many schools have followed the disciplines and guides offered by the learning organization model in developing their organizations (Wyckoff, 1998). In this study, I have suggested that applying the learning organization concept to Korean schools, specifically vocational high schools, was essential to comprehensively deal with current organizational problems such as the explosive increase in vocational student advancement to higher education, the existence of severe stigma on the education received from vocational high schools, and dramatic decreases in student enrollment to vocational high schools. In a similar vein, the Korea Research Institute for Vocational Education and Training (2000) reported that systemic changes to secondary vocational education in South Korea are needed in the areas of program types, curriculum, and career opportunities in accordance with changes in the nature of work, continuing education, and a decline of the school-age population. In this situation, I measured the learning organization model, which may serve as a prerequisite to systemically driving the transformation of Korean vocational high schools into learning organizations. Results of this study demonstrate that the learning organization concept is applicable to teachers in Korean vocational high schools.

In the future, this measurement model, based on Senge's (1990) theory, may provide a compass for Korean school administrators and educators who want to change their schools into learning organizations. For instance, by using the measurement model as a part of diagnosing their current school organizations, Korean educators and school administrators may identify the degree of their school as learning organizations. Using the measurement model may also contribute to developing appropriate interventions to effectively transform schools into learning organizations.

Research Limitations

While the results of this study make several contributions to theory and practice in the field of learning organization, several limitations must also be acknowledged. First, these findings are not necessarily generalizable to all of Korean education or even to all academic and vocational teachers employed in Korean vocational high schools. Research participants, who were all full-time teachers, responded to an instrument that focused on teacher perceptions and teacher behaviors. In addition, since school organizations involve various members such as principal, vice-principals, administrative staff, students, and external stakeholders (e.g., parents and community members), findings derived from teacher perceptions are limited and can not be generalized to the whole dimension of school organizations. As research on this issue evolves, focus should be placed on the many aspects of organizational behaviors existing at multiple levels. Analysis of the whole school organization (both locally and nationally) as a learning organization system should also be pursued.

Second, an issue can be raised regarding the characteristics and content validity of the items (indices) I developed to represent and reflect the five disciplines of Senge's (1990) learning organization theory. As with most research, hindsight provides a clearer path for ways to improve. This study was also no exception. Replication studies on the items (indices) developed to represent Senge's learning organization theory in this study are required in the future.

Finally, several limitations of the measurement model should be discussed. First, this study did not include various nested or alterative models, but proposed only one hypothesized model when conducting the confirmatory analysis (i.e., CFA and multiple group CFAs). The use of different items may have resulted in decisions to investigate some nested models. Second, the presence of high correlations between latent factors (five disciplines of the learning organization)

was found in both EFA and CFA results. These correlations may give rise to the question of whether some of these latent factors are sufficiently distinct. While potentially problematic, the relationships do reflect the nature of the factors according to Senge's (1990) theory.

Further Research

To further our understanding of both theory and practice in the field of learning organization, as well as development of school organizations, several areas are suggested for further research. First, the external validity of the learning organization theory should be studied in additional school contexts. While I confirmed the internal validity of a measure of Senge's (1990) learning organization theory, the model was only verified in Korean vocational high schools. This study did not deal with the external validity or criterion-related predictive validity of such a measure. Evidence of external validity should be supported by examining relationships between the degree of becoming a learning organization and other exogenous variables such as effectiveness of school organizations, students' academic performance, or organizational change adaptability. Structural equation modeling method (SEM) can be useful in determining external validity of the learning organization model.

Second, a cross-cultural study is recommended to identify how the learning organization concept and model is perceived in the United States and Asian countries, particularly South Korea. This type of cross-cultural study may also enlarge the body of evidence about the generalizability of the learning organization theory across cultures. Replication of this study with different educational contexts may also be fruitful. For example, investigations of people who provide education or training to workers in business and industry settings or postsecondary vocational and academic institutions are seen as particularly important.

Finally, as a measurement issue, a possible response set bias from item order effect needs to be studied. Currently, the items found in most existing instruments related to the learning organization field including this one—e.g., Marquardt's (1996) *Learning Organization Profile*, and *Dimensions of Learning Organization Questionnaire* by Watkins and Marsick (1997)—are not randomly ordered but sequenced with the factor order. Future research to investigate the possible bias of item order effect when measuring learning organization is required.

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APPENDICES

Appendix A

SAMPLE CONTENT VALIDITY RATING FORM

SAMPLE CONTENT VALIDITY RATING FORM

Instruction:

The statements that follow are being considered for inclusion in the survey instrument of measuring Peter Senge's five disciplines in high school settings. Please review the content of the items by providing two rating for their statement. The operational definition of each discipline and the rating instruction are listed below.

Domain of Construct	*Operational Definition*
I. Personal mastery II.	At the school work, personal vision (or dreams) is frankly formulated and truly attained through being aware of current reality including oneself and intrinsic aspiration, engaging in self-reflection, and living in continual learning mode

Rating Tasks:

• Please indicate the domain of construct that the following statement of each item bets fits by circling the appropriate numeral (statement of item not fitting any construct domain should be kept without marking)

• Please indicate how strongly you feel out your placement of each statement of the items into construct domain by circle the appropriate number as follows:

1. Strongly agree, 2. Agree, 3. I am not sure.

Statements of Items	*Category of Construct*	*Rating*
1.	I II III IV V	1 2 3
2.	I II III IV V	1 2 3
3.	I II III IV V	1 2 3

(Continue for all items)

Appendix B

ITEM AND THEORETICAL SOURCES

ITEM AND THEORETICAL SOURCES

I. Personal mastery

Item	Source
1. Our teachers engage in continuous learning and reflection activities as to achieve personal growth.	(Senge,1990)
2. Our teachers continually work to clarify their professional goals at the school.	(Senge, 1990)
3. Our teachers view the current reality more clearly in terms of their career goals.	(Senge, 1990)
4. Teachers' individual growth is truly valued in the school.	(Senge, 1990)
5. Our teachers have learning opportunities in their teaching or other professional work	(Senge, 1990)
6. At the school, our teachers continually learn to bridge the gap between their current reality and the desired future.	(Senge, 1990)
7. Our teachers strive to supplement their lack of skills and knowledge in their teaching and subject area.	(Senge et al., 2000; Wyckoff, 1998)
8. Our teachers are motivated to learn from mistakes in their work.	(Senge, 1990)
9. Our teachers clearly understand the process of pursuing their professional development.	(Senge et al., 1994; 2000)
10. At the school, the evaluation system of teachers contributes to their personal growth and career development.	(Senge et al., 1994)

II. Mental models

Item	Source
11. Our teachers often reflect on assumptions about schooling activities with other teachers to ensure that they are in line with educational principles.	(Senge et al., 1994; Wyckoff, 1998)
12 At the school, clearly revealing different perspectives or educational assumptions of teachers is encouraged as a reflective loop process.	(Senge et al., 1994; 2000)
13. Our teachers inquire about the appropriateness of their own course or program with respect to the goals of schooling.	(Senge et al., 2000)
14. Our teachers learn and change as a result of students' reactions during teaching.	(Fullan, 1995)
15. Our teachers often use the significant events of the school or classroom to think about their beliefs about education.	(Senge et al., 2000; Wyckoff, 1998)
16. Our teachers change their own pattern or unique teaching style to implement new approaches.	(Elmore, 1995; Kline, Saunders, & Kline, 1995)

Item	Source
17. Our teachers actively explore their assumptions and ideas with each other about educational practices.	(Senge et al., 1994)
18. Our teachers are very aware of how their beliefs and assumptions affect their educational practices.	(Senge, 1990)
19. Our teachers at the school can effectively explain their assumptions underlying their reasoning.	(Senge, 1990)

III. Shared vision

Item	Source
20. Our teachers and staff together build the school's vision and goals.	(Senge, 1990; Wyckoff, 1998)
21. Our teachers involve students in formulating school and classroom policy.	(Silins, Mulford, & Zarns, 2002)
22. Our teachers develop their personal goals to align with the whole school vision or goals.	(Senge, 1990)
23. Our teachers align personal class or teaching goals with the school vision and goals.	(Senge, 1990)
24. Our teachers feel comfortable in sharing ideas with other teachers about the school vision.	(Isaacon & Bamburg, 1992: Senge, 1990)
25. Our teachers are committed to a shared vision for the future of our school.	(Senge, 1990; Senge et al., 2000; Wyckoff, 1998)
26. Our teachers agree on the principles necessary to achieve the school vision.	(Senge, 1990; Senge et al., 2000)
27. When changing educational practices, our teachers consider the impact on the school vision and goals.	(Senge, 1990; Wyckoff, 1998)

IV. Team learning

Item	Source
28. Our teachers feel free to ask questions of other teachers or staff regardless of gender, age, and professional status at the school.	(Senge, 1990; Watkins & Marsick, 1997)
29. In conversation, our teachers accept other colleagues' mistakes without criticism.	(Ellinor & Gerard, 1998; Senge, 1990)
30. In our school, group or team activities are used in teacher professional development activities.	(DuFour, 1997)
31. Small group or team activities are encouraged at our school as a method of dealing with school issues.	(DuFour, 1997; Marks & Louis, 1999; Watkins & Marsick, 1997)
32. Our teachers are treated equally in team or committee activities.	(Senge, 1990; Watkins & Marsick, 1997)

Item	Source
33. Our teachers share information across course subjects and grade levels with other colleagues.	(Marks & Louis, 1999)
34. Our teachers believe that sharing information or knowledge through team activities is useful for solving complex schooling problems.	(Fullan, 1993)
35. Our teachers respect other colleague's ideas and opinions by viewing them from their colleague's perspective.	(Ellinor & Gerard, 1998; Senge, 1990; Senge et al., 2000)
36. Our teachers participate in open and honest conversations to share their educational best practices.	(Ellinor & Gerard, 1998; Senge, 1990; Senge et al., 2000)

V. Systems thinking

Item	Source
37. When developing lesson plans, our teachers consider the different needs and abilities of students.	Generated for study
38. When changing educational practices, our teachers consider the impact on their results to the inside and outside of the school.	(Senge, 1990; Wyckoff, 1998)
39. When dealing with a student discipline problem, our teachers consider the impact on other teachers.	(Wyckoff, 1998)
40. At the school, our teachers regard educational issues as a continual process rather than with a snapshot or event.	(Senge, 1990)
41. Our teachers attentively link the current schooling with students' career pathways.	(Senge et al., 2000)
42. When changing and creating school rules, consistency with the policy of the governments and educational Acts is considered.	Generated for study
43. Our teachers consider the effect on students when dealing with school challenges.	(Senge, 1990)

Appendix C

BACK TRANSLATION OF KOREAN ITEMS

BACK TRANSLATION OF KOREAN ITEMS

1) Our teachers continually engage in learning and reflection activities for personal growth.
2) The teachers at our school continually pursue their professional goals.
3) Our teachers see and grasp the concepts and dimensions of career goals and the current reality in a levelheaded fashion.
4) In the school, personal growth for the teachers is really valued.
5) Our teachers learn by themselves through teaching and other professional work.
6) The teachers at our school make a lot of effort to close the gap between the current situation and the desirable future.
7) Our teachers not only study in their field, but make an effort to find relations with corresponding subjects to supplementing weak areas within their field.
8) Even if our teachers make mistakes, they learn from them because of their duty to perform, giving them the motivation to accomplish their tasks.
9) Our teachers clearly understand their process of pursuing their professional development.
10) In school, we have a teacher evaluation system that contributes to personal growth and career development.
11) Our teachers will often re-examine the assumptions that school activities are incorporated completely with the educational principles with other teachers.
12) With the school's single reflective loop process, the school encourages teachers a unique educational opportunity to clearly communicate their viewpoints and opinions.
13) Our teachers study in depth to relate the school's educational goals with their own subjects that they teach, along with the school program's appropriate characteristics.
14) Our teachers learn and make changes in their teaching methods from their student's reactions during class.
15) When there is an increase in events in the classroom, it often gives our teachers the opportunity to re-examine and reflect upon the data about beliefs in education
16) To initiate new ways of teaching, our teachers try to change their specific routine patterns during class.
17) Our teachers study in depth the assumptions and ideas of classroom operations during class.
18) Our teachers recognize the influence that educational beliefs and assumptions have on classroom operations during class.
19) The school's teachers can effectively comment on the assumptions underlying their reasoning.
20) Besides the teachers, other teaching staff members also help establish the goals and visions of the school.
21) Our teachers have students participate in the establishment of school and classroom policy.
22) Our teachers develop their own personal goals in line with the school in order to avoid conflict with the entire school's goals and visions.
23) Our teachers place their own personal studies and classroom goals in line with the school's goals and visions.

24) Our teachers comfortably share with other teachers their ideas involving the school vision.
25) Our teachers are devoted to the formation of the school's future vision.
26) Our teachers have used needed principals to accomplish the school's vision.
27) When making changes to the school's educational practices, our teachers consider the wide variety of characteristics of the school's goals and vision.
28) At school, our teachers can comfortably ask other teacher's staff members regardless of their sex, age, duty, or position.
29) Because there is open communication between teachers in this school, none of the teachers criticize one another for their colleague's mistakes.
30) To further promote teacher professional development activities, our school applies and encourages group or team activities among teachers.
31) It is encouraged at our school to participate in team or group activities in order deal with issues or problems that arise in school.
32) Our teachers are treated and handled in team and commission activities equally.
33) Our teachers share information spanning from course subjects to grade levels with their colleagues.
34) Our teachers find it useful to share information and knowledge regarding complex school education problems during team activities.
35) Our teachers respect each other's ideas, opinions, and viewpoints.
36) To share the best educational practices, our teachers have free and honest discussions with each other.
37) When planning their lesson plans, our teachers consider the students' unique demands and skills into consideration.
38) When improving educational practices at the school, our teachers consider the results of a wide range of characteristics within the school.
39) When administering student discipline, our teachers consider the influence this discipline has on other teachers.
40) In school, our teachers access educational problems as a continual process, rather than a snapshot or event.
41) Our teachers prudently connect current educational practices with career pathways.
42) When fixing or making a school rule, a school ought to pay attention to the educational law under the category of consistency of government policy.
43) When dealing with the school's challenges, our teachers give serious consideration to the influence it has over its students.

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Appendix D

LEARNING ORGANIZATION QUESTIONNAIRE FOR SCHOOLS

LEARNING ORGANIZATION QUESTIONNAIRE FOR SCHOOLS

Part I. Questionnaire regarding the background of teacher and school
The following items relate to the general facts about your employment and school. Please place a check or filling in' in the relevant spaces given or write an answer in the appropriate space given.

1. Teaching subject:_____Vocational course; _____Academic course
2. Gender:_____Male; _____Female
3. Age:_____Years
4. Years of teaching experience:_____Years
5. Vocational program of school: ___ Business; __Trade industry-technical, ___Comprehensive

Part II
Direction: This survey instrument was developed to investigate the extent to which teachers recognize their school as a learning organization. The statements described below relate to beliefs and attitudes that you may have about activities and behaviors conducted by your teachers or school organization. There is no right or wrong answer to any statements, so please respond honestly by circling the appropriate number with respect to activities or behaviors conducted by you, your colleagues, or school organization.

1	2	3	4	5
Almost Never True	Usually Not True	Sometimes True or Sometimes Not True	Usually true	Almost Always True

		Almost Never True				Almost Always True
1	Our teachers at the school engage in continuous learning and reflection activities to achieve personal growth.	1	2	3	4	5
2	Our teachers continually work to clarify their professional goals at the school.	1	2	3	4	5
3	Our teachers view the current reality more clearly in terms of targeting their career goals.	1	2	3	4	5
4	Teachers' individual growth is truly valued in the school.	1	2	3	4	5
5	Our teachers have learning opportunities in their teaching or other professional work.	1	2	3	4	5
6	At the school, our teachers continually learn to bridge the gap between their current reality and the desired future.	1	2	3	4	5
7	Our teachers strive to supplement their lack of skills and knowledge in their teaching and subject area.	1	2	3	4	5
8	Our teachers are motivated to learn from mistakes in their work.	1	2	3	4	5
9	Our teachers clearly understand the process of pursuing their professional development.	1	2	3	4	5

		Almost Never True				Almost Always True
10	Our teachers often reflect on assumptions about schooling activities with other teachers to ensure that they are in line with educational principles	1	2	3	4	5
11	At the school, clearly revealing different perspectives or educational assumptions of teachers is encouraged as a reflective loop process.	1	2	3	4	5
12	Our teachers inquire about the appropriateness of their own course or program with respect to the goals of schooling.	1	2	3	4	5
13	Our teachers learn and change as a result of students' reactions during teaching.	1	2	3	4	5
14	Our teachers often use the significant events of classrooms to think about their beliefs about education and educational practices.	1	2	3	4	5
15	Our teachers change their own pattern or unique teaching style to implement new approaches.	1	2	3	4	5
16	Our teachers and colleagues actively explore their assumptions and ideas with each other about educational practices.	1	2	3	4	5
17	Our teachers are very aware of how their beliefs and assumptions affect their educational practices.	1	2	3	4	5
18	Our teachers at the school can effectively explain their assumptions underlying their reasoning.	1	2	3	4	5
19	Our teachers and staff together build the school's vision and goals.	1	2	3	4	5
20	Our teachers develop their personal goals to align with the whole school vision or goals.	1	2	3	4	5
21	Our teachers align personal class or teaching goals with the school vision and goals.	1	2	3	4	5
22	Our teachers feel comfortable in sharing ideas with other teachers about the school vision.	1	2	3	4	5
23	Our teachers are committed to a shared vision for the future of our school.	1	2	3	4	5
24	Our teachers agree on the principles necessary to achieve the school vision.	1	2	3	4	5
25	When changing educational practices, our teachers consider the impact on the school vision and goals.	1	2	3	4	5

		Almost Never True				Almost Always True
26	Our teachers feel free to ask questions of other teachers or staff regardless of gender, age, and professional status at the school.	1	2	3	4	5
27	In conversation, our teachers accept other colleagues' mistakes without criticism.	1	2	3	4	5
28	In our school, group or team activities are used in teacher professional development activities.	1	2	3	4	5
29	Small group or team activities are encouraged at our school as a method of dealing with school issues.	1	2	3	4	5
30	Our teachers are treated equally in team or committee activities.	1	2	3	4	5
31	Our teachers share information across course subjects and grade levels with other colleagues.	1	2	3	4	5
32	Our teachers believe that sharing information or knowledge through team activities is useful for solving complex schooling problems.	1	2	3	4	5
33	Our teachers respect other colleague's ideas and opinions by viewing them from their colleague's perspective.	1	2	3	4	5
34	Our teachers participate in open and honest conversations to share their educational best practices.	1	2	3	4	5
35	When developing lesson plans, our teachers consider the different needs and abilities of students.	1	2	3	4	5
36	When changing educational practices, our teachers consider the impact on their results to the inside and outside of the school.	1	2	3	4	5
37	When dealing with a student discipline problem, our teachers consider the impact on other teachers.	1	2	3	4	5
38	At the school, our teachers regard educational issues as a continual process rather than with a snapshot or event.	1	2	3	4	5
39	Our teachers attentively link the current schooling with students' career pathways.	1	2	3	4	5
40	When changing and creating school rules, consistency with the policy of the governments and educational Acts is considered.	1	2	3	4	5
41	Our teachers consider the effect on students when dealing with school challenges.	1	2	3	4	5

Appendix E

KOREAN VERSION OF LEARNING ORGANIZATION QUESTIONNAIRE FOR SCHOOLS

학습조직으로서 학교 조직 진단 질문지

Part 1: 일반사항 질문

다음은 선생님께서 근무하고 계신 학교 및 개인관련 일반사항을 묻는 항목들입니다.

해당되는 곳에 v 를 하거나 문항에 알맞게 빈칸에 직접 써 넣어주십시오.

1) 담당 수업교과: _____ 실업교과(실업과목); _____ 일반교과(인문과목)
2) 성별: _____ 남 _____여
3) 연령:_____세
4) 교직경력:_____년
5) 실업계 학교유형:_____공업;_____정보 및 상업; _____종합

Part 2: 학습조직 진단 질문

아래 질문지에 기술된 진술들은 본인 및 동료 선생님들 이나 학교 조직에 의해 행해진 행동 및 활동들에 대해 선생님 여러분이 가지게된 믿음이나 태도와 관련되어 있습니다. 어떠한 진술에도 옳거나 그릇된 답이 없습니다. 따라서, 본인, 동료 선생님, 또는 학교조직에 의해 행해진 행동 및 활동들에 비추어 선생님께서 동의하시는 정도를 아래의 적절한 숫자를 토대로 표기해 주시기 바랍니다.

1	2	3	4	5
전혀 그렇지 않다	그렇지 않다	그저 그렇다	그렇다	매우 그렇다

		전혀 그렇지 않다				매우 그렇다
1	우리 선생님들은 개인적 성장을 위해 계속적인 학습 및 성찰 활동을 한다.	1	2	3	4	5
2	우리 선생님들은 학교에서 자신들의 교직 전문성 목표를 추구하기 위해 지속적으로 일한다.	1	2	3	4	5
3	우리 선생님들은 자기개발을 위한 목표 차원에서 현실 여건을 보다 냉철히 파악한다.	1	2	3	4	5
4	학교에서는 선생님들의 개인적 발전이 정말로 가치있다고 여겨진다.	1	2	3	4	5
5	우리 선생님들은 수업 또는 다른 교직관련 업무 속에서 스스로 배운다.	1	2	3	4	5
6	학교에서 우리 선생님들은 현재의 상태와 바람직한 미래와의 차이를 좁히기 위해 계속적으로 학습한다.	1	2	3	4	5
7	우리 선생님들은 수업 및 해당 과목과 관련하여 부족한 지식과 기술을 보충하기 위해 노력한다.	1	2	3	4	5
8	우리 선생님들은 직무 수행에 있어 실수를 통해서도 배울 수 있도록 동기를 부여받는다.	1	2	3	4	5
9	우리 선생님들은 그들의 교직 전문성 향상 절차를 확실히 이해한다.	1	2	3	4	5
10	우리 선생님들은 학내 교육활동들이 교육적 원리들에 충실히 일치될 수 있도록 종종 다른 선생님들과 함께 그것들에 관한 교육적 관점을 돌이켜 본다.	1	2	3	4	5
11	우리 학교에서는 하나의 성찰적 과정으로서, 선생님들의 다양한 교육적 관점과 견해가 분명히 나타내어 질 수 있도록 격려된다.	1	2	3	4	5
12	우리 선생님들은 학교교육의 목표와 관련하여 자신들의 수업 과목 또는 프로그램의 적절성을 탐구한다.	1	2	3	4	5
13	우리 선생님들은 수업활동중 학생들의 반응으로부터 배우고 변화한다.	1	2	3	4	5
14	우리 선생님들은 교실에서의 인상적인 이벤트들을 자신들의 교육관을 돌이켜 보기위한 성찰 자료로 종종 활용한다.	1	2	3	4	5

		전혀 그렇지 않다				매우 그렇다
15	우리 선생님들은 새로운 수업 방법들을 시행하기 위해 자신들의 고유한 수업 관행과 패턴을 변화시킨다.	1	2	3	4	5
16	우리 선생님들은 수업 및 학급운영 활동들에 관한 자신들의 관점과 아이디어들을 서로 함께 적극적으로 탐구한다.	1	2	3	4	5
17	우리 선생님들은 그들의 교육관이 어떻게 수업 및 학급운영 활동들에 영향을 주는지를 잘 인식한다.	1	2	3	4	5
18	학교에서 선생님들은 논리추론에 근원이 되는 자신의 교육관들을 효과적으로 설명할 수 있다.	1	2	3	4	5
19	우리 선생님 및 교직원들은 학교의 비전과 목표들을 함께 수립한다.	1	2	3	4	5
20	우리 선생님들은 전체 학교의 비전 또는 목표에 맞추기 위해 자기의 개인적 목표를 개발한다.	1	2	3	4	5
21	우리 선생님들은 개인적 수업 또는 교실 목표들을 학교의 비전 및 목표에 일치 시킨다.	1	2	3	4	5
22	우리 선생님들은 학교의 비전과 관련하여 다른 선생님들과 아이디어를 편안하게 공유한다.	1	2	3	4	5
23	우리 선생님들은 학교의 미래를 위한 공유된 비전형성 에 헌신적이다.	1	2	3	4	5
24	우리 선생님들은 학교의 비전을 성취하는데 필요한 원리들에 동의해 왔다.	1	2	3	4	5
25	수업 및 학급운영 활동들을 변화시킬 때, 우리 선생님들은 학교 비전 및 목표들 대한 파급성을 고려한다.	1	2	3	4	5
26	우리 선생님들은 학교에서 성별이나 연령 및 직위에 관계없이 다른 선생님 및 직원들에게 편하게 질문할 수 있다.	1	2	3	4	5
27	우리 선생님들은 대화에 있어, 다른 동료의 실수를 비판하지 않는다.	1	2	3	4	5
28	우리 학교에서는 그룹 또는 팀 활동들이 교사의 전문성 개발을 위해 활용된다.	1	2	3	4	5
29	우리 학교에서는 소그룹 또는 팀 활동들이 학내문제를 다루는 한 방법으로서 격려된다.	1	2	3	4	5

		전혀 그렇지 않다				매우 그렇다
30	우리 선생님들은 팀이나 위원회활동들에 있어서 평등하게 취급된다.	1	2	3	4	5
31	우리 선생님들은 교과 및 학년을 불문하고 다른 동료 선생님들과 정보를 공유한다.	1	2	3	4	5
32	우리 선생님들은 팀 활동들을 통한 정보 또는 지식의 공유가 복잡한 학교교육의 문제를 해결하는데 유용하다고 믿는다.	1	2	3	4	5
33	우리 선생님들은 다른 동료 선생님들의 아이디어 및 의견들을 그들의 관점에서 봄으로서 그것들을 존중한다.	1	2	3	4	5
34	우리 선생님들은 모범적인 수업 및 학급 운영 사례를 공유하기 위해 자유롭고 솔직한 대화를 가진다.	1	2	3	4	5
35	수업 계획을 수립 할 때, 우리 선생님들은 학생들의 다양한 요구와 능력을 고려한다.	1	2	3	4	5
36	수업 및 학급운영 방식들을 개선 할 때, 우리 선생님들은 그것의 결과로 인한 학교 안팎의 파급성을 고려한다.	1	2	3	4	5
37	학생규율 문제를 다룰 때, 우리 선생님들은 다른 선생님들에게 미치는 영향을 고려한다.	1	2	3	4	5
38	학교에서 우리 선생님들은 교육적인 문제들을 일회성 사례보다는 하나의 계속적 절차로서 접근한다.	1	2	3	4	5
39	우리 선생님들은 현재의 학교교육을 학생들의 진로와 세심히 연계 시킨다.	1	2	3	4	5
40	학교의 규칙을 만들거나 고칠때, 교육 법령 및 정부 정책과의 일관성을 주목한다.	1	2	3	4	5
41	우리 선생님들은 학내 현안들을 다룰 때, 학생들에게 미치는 영향을 중시한다.	1	2	3	4	5

Appendix F

COVER LETTERS FOR DATA COLLECTION

COVER LETTER TO TEACHER

(English Version)

08/ /2005

Dear Vocational High School Teachers:

My name is Joo Ho Park. I highly appreciate your great efforts for Korean secondary vocational education under hard circumstances. Since 1993, I have been working for the Korea Ministry of Education and Human Resources. I have two-year experiences for Korean vocational education policy and am now pursuing a doctorate at the program of workforce education in the University of Georgia, one of famous research universities in the occupational studies field of the United States.

I am requesting your assistance in a research study being completed as part of my doctoral dissertation requirement. The purpose of this study is to examine the extent to which the learning organization model is applicable to public vocational high schools located in Seoul Megalopolis, South Korea. Specifically, this study will reveal the extent to which Korean vocational high schools are involved with promoting the constructs of the learning organization. In a practical sense, the greatest value of this study is that identified learning organization's constructs will provide current information about Korean vocational high school teachers and schools as administrators and policymakers endeavor to transform schools into learning organizations. Enclosed you will find a survey, and returning envelop. The survey may take no more than 20 minutes to complete. On the other hand, your participation in the research study is voluntary. Therefore, you can skip any question if you are not comfortable to answer it. Also, you can return the survey blank if you don't want to participate in this research study. After completion, please send the response sheet back to your school administrative staff who distributes the survey to you. No name is required and no school or individuals will be identified in any data analysis or report of this study.

Thank you for your response. I appreciate you taking the time to participate in this study. If you have any question for me about the study. Please flee free to contact me or my advisor (Dr. Rojewski) via the e-mail or phone below. Additional questions or problems regarding your rights as a research participant should be addressed to the Chairperson, Institutional Review Board, University of Georgia, 612 Boyd Graduate Studies Research Center, Athens, Georgia 30602-7411; Telephone 1-706-542-3199; E-mail address IRB@uga.edu .

Sincerely,

Joo Ho Park (E-mail: jhpark44@uga.edu; Phone: 061-763-2389) and
Dr. Jay W. Rojewski (E-mail: rojewski@uga.edu; Phone: 1-706-542-4461)
Department of Workforce Education, Leadership & Social Foundations
College of Education, The University of Georgia.

COVER LETTER TO ADMINISTRATIVE STAFF MEMBER

(English Version)

08/ /2005.

Dear _____:

My name is Joo Ho Park, an educational administrator working for the Ministry of Education and Human Resources Development in Korea. I am now studying workforce education in the Ph.D. program at The University of Georgia in the United States. I am conducting research for my dissertation titled, "Senge's Learning Organization Model in Korean public vocational high school". I am writing this letter to request your help in collecting data.

Please complete the following:

1. Distribute each sealed questionnaire packet to the teachers of your schools.
2. Collect the completed questionnaires, each in a sealed envelope, from the teachers and place them in the self-stamped return address envelope.
3. Return the self-stamped return address envelope to the addresser (Joo Ho Park, 270 Seagraves Drive, Athens, GA 30605).

Teachers' participation in this research study is voluntary. They can skip any question if they are not comfortable to answer it. Also, they can return the survey blank if they don't want to participate in this research study. Therefore, no pressure should be applied to encourage them to participate in the research study.

Please make sure that all return envelopes you receive from the teachers in your school are kept confidential. I very much appreciate your time and assistance. If you have any questions or concerns, you can contact me via e-mail (jhpark44@uga.edu) or telephone (061-763-2389).

Sincerely,

Joo Ho Park
Ph.D. Candidate
Department of Workforce Education, Leadership & Social Foundations
College of Education, The University of Georgia

COVER LETTER TO TEACHER

(Korean version)

교사를 위한 연구조사 안내서

2005 년 8 월

존경하는 실업계고교 선생님,

저의 이름은 박 주호입니다. 어려운 환경속에서도 한국의 실업계 고등학교 교육을 위해 애쓰시는 선생님 여러분의 노고에 진심으로 감사드립니다. 저는 1993 년도 이후, 교육인적자원부 직원으로 근무하고 있습니다. 그 동안 우리나라 실업계고등학교 정책을 위하여 2 년간 근무를 했었고, 현재는 미국의 직업교육분야에서 유명한 연구중심대학의 하나인 조지아 대학교 (The University of Georgia)의 산업인력교육 프로그램에서 박사과정을 수학하고 있습니다.

저의 박사학위 논문을 완성하기 위해 선생님 여러분에게 도움을 청하고자 합니다. 박사논문의 연구목적은 학습조직 모델이 서울, 경기, 인천 지역에 소재한 공립 실업계 고등학교들에게 어느 정도까지 적용되는 지를 조사하는 것입니다. 특히, 저의 연구는 한국의 실업계 고등학교들이 학습조직 구성 개념들을 어느 정도까지 실현하고 있는 지를 보여 주게될 것입니다. 실제적 의미에서 저의 연구가 지닌 가장 큰 가치는 학교들을 학습조직으로 전환시키기를 갈망하는 우리의 교육행정가와 정책결정자들이 확인될 학습조직 구성 개념들을 통해서 우리나라 실업계 학교 및 교사들에 관한 관련 정보를 확보하는 것일 것으로 보입니다.

선생님 여러분들은 응답을 위한 서베이 용지를 접하게 될 것입니다. 본 서베이에 응답을 위해서는 20 분 이내의 시간이 소요될 것으로 보입니다. 한편, 본 연구에 선생님 여러분의 참여는 자발적입니다. 그러므로, 어떤 질문에 답하기가 불편하다면 그 질문을 간과할 수 있습니다. 또한 본 연구에 참여하기를 원하지 않는 다면 서베이를 공백으로 보낼수 있습니다. 연구조사 질문지를 완성한 후, 선생님 여러분들에게 그 질문지를 배포해 주신 담당 직원에게 응답지를 보내 주시기를 부탁드립니다.

선생님 여러분들의 응답에 감사드립니다. 저의 연구를 위해 시간을 내어 주신 선생님 여러분에게 재차 고맙다는 말씀을 드립니다. 저의 연구에 문의 사항이 있으시면, 아래의 메일이나 전화번호로 언제든지 저나 또는 저의 지도교수 (Dr. Rojewski)에게 문의해 주시기 바랍니다. 연구 참여자로서 여러분의 권리에 관한 문의나 부가적 문제는 조지아 대학교의 Institutional Review Board (612 Boyd Graduate Studies Research Center, Athens, Georgia 30602-7411; Telephone 1-706-542-3199; E-mail address IRB@uga.edu) 의장에게 조회되어야 합니다.

감사합니다.

박 주호 (E-mail:jhpark44@uga.edu; Phone: 061-763-2389),
Dr. Jay W. Rojewski (E-mail: rojewski@uga.edu; Phone: 1-706-542-4461)
산업인력교육, 리더십 & 사회기반 학과
교육대학, 조지아 대학교

COVER LETTER TO ADMINISTRATIVE STAFF MEMBER

(Korean version)

행정직원을 위한 연구조사 안내서

2005 년 8 월

존경하는 ----------님:

저의 이름은 박 주호입니다. 저는 한국의 교육인적자원부 직원으로 근무하고 있습니다. 현재는 미국의 조지아 대학교 (The University of Georgia)의 산업인력교육 프로그램에서 박사과정을 수학하고 있습니다. " 한국의 공립 실업계 고등학교에서 Senge 의 학습조직 모델" 이라는 타이틀 아래 박사논문을 작성하고 있습니다. 저의 박사논문을 위한 자료조사를 위해 도움을 청하고자 본 안내서를 작성하고 있습니다.

다음 사항들을 완성해 주시기를 부탁드립니다:

1. 각 밀봉된 질문지를 여러분의 학교교사들에게 배포해 주십시오.
2. 선생님들로부터 완성된 질문지들을 밀봉된 봉투에 수거해 주시고, 그 것들을 우표가 붙여진 환송봉투에 넣어 주시기 바랍니다.
3. 우표가 붙여진 환송봉투를 답신자(Joo Ho Park, 270 Seagraves Drive, Athens, GA 30605)에게 보내주십시오.

본 연구에 선생님들의 참여는 자발적입니다. 그들은 어떤 질문에 답하기가 불편하다면 그 질문을 간과 할 수 있습니다. 또한 그들은 본 연구에 참여하기를 원하지 않는 다면 서베이를 공백으로 보낼 수 있습니다. 그러므로, 그들에게 본 연구의 참여를 촉진하기위해 어떤한 압력도 행사되지 아니하여야 합니다.

여러분 학교의 선생님들로 부터 수집한 모든 환송 봉투들은 비공개가 전제되어야 한다는 것을 명심해 주십시오. 여러분의 도움에 대단히 감사드립니다. 어떤 문제나 의문사항이 있다면, 저의 전자메일이나 전화로 저에게 문의해 주십시오.(E-mail: jhpark44@uga.edu; Phone: 061-763-2389).

감사합니다.

박 주호
박사 예정자
산업인력교육, 리더십 & 사회기반 학과
교육대학, 조지아 대학교

Appendix G

CORRELATION MATRIX FOR THE EFA

CORRELATION MATRIX FOR THE EFA

	1p	2p	3p	4p	5p	6p	7p	8p	9p	10m	11m	12m	13m
1p	1.00												
2p	.760	1.00											
3p	.554	.594	1.00										
4p	.355	.375	.417	1.00									
5p	.458	.459	.417	.356	1.00								
6p	.583	.584	.529	.417	.458	1.00							
7p	.548	.537	.468	.356	.468	.649	1.00						
8p	.323	.320	.280	.304	.368	.411	.396	1.00					
9p	.399	.468	.447	.332	.325	.495	.451	.416	1.00				
10m	.351	.340	.334	.286	.298	.399	.425	.328	.376	1.00			
11m	.339	.339	.295	.316	.295	.350	.336	.380	.402	.459	1.00		
12m	.433	.485	.415	.299	.385	.504	.514	.334	.458	.449	.507	1.00	
13m	.310	.313	.267	.356	.411	.376	.438	.315	.285	.360	.352	.472	1.00
14m	.254	.237	.228	.265	.248	.307	.337	.316	.256	.298	.377	.331	.446
15m	.309	.386	.360	.291	.338	.474	.505	.335	.474	.402	.405	.431	.428
16m	.360	.359	.335	.271	.329	.422	.406	.361	.384	.473	.428	.437	.404
17m	.326	.351	.316	.335	.382	.427	.461	.350	.415	.472	.397	.400	.416
18m	.423	.397	.363	.359	.357	.486	.469	.331	.477	.433	.427	.464	.391
19v	.313	.347	.296	.305	.208	.359	.313	.376	.339	.320	.517	.402	.240
20v	.357	.382	.398	.351	.326	.422	.349	.354	.494	.370	.483	.452	.289
21v	.363	.376	.347	.260	.311	.391	.356	.277	.391	.334	.443	.456	.324
22v	.266	.301	.267	.179	.268	.321	.302	.397	.336	.382	.458	.393	.263
23v	.272	.329	.254	.267	.251	.342	.271	.343	.371	.403	.446	.389	.227
24v	.348	.393	.342	.343	.334	.388	.371	.414	.422	.369	.466	.425	.288
25v	.331	.328	.305	.322	.275	.334	.343	.331	.421	.362	.421	.392	.317

	1p	2p	3p	4p	5p	6p	7p	8p	9p	10m	11m	12m	13m
26t	.272	.264	.274	.291	.287	.287	.269	.332	.252	.215	.373	.265	.239
27t	.195	.177	.243	.227	.208	.239	.228	.240	.304	.211	.269	.271	.255
28t	.259	.290	.278	.260	.242	.336	.320	.311	.391	.313	.464	.360	.217
29t	.271	.283	.238	.251	.220	.303	.323	.317	.319	.371	.485	.332	.257
30t	.313	.297	.286	.229	.216	.327	.324	.312	.345	.313	.477	.304	.238
31t	.306	.339	.321	.347	.359	.374	.389	.330	.329	.407	.426	.342	.363
32t	.312	.334	.256	.307	.420	.340	.331	.310	.267	.325	.350	.359	.309
33t	.375	.393	.316	.330	.337	.387	.382	.309	.329	.410	.416	.388	.402
34t	.299	.317	.281	.226	.267	.370	.309	.332	.297	.431	.417	.362	.334
35s	.372	.399	.351	.330	.330	.385	.415	.223	.310	.315	.300	.387	.387
36s	.342	.392	.392	.317	.325	.396	.404	.329	.428	.360	.339	.447	.368
37s	.242	.252	.245	.267	.229	.332	.329	.249	.244	.240	.282	.306	.368
38s	.319	.340	.362	.314	.283	.408	.381	.302	.326	.313	.310	.383	.349
39s	.323	.366	.372	.290	.353	.380	.363	.320	.352	.285	.337	.331	.337
40s	.295	.282	.313	.274	.332	.347	.322	.245	.269	.316	.334	.377	.322
41s	.348	.385	.361	.295	.324	.446	.427	.304	.316	.273	.291	.346	.332

	14m	15m	16m	17m	18m	19v	20v	21v	22v	23v	24v	25v	26t
14m	1.00												
15m	.436	1.00											
16m	.396	.531	1.00										
17m	.353	.482	.534	1.00									
18m	.334	.478	.435	.568	1.00								
19v	.222	.299	.300	.329	.437	1.00							
20v	.281	.405	.356	.349	.459	.662	1.00						
21v	.255	.369	.317	.394	.489	.587	.667	1.00					
22v	.260	.316	.410	.283	.372	.539	.503	.534	1.00				
23v	.258	.363	.320	.362	.448	.557	.558	.591	.594	1.00			
24v	.303	.387	.331	.364	.427	.567	.563	.526	.528	.615	1.00		
25v	.329	.428	.337	.389	.447	.437	.515	.513	.485	.551	.620	1.00	
26t	.214	.252	.273	.238	.287	.384	.353	.310	.432	.332	.361	.328	1.00
27t	.207	.269	.235	.282	.318	.291	.325	.249	.275	.295	.289	.281	.416
28t	.269	.330	.293	.328	.406	.477	.460	.462	.459	.421	.418	.423	.356
29t	.237	.347	.332	.322	.420	.481	.457	.467	.486	.484	.399	.454	.374
30t	.261	.322	.299	.317	.366	.502	.417	.394	.489	.436	.433	.420	.485
31t	.265	.402	.387	.369	.414	.371	.402	.356	.457	.382	.392	.388	.478
32t	.252	.326	.349	.346	.373	.310	.353	.300	.338	.304	.349	.344	.353
33t	.283	.388	.405	.413	.395	.352	.382	.345	.412	.377	.393	.420	.397
34t	.271	.367	.458	.357	.436	.353	.357	.360	.497	.399	.345	.355	.388
35s	.317	.403	.396	.429	.449	.340	.381	.420	.341	.424	.365	.395	.343
36s	.257	.433	.396	.363	.442	.408	.438	.433	.431	.462	.481	.468	.288
37s	.282	.313	.298	.315	.375	.340	.335	.382	.396	.357	.355	.413	.295
38s	.269	.319	.316	.371	.413	.316	.333	.383	.405	.404	.399	.465	.317
39s	.268	.311	.322	.395	.412	.320	.364	.378	.373	.364	.414	.459	.320
40s	.252	.245	.321	.351	.393	.338	.301	.372	.323	.372	.402	.421	.331
41s	.269	.301	.343	.325	.338	.363	.368	.400	.336	.353	.404	.377	.346

	26t	27t	28t	29t	30t	31t	32t	33t	34t	35s	36s	37s	38s	39s	40s	41s
26t	1.00															
27t	.416	1.00														
28t	.356	.384	1.00													
29t	.374	.339	.645	1.00												
30t	.485	.413	.549	.542	1.00											
31t	.478	.366	.476	.427	.543	1.00										
32t	.353	.255	.398	.388	.432	.531	1.00									
33t	.397	.351	.407	.399	.477	.534	.575	1.00								
34t	.388	.315	.432	.491	.487	.543	.472	.569	1.00							
35s	.343	.266	.377	.300	.417	.440	.401	.442	.385	1.00						
36s	.288	.318	.364	.369	.401	.432	.397	.418	.404	.574	1.00					
37s	.295	.195	.310	.366	.332	.307	.313	.428	.342	.392	.484	1.00				
38s	.317	.229	.325	.285	.324	.392	.283	.438	.354	.439	.477	.510	1.00			
39s	.320	.271	.375	.330	.378	.405	.354	.442	.362	.480	.495	.450	.573	1.00		
40s	.331	.295	.330	.290	.364	.353	.356	.375	.285	.397	.438	.350	.510	.512	1.00	
41s	.346	.277	.331	.299	.354	.394	.357	.420	.333	.474	.455	.474	.526	.558	.516	1.00

Appendix H

COVARIANCE MATRIX FOR THE CFA

COVARIANCE MATRIX FOR THE CFA

	p1	p2	p3	p5	p6	p7
p1	0.50					
p2	0.34	0.49				
p3	0.28	0.28	0.57			
p5	0.23	0.25	0.24	0.54		
p6	0.25	0.24	0.26	0.24	0.51	
p7	0.26	0.26	0.22	0.27	0.32	0.49
m10	0.15	0.15	0.19	0.18	0.24	0.23
m12	0.23	0.24	0.23	0.27	0.28	0.27
m13	0.17	0.20	0.17	0.22	0.20	0.24
m14	0.11	0.12	0.14	0.12	0.17	0.16
m15	0.17	0.20	0.22	0.18	0.23	0.21
m16	0.18	0.20	0.23	0.17	0.22	0.24
m17	0.15	0.16	0.19	0.19	0.17	0.20
m18	0.13	0.16	0.19	0.19	0.15	0.18
v19	0.18	0.19	0.17	0.18	0.16	0.17
v20	0.15	0.18	0.14	0.17	0.16	0.19
v21	0.11	0.16	0.16	0.17	0.15	0.15
v22	0.15	0.18	0.15	0.18	0.18	0.17
v23	0.14	0.17	0.22	0.16	0.21	0.17
v24	0.11	0.15	0.17	0.16	0.18	0.17
v25	0.13	0.16	0.18	0.17	0.17	0.17

	m10	m12	m13	m14	m15	M16
m10	0.65					
m12	0.30	0.60				
m13	0.21	0.27	0.55			
m14	0.22	0.20	0.20	0.55		
m15	0.23	0.27	0.23	0.28	0.60	
m16	0.30	0.27	0.22	0.23	0.33	0.61
m17	0.24	0.27	0.18	0.14	0.20	0.25
m18	0.21	0.24	0.14	0.21	0.25	0.27
v19	0.24	0.29	0.12	0.20	0.21	0.26
v20	0.17	0.26	0.15	0.19	0.23	0.25
v21	0.19	0.27	0.17	0.19	0.23	0.24
v22	0.27	0.28	0.17	0.21	0.21	0.28
v23	0.28	0.28	0.15	0.21	0.22	0.27
v24	0.24	0.28	0.17	0.18	0.20	0.23
v25	0.24	0.26	0.18	0.18	0.20	0.25
t26	0.21	0.20	0.17	0.14	0.11	0.17
t28	0.23	0.22	0.12	0.16	0.20	0.27
t30	0.20	0.19	0.14	0.16	0.15	0.20
t31	0.20	0.20	0.15	0.19	0.15	0.25
t32	0.19	0.21	0.17	0.16	0.16	0.22
t33	0.17	0.21	0.19	0.14	0.21	0.22
t34	0.25	0.23	0.19	0.19	0.21	0.29
s35	0.17	0.20	0.21	0.15	0.14	0.19
s36	0.20	0.23	0.20	0.18	0.21	0.22
s37	0.18	0.20	0.16	0.19	0.13	0.16
s38	0.17	0.21	0.17	0.14	0.14	0.17
s39	0.20	0.23	0.18	0.14	0.19	0.22
s40	0.16	0.22	0.16	0.11	0.15	0.20
s41	0.17	0.22	0.19	0.14	0.17	0.19

	m17	m18	v19	v20	v21	v22
m17	0.55					
m18	0.28	0.53				
v19	0.18	0.21	0.78			
v20	0.18	0.22	0.50	0.69		
v21	0.19	0.24	0.43	0.43	0.61	
v22	0.18	0.23	0.41	0.36	0.37	0.71
v23	0.23	0.22	0.35	0.35	0.34	0.41
v24	0.20	0.20	0.30	0.31	0.31	0.37
v25	0.19	0.20	0.31	0.30	0.32	0.32
t26	0.17	0.17	0.24	0.22	0.21	0.31
t28	0.20	0.23	0.36	0.33	0.31	0.34
t30	0.17	0.22	0.30	0.26	0.28	0.30
t31	0.17	0.17	0.23	0.21	0.21	0.30
t32	0.18	0.18	0.23	0.23	0.24	0.28
t33	0.20	0.20	0.19	0.18	0.21	0.25
t34	0.21	0.22	0.25	0.24	0.23	0.30
s35	0.20	0.18	0.21	0.23	0.21	0.22
s36	0.20	0.20	0.24	0.26	0.24	0.26
s37	0.18	0.18	0.19	0.22	0.22	0.24
s38	0.19	0.16	0.15	0.19	0.18	0.20
s39	0.19	0.15	0.29	0.23	0.21	0.23
s40	0.15	0.15	0.25	0.21	0.18	0.21
s41	0.19	0.18	0.24	0.22	0.21	0.21

	v23	v24	v25	t26	t28	t30
v23	0.67					
v24	0.42	0.61				
v25	0.34	0.38	0.56			
t26	0.29	0.26	0.26	0.82		
t28	0.39	0.29	0.30	0.26	0.71	
t30	0.32	0.25	0.25	0.35	0.35	0.77
t31	0.26	0.23	0.22	0.30	0.24	0.37
t32	0.25	0.23	0.23	0.24	0.28	0.31
t33	0.22	0.20	0.20	0.24	0.23	0.29
t34	0.30	0.25	0.25	0.27	0.29	0.33
s35	0.21	0.20	0.20	0.22	0.21	0.22
s36	0.23	0.24	0.30	0.18	0.21	0.21
s37	0.22	0.21	0.19	0.19	0.18	0.18
s38	0.21	0.19	0.19	0.15	0.17	0.16
s39	0.25	0.26	0.26	0.17	0.23	0.19
s40	0.21	0.18	0.22	0.16	0.24	0.25
s41	0.18	0.18	0.21	0.21	0.19	0.24

	t31	t32	t33	t34	s35	s36
t31	0.64					
t32	0.33	0.56				
t33	0.28	0.32	0.52			
t34	0.31	0.29	0.31	0.63		
s35	0.19	0.22	0.20	0.22	0.56	
s36	0.18	0.23	0.21	0.19	0.32	0.55
s37	0.19	0.24	0.20	0.20	0.23	0.29
s38	0.16	0.18	0.19	0.18	0.25	0.25
s39	0.19	0.22	0.22	0.22	0.29	0.30
s40	0.20	0.19	0.18	0.19	0.24	0.28
s41	0.20	0.22	0.23	0.21	0.25	0.27

	p1	p2	P3	p5	P6	p7
t26	0.12	0.13	0.08	0.15	0.13	0.14
t28	0.13	0.18	0.15	0.18	0.20	0.19
t30	0.15	0.15	0.15	0.18	0.18	0.17
t31	0.10	0.13	0.14	0.14	0.16	0.13
t32	0.13	0.14	0.14	0.17	0.19	0.19
t33	0.12	0.15	0.14	0.20	0.20	0.20
t34	0.13	0.16	0.15	0.20	0.19	0.19
s35	0.17	0.16	0.15	0.18	0.17	0.17
s36	0.18	0.19	0.21	0.18	0.21	0.20
s37	0.14	0.14	0.15	0.12	0.14	0.11
s38	0.16	0.16	0.14	0.16	0.16	0.15
s39	0.20	0.19	0.18	0.21	0.22	0.21
s40	0.17	0.17	0.16	0.18	0.17	0.19
s41	0.20	0.22	0.19	0.20	0.18	0.20

	s37	s38	s39	S40	s41
s37	0.59				
s38	0.27	0.51			
s39	0.26	0.33	0.67		
s40	0.24	0.25	0.32	0.62	
s41	0.25	0.29	0.36	0.34	0.60

Appendix I

LISREL SYNTAX FOR CFA AND FACTORIAL INVARIANCE TESTS

LISREL SYNTAX FOR CFA AND FACTORIAL INVARIANCE TESTS

1. Test of higher-order factor model

```
Title:  Test of the learning organization model
 observed variables
 p1 p2 p3 p5 p6 p7 m10 m12 m13 m14 m15 m16 m17 m18
 v19 v20 v21 v22 v23 v24 v25 t26 t28 t30 t31 t32 t33 t34
 s35 s36 s37 s38 s39 s40 s41
 covariance matirx from file: all.cov
 sample size 483
 latent variables: PM MM SV TL ST LO
 relationships:

 p1 p2 p3 p5 p6 p7 = PM
 m10 m12 m13 m14 m15 m16 m17 m18 = MM
 v19 v20 v21 v22 v23 v24 v25 = SV
 t26 t28 t30 t31 t32 t33 t34 = TL
 s35 s36 s37 s38 s39 s40 s41 = ST
 PM MM SV TL ST = LO
 set the variance of LO = 1.0
 path diagram
 options rs mi ef sc
```

2. Invariant test of factor structure

```
Title: Invariant test of factor structure
 observed variables
 p1 p2 p3 p5 p6 p7 m10 m12 m13 m14 m15 m16 m17 m18 v19 v20 v21 v22 v23 v24 v25
 t26 t28 t30 t31 t32 t33 t34 s35 s36 s37 s38 s39 s40 s41
 covariance matrix from file: voc.cov
 sample size 290
 latent variables: PM MM SV TL ST LO
 relationships:
 v19 = 1* SV
 v20 v21 v22 v23 v24 v25 = SV
 p2 = 1*PM
 p1 p3 p5 p6 p7 = PM
 t31 = 1*TL
 t26 t28 t30 t32 t33 t34 = TL
 m15 = 1*MM
 m10 m12 m13 m14 m16 m17 m18 = MM
 s38 = 1*ST
 s35 s36 s37 s39 s40 s41 = ST
 options mi
```

group 2: Academic
covariance matrix from file: aca.cov
sample size 193
latent variables: PM MM SV TL ST LO
relationships:
v19 = 1* SV
v20 v21 v22 v23 v24 v25 = SV
p2 = 1*PM
p1 p3 p5 p6 p7 = PM
t31 = 1*TL
t26 t28 t30 t32 t33 t34 = TL
m15 = 1*MM
m10 m12 m13 m14 m16 m17 m18 = MM
s38 = 1*ST
s35 s36 s37 s39 s40 s41 = ST

set the error variances of p1 - s41 free
set the correlations of PM MM SV TL ST free
set the variances of PM MM SV TL ST free
options mi sc

3. Invariant test of factor loadings

Title Multiple Groups Loadings invariant
observed variables
p1 p2 p3 p5 p6 p7 m10 m12 m13 m14 m15 m16 m17 m18 v19 v20 v21 v22 v23 v24 v25
t26 t28 t30 t31 t32 t33 t34 s35 s36 s37 s38 s39 s40 s41

covariance matrix from file: voc.cov
sample size 290
latent variables: PM MM SV TL ST LO
relationships:
v19 = 1* SV
v20 v21 v22 v23 v24 v25 = SV
p2 = 1*PM
p1 p3 p5 p6 p7 = PM
t31 = 1*TL
t26 t28 t30 t32 t33 t34 = TL
m15 = 1*MM
m10 m12 m13 m14 m16 m17 m18 = MM
s38 = 1*ST
s35 s36 s37 s39 s40 s41 = ST
options mi

group 2: Academic
covariance matrix from file: aca.cov

sample size 193
latent variables: PM MM SV TL ST LO
relationships:
!v19 = 1* SV
!v20 v21 v22 v23 v24 v25 = SV
!p2 = 1*PM
!p1 p3 p5 p6 p7 = PM
!t31 = 1*TL
!t26 t28 t30 t32 t33 t34 = TL
!m15 = 1*MM
!m10 m12 m13 m14 m16 m17 m18 = MM
!s38 = 1*ST
!s35 s36 s37 s39 s40 s41 = ST

set the error variances of p1 - s41 free
set the correlations of PM MM SV TL ST free
set the variances of PM MM SV TL ST free
options mi sc

4. Invariant test of measurement error

Title Multiple Groups Loadings and measurement error variances invariant
observed variables
p1 p2 p3 p5 p6 p7 m10 m12 m13 m14 m15 m16 m17 m18 v19 v20 v21 v22 v23 v24 v25
t26 t28 t30 t31 t32 t33 t34 s35 s36 s37 s38 s39 s40 s41

covariance matrix from file: voc.cov
sample size 290
latent variables: PM MM SV TL ST LO
relationships:
v19 = 1* SV
v20 v21 v22 v23 v24 v25 = SV
p2 = 1*PM
p1 p3 p5 p6 p7 = PM
t31 = 1*TL
t26 t28 t30 t32 t33 t34 = TL
m15 = 1*MM
m10 m12 m13 m14 m16 m17 m18 = MM
s38 = 1*ST
s35 s36 s37 s39 s40 s41 = ST
options mi

group 2: Academic
covariance matrix from file: aca.cov
sample size 193
latent variables: PM MM SV TL ST LO

relationships:
!v19 = 1* SV
!v20 v21 v22 v23 v24 v25 = SV
!p2 = 1*PM
!p1 p3 p5 p6 p7 = PM
!t31 = 1*TL
!t26 t28 t30 t32 t33 t34 = TL
!m15 = 1*MM
!m10 m12 m13 m14 m16 m17 m18 = MM
!s38 = 1*ST
!s35 s36 s37 s39 s40 s41 = ST

!set the error variances of p1 - s41 free
set the correlations of PM MM SV TL ST free
set the variances of PM MM SV TL ST free
options mi sc

5. Invariant test of factor variance

Title Multiple Groups loading, measurement error variances, factor variances invariant
observed variables
p1 p2 p3 p5 p6 p7 m10 m12 m13 m14 m15 m16 m17 m18 v19 v20 v21 v22 v23 v24 v25
t26 t28 t30 t31 t32 t33 t34 s35 s36 s37 s38 s39 s40 s41

covariance matrix from file: voc.cov
sample size 290
latent variables: PM MM SV TL ST LO
relationships:
v19 = 1* SV
v20 v21 v22 v23 v24 v25 = SV
p2 = 1*PM
p1 p3 p5 p6 p7 = PM
t31 = 1*TL
t26 t28 t30 t32 t33 t34 = TL
m15 = 1*MM
m10 m12 m13 m14 m16 m17 m18 = MM
s38 = 1*ST
s35 s36 s37 s39 s40 s41 = ST
options mi

group 2: Academic
covariance matrix from file: aca.cov
sample size 193
latent variables: PM MM SV TL ST LO
relationships:
!v19 = 1* SV

```
!v20 v21 v22 v23 v24 v25 = SV
!p2 = 1*PM
!p1 p3 p5 p6 p7 = PM
!t31 = 1*TL
!t26 t28 t30 t32 t33 t34 = TL
!m15 = 1*MM
!m10 m12 m13 m14 m16 m17 m18 = MM
!s38 = 1*ST
!s35 s36 s37 s39 s40 s41 = ST

!set the error variances of p1 - s41 free
set the correlations of PM MM SV TL ST free
!set the variances of PM MM SV TL ST free
options mi sc
```

Appendix J

PERMISSION LETTERS

PERMISSION LETTER FOR USING ITEM

Date: Sat, 16 Oct 2004 17:42:37 -0500

From: Steve Wyckoff <swyckoff@essdack.org>

Subject: Re: Asking for permission to use the survey instrument

To: Joo Park <jhpark44@uga.edu>

Joo Ho,

Feel free to use my dissertation and survey in any way that will help you achieve your goals. Good luck and let me know how your study turns out.

Steve

PERMISSION LETTERS TO COLLECT DATA

Joo Ho Park
Graduate Student
Dept. of Workforce Education, Leadership, & Social Foundations
River's Crossing, 850 College Station Road,
The University of Georgia, Athens, GA

Dear Joo Ho Park,

On behalf of Seoul Metropolitan Office of Education, I am pleased to let you know that you are permitted to collect your survey data from teachers of major public vocational high schools in Seoul. You may contact these high school teachers and administrators during school days for the purpose of effective performing your research. My colleagues and I will help you ensure that your data collection is successfully conducted in high schools which are under the authority of Seoul Metropolitan Office of Education.

I strongly believe that your study will contribute to developing our reform policy for the public vocational high schools. Also, I hope that the results of your research will be shared with Seoul Metropolitan Office of Education.

Sincerely,

Park sang chun

Sang chun Park
Senior Supervisor
Seoul Metropolitan Office of Education

SEOUL METROPOLITAN OFFICE OF EDUCATION
2-77, Shinmun-Ro 2Ga, Chongro-Gu, Seoul, 110-781 Korea
Tel : (82-2)3999-314~317 Fax : (82-2)3999-465

Joo Ho Park
Graduate Student
Dept. of Workforce Education, Leadership, & Social Foundations
River's Crossing, 850 College Station Road,
The University of Georgia, Athens, GA

Dear Joo Ho Park,

On behalf of Gyeonggi Provincial Office of Education, I am pleased to let you know that you are permitted to collect your survey data from teachers of major public vocational high schools. You may contact these high schools' teachers and administrators during school days for the purpose of effectively performing your research. I will help you to ensure that your data collection is successfully conducted in the high schools which are under the authority of Gyeonggi Provincial Office of Education.

I believe that your study will contribute to developing the reform policy for public vocational high schools. Also, I hope that the results of your research will be shared with Gyeonggi Provincial Office of Education.

Sincerely,

Sung Jun Cho

Senior Supervisor
Gyeonggi Provincial Office of Education

Joo Ho Park
Graduate Student
Dept. of Workforce Education, Leadership, & Social Foundations
River's Crossing, 850 College Station Road,
The University of Georgia, Athens, GA

Dear Joo Ho Park,

On behalf of Incheon Metropolitan Office of Education, I am pleased to let you know that you are permitted to collect your survey data from teachers of major public vocational high schools. You may contact these high schools' teachers and administrators during school days for the purpose of performing your research. I will help you to ensure that your data collection is successfully conducted in the high schools.

I believe that your study will contribute to the growth of our public vocational high schools. Also, I hope that the results of yourresearch will be shared with Incheon Metropolitan Office of Education.

Sincerely,

Kim dong won 김동원

Senior Supervisor
Incheon Metropolitan Office of Education