Learning Style and Academic Achievement of Middle School Geography Students in Korea

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This study was conducted to identify the nature of Korean students' learning styles and to determine the relationship between learning style and geography achievement. This study was based on the learning style model developed by David A. Kolb and the teaching style models by Svinicki, Dixon, and Sheehy. The Learning Style Inventory (LSI) was administered to 791 Korean middle school geography student and a survey designed to identify a teacher's teaching style was administered to their teachers. The results showed that the distributions of geography students' learning styles in Korea were different from previous research studies in other cultures. Environmental considerations, including school experience and educational settings, may be factors in such results. In addition, the data from this study showed that the approach traditionally taken in Korean geography education provided the best learning environment for one study of learning style: that of the assimilator. Through these results, this study suggested that Korean geography education could improve through provision of opportunities for students to learn self-monitoring skills for improving their academic achievement, and for teachers to train in new and various instructional methods in order to meet different students' learning preferences. In addition, teachers have to be trained in technology education such as geographic information systems (GIS). This study develops baseline data on Korean students' learning styles in geography education and may aid in making geography textbooks' contents more concrete and effective.

Key Words: *learning style, teaching style, geographic education, Korea*

INTRODUCTION

The concept of "learning style" has become one of the cornerstones of the modern educational reform movement. Increasingly, leaders in education recognize that the processes of learning and goal setting ability are critically important. Thus, considerable research in education has been directed toward identifying the effects that individual student differences, as expressed through the concept of learning style, have on academic achievement.

Everyone has a learning style. Learning style has been modeled as a moderating variable in learning effectiveness and efficiency. The National Association of Secondary School Principals (NASSP) defines "learning style" as the composite of characteristic cognitive, affective, and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment (Keefe 1979, 1). NASSP views learning style as a set of unique internal processes that guide how we take information from our surrounding environment (Ursin 1995). Gregorc and Ward state that "learning style consists of distinctive behaviors which serve as indicators of how a person learns from and adapts to the environment. It also gives clues as to how a person's mind operates" (1979, 234).

According to Dunn and Dunn (1993, 2), "learning style is the way each individual begins to concentrate on, process, internalize, and remember new and difficult academic information or skills." Although many students can master information presented in a style that is not comparable with their own, they are thought to learn more efficiently and rapidly when they capitalize on their own learning style strengths.

Learning style may be analyzed in the classroom setting because each student has a specific optimal style of learning. Teachers are faced with many different learning styles in the classroom. Learners differ in a variety ways, and these differences are likely to influence how learners respond to and benefit from a given instructional method. By taking learning preferences into account, educators can develop a curriculum that improves students' attainment of course objectives.

Most reported research studies dealing with this topic have been carried out in the United States. However, in recent years there has been an increased need for research regarding learning style and teaching style in Korean classrooms. This need is significant because one of the most serious educational problems in Korea involves teaching that is undertaken without consideration of individual differences among students and the use of teaching materials, classroom instructional methods, and educational methods that are the same for all students. Teachers rely heavily on the technique of lecturing, regardless of the characteristics of instructional objectives. Traditional methods of teaching focus primarily on supplying students with the necessary information/skills for concept development and subsequent rehearsal for learning retention (Szewczyk 1987). This traditional instruction methodology (mainly lecture and recitation) may neglect many aspects of individual learning preferences that contribute toward more effective cognitive growth (McCarthy 1981). Traditional teaching modes in Korea are aimed at what is perceived to be the "average" learner. Therefore, they stand in contrast to methods that recognize the unique preference of each student.

Since the beginning of the 1990s, the Ministry of Education in Korea has carried out an innovative effort to streamline the Korean educational system (Ministry of Education 1999). The major thrust of this educational innovation has been directed toward the development of autonomous, rational-thinking, decision-making ability and on increasing the learner's problem-solving ability. The type of education that will serve this new thrust demands that teaching depart from the conventional method of rote learning and memorization of bits of knowledge. The new teaching methods are those that vary to meet individual needs and that develop critical thinking capability, inquiry skills, and creativity through experiential learning.

Geography, in particular, is not a collection of arcane information, but is the study of spatial aspects of human existence. Geography is composed of three interrelated and inseparable components - subject matter, skills, and perspectives. Subject matter is the distillation of essential knowledge and is important in the formulation of geography standards. Skills include (1) asking geographic questions, (2) acquiring geographic information, (3) organizing geographic information, (4) analyzing geographic information, and (5) answering geographic questions. Both subject matter (knowledge) and geographic skills must be considered from the spatial and ecological perspectives that form the third significant element of the discipline (Geography Education Standards Project 1994).

Geography has much more to do with asking questions and solving spatial and ecological problems than it does with rote memorization of isolated facts, and the goal of geographic education is the skill of thinking geographically (Geography Education Standards Project 1994). However, this goal is not supported by the dominant teaching methods in geography classes in Korea, which include teacher-centered lectures, textbook-centered lectures, recitation, paper and pencil tests, and fact-and-concept oriented learning (Han 1989; Paik 1994).

Because Korean geography education needs new teaching methods that will promote geographical thinking, data from this study will assist educators as they examine the relationship between learning style and academic achievement. Moreover, the study will help in identifying teaching strategies that will meet geography education objectives.

PURPOSE AND OBJECTIVES

The major purpose of this study was to identify the nature of Korean students' learning styles and to determine the usefulness of students' learning styles to predict academic achievement for middle school geography students in Korea.

The objectives of this study were (1) to identify the nature of the learning styles of Korean middle school geography students, (2) to determine the relationship between students' learning styles and geography academic achievement by examining whether students' learning styles are useful for predicting academic achievement, and (3) to use the data obtained from this study to make recommendations for enhancing the Korean geography curriculum and teaching methods.

METHODS

Subjects

The sample for this study was 791 ninth grade geography students (328 male and 463 female) and their eight teachers in three middle schools in Seoul, Korea. The schools selected were an all-boy's school, an all-girl's school, and a co-educational school. These schools were medium-sized middle schools located in Seoul and attended by students whose families lived in a low-to-middle income urban area. The students in the sample all experienced similar conditions in their educational programs. In addition, they all had similar interests about participation in the study.

Procedure

1. Identification of Student Learning Style

In order to determine students' learning styles, Kolb's Learning Style Inventory was used. The Learning Style Inventory (Kolb and Smith 1985) is a self-descriptive instrument designed by David A. Kolb to assess an individual's preferred learning style. The instrument helps learners identify their learning styles and determine how they absorb and deal with new information. Kolb's Learning Style Inventory (Kolb 1984) is based on John Dewey's emphasis on the need for learning to be grounded in experience, Kurt Lewin's work that stressed the importance of a person's being active in learning, and Jean Piaget's theory on intelligence as the result of the interaction of the person and the environment.
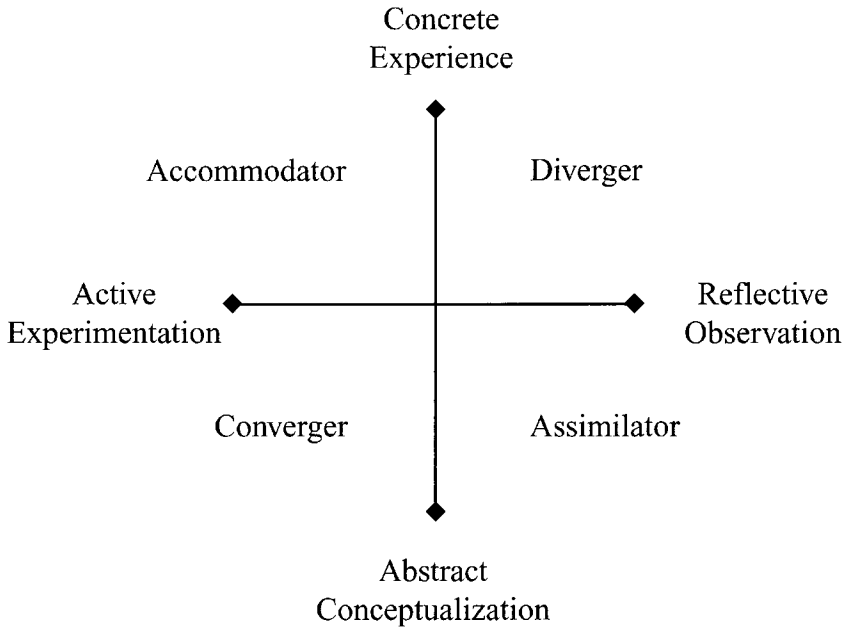
Kolb (1986) developed the 12-item Learning Style Inventory (LSI) to assess learning styles. Each item asks respondents to rank-order four sentence endings in a way that best describes their learning style. One ending in each item corresponds to one of the four learning orientations: an experienced-based Concrete Experience (CE), a conceptually based Abstract Conceptualization (AC), an action-based Active Experimentation (AE), and

an observation-based Reflective Observation (RO) (Kolb and Smith 1985). These four modes create four learning styles (Figure 1).

Students classified as divergers, and identified as a combination of concrete experience and reflective observation, are interested in people and tend to be imaginative and emotional. Assimilators, identified by a combination of reflective observation and abstract conceptualization, believe it is important that any theory be logically sound and precise. Convergers, identified as a combination of abstract conceptualization and active experimentation, organize knowledge through hypothetical-deductive reasoning so that action takes place. The greatest interest for accommodators, identified as a combination of active experimentation and concrete experiences, lies in doing things, in carrying out plans and experiments, and involving themselves in new experiences (Kolb and Smith 1985). Kolb's learning theory suggests the design of instructional materials to develop the strengths of the student's dominant learning style, as well as to encourage the strengthening of non-dominant preferences (Akin 1992).

The LSI has been used mostly in education and management training. It has been used to help learners and teachers understand the learning process and preference for different kinds of educational experiences (McFadden 1986). It has been applied to several cultural settings. Farina (1997) compared learning characteristics of physical therapy students in the United States, Australia, and Canada. The cross-cultural efficiency of the LSI has been substantiated in several studies, including Ruksasuk (2000), Hanpol (1999) who applied learning style theory within a Thai educational setting, and Hajizainuddin (1999) who researched it in Malaysia.

For this study, the Learning Style Inventory (LSI) was translated into Korean by the researcher and a Korean English Teacher after obtaining permission for translation from the publisher. The two versions of LSI were compared and differences eliminated by the researcher. A Korean language teacher then reviewed these. Internal consistency was examined for the LSI Korean version using the same sample of Korean geography middle school students as used in the study (n = 791). The internal consistency of the LSI Korean version as measured by the co-efficient alpha for the learning orientations ranged from 0.53 to 0.67 (CE = 0.53, RO = 0.56, AC = 0.67, and AE = 0.63; See Table 1). The Korean version of LSI was then administered to the sample of 791 ninth grade students in the second semester of 1998. Each teacher explained the objectives and procedures of testing to students. Students were administered the test during a single class period of 45 minutes. No make-up tests were administered.

Concrete
Experience

Accommodator   Diverger

Active   Reflective
Experimentation   Observation

Converger   Assimilator

Abstract
Conceptualization

Figure 1. Kolb's Experiential Learning Model (Smith and Kolb 1986, 16)

2. Identification of Instructional Methods

In order to determine the methods of instruction used by teachers, the researcher conducted a survey of teachers' instructional methods by synthesizing the lists of Svinicki and Dixon (1985) and Sheehy (1996). Svinicki and Dixon (1985) identified four specific classroom-learning activities that are complementary to the four phases of Kolb's Experiential Learning Cycle. Sheehy (1996) discovered that the Svinicki and Dixon adaptation did not include a sufficient number of activities and assessments, and consequently, designed supplemental lists of activities and assessments that provided for more learning style activities. Both the Svinicki and Dixon (1985) and Sheehy (1996) adaptations elaborated the Kolb model slightly by designing the four activities with action verbs that described the activity of the learner at each step. Thus, concrete experience becomes experiencing; reflective observation becomes examining; abstract conceptualization becomes explaining; and active experimentation becomes applying.

	Eng+*	Eng+**	Eng+***	Kor++
Concrete Experience (CE)	0.82	0.56	0.85	0.53
Reflective Observation (RO)	0.73	0.67	0.80	0.56
Abstract Conceptualization (AC)	0.83	0.71	0.83	0.67
Active Experimentation (AE)	0.78	0.52	0.81	0.63

Table 1. Comparison of the internal consistency of the English and Korean Versions: LSI. + - English; ++ - Korean; *Smith and Kolb 1985; ** Veres, Sims and Locklear 1991; *** Ruble and Stout 1991.

Twenty-nine kinds of instructional methods were randomly selected from the lists of Svinicki and Dixon (1985) and Sheehy (1996), and served as the basis for a survey used to classify the teaching styles of the eight geography teachers involved in the study.

The Survey for Teaching Methods was administered to the eight teachers that taught geography to the 791 ninth grade middle school student participants during the second semester of 1998 in order to classify their teaching styles according to Kolb's model. The teachers indicated the frequency for each instructional method: 5 = every class, 1 = never used. Table 2 presents the instrument used in collecting and analyzing the four phases Teaching Methods data based on Kolb's Experiential Learning Cycle. While the study collected and analyzed data for each of the eight teachers, Table 2 represents the data from just one teacher in order to demonstrate the format.

The classification and analysis of the completed surveys revealed four categories of instructional methodology: Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE). These categories of instructional methodology may be further elaborated. For example: field experiences, laboratories, direct data collection, and reading of primary resources are all designed to give the learner firsthand, personal experiences with the content (CE). Activities such as discussion and journal keeping encourage students to reflect on their experience (RO). Model building, research papers, or lectures that present a model foster abstract conceptualization (AC). Simulations and projects encourage students to apply the models to problem situations (AE) (Svinicki & Dixon 1985).

3. Assessing Student Achievement

The achievement test was developed with 70% multiple-choice questions and 30% short answer questions. It was designed to reveal the effects of the instruction and learning style elements on student achievement. All of the questions were focused on the content and concepts for the ninth grade, second semester geography class. The topics were: Chapter Five, industrialization, urbanization, and environmental problems; Chapter Six, natural resources and regional development; and Chapter Seven, Korea in international society.

The students in the sample were administered two content-based tests, a midterm exam, and a final exam. Mean scores for the tests were calculated as a composite score. Academic achievement data for geography were also obtained from each student's transcript. The composite score (midterm and final exams) for the geography students for each of the schools is presented in Table 3. The table shows that the gap between the highest and lowest mean composite score for the three schools is greater than 15 points. Consequently, the students' achievement scores were converted to T-scores, with a mean of 50 and standard deviation of 10, in order to make comparisons between schools practical (Table 4). Conversion to T-scores is a statistical technique used to make raw test scores comparable. Although curriculum and exam style (70% multiple choice questions and 30% short answer questions) were the same in each school, the questions themselves were judged conceptually similar by the researcher, but were not duplicate questions because the test items were constructed by teachers in each school.

RESULTS

Analysis of Data

Several scores from the Learning Style Inventory were used to explain geography academic achievement as indicated by the teacher-generated test. The regression equation $y = b_0 + b_1 x_1$ was used where x_1 denotes learning style of student, and y denotes academic achievement. Each student exhibited a preferred learning style: diverger, assimilator, converger, or accommodator. Learning style was the categorization variable coded from 1 through 4. Each value was transformed to a new variable value to accommodate the assumption of equal intervals underlying the regression model. This allowed the researcher to capture the information contained in the categorization scheme and analyze its effects as an estimation of standard regression.

	Every Class	Once a week	Once every two weeks	Once a month	Never Used
1. Lecture	X				
2. Define	X				
3. Time Line			X		
4. Review	X				
5. Note Taking	X				
6. Map		X			
7. Evaluation of Work			X		
8. Observation	X				
9. Primary Text Reading	X				
10. Simulation / Game					X
11. Field Work					X
12. Class Participation		X			
13. Summary	X				
14. Presentation				X	

Table 2. Teaching style questionnaire. One teacher's responses entered to demonstrate format.

	Every Class	Once a week	Once every two weeks	Once a month	Never Used
15. Case Study				X	
16. Homework			X		
17. Group Work					X
18. Charting Results				X	
19. Thought Question			X		
20. Brainstorming				X	
21. Journals				X	
22. Rhetorical Questions			X		
23. Role Play					X
24. Laboratories					X
25. Projects					X
26. Trigger Films					X
27. Calculate Results				X	
28. Library				X	
29. Handouts		X			

Interpretation of Data

1. Nature of the Learning Style

The students surveyed were categorized, based upon the Learning Style Inventory, as follows: 40.7% divergers, 34.1% assimilators, 10.6% convergers, and 14.5% accommodators (Table 5). Teachers, on the other hand, used reflective observation and abstract conceptualization as instructional methodologies. This observed difference suggests a mismatch between teaching methods and students' learning style in general. Chi-square analysis showed no significant difference between male and female students on learning styles within the sample ($p = 0.09895$). Thus, the mismatch was evident across the student sample.

2. Learning Style and Geography Achievement

Table 6 shows the results of the multiple regression analysis using learning style to predict geography achievement scores. The variance in the learning style (r^2) attributable to the prediction of academic achievement is 9%. The data suggest that learning style is a minor predictor of academic achieve-

	Mean	Standard Deviation
School 1	75.93	19.10
School 2	66.85	20.85
School 3	60.42	20.43

Table 3. The means of achievement scores by school.

	Mean	Standard Deviation
School 1	49.96	10.05
School 2	49.93	9.93
School 3	50.21	10.22

Table 4. T-scores for achievement by school.

ment despite the significance of the statistic at the 0.05 confidence level. It is believed by the researcher that statistical significance may result largely from sample size (N =791).

The mean scores for academic achievement in geography by students according to their different learning styles are in close agreement between girls and boys within groups. There are noticeable differences between several of the sub-sample groups that exhibited specific learning styles. For example, assimilators had the highest mean score in geography achievement, while convergers and divergers, who rely on experience, feeling, and doing, had low mean scores on geography achievement. This fact may be related to and result from the teachers' instructional methods (Table 7).

A summary of the instructional methods categories for teachers in the sample is presented in Table 8. Individual teacher's scores within each category ranged from a minimum of 8 to a maximum of 40. The predominant teaching methods in geography for the sample are reflective observation and abstract conceptualization. Such instructional environments are believed best for assimilators. While we know that students learn in different ways, the data suggest that Korean geography teachers most often teach for assimilators. Furthermore, the data suggest that instructional methods in geography classes in Korea are most likely teacher-centered lectures geared toward fact and concept-oriented learning. Instructional methods to meet individual needs and to develop critical thinking and inquiry skills through experiential learning are practiced infrequently in geography classrooms in Korea.

	Boys		Girls		Total	
Diverger	125	38.1%	197	42.6%	322	40.7%
Assimilator	133	34.5%	157	33.9%	270	34.1%
Converger	45	13.7%	39	8.4%	84	10.6%
Accommodator	45	13.7%	70	15.1%	115	14.5%
Total	328	100.0%	463	100.0%	791	100.0%

Table 5. Sample of Korean student subjects by learning style. Chi-square test between boys and girls: p = 0.09895.

The analyses strongly suggest that learning style and instructional methods each have an effect upon student achievement. Students with the learning styles classified as divergers and convergers had low mean scores in achievement. Those students may have performed at a higher level if different instructional methods were used. Those students perhaps have the greatest need for concrete, imaginative, action-oriented learning experiences in order to improve their academic performance.

SUMMARY AND CONCLUSIONS

Geography education in Korea has been crucial in the quantitative improvement of Korea's human capital (Han 1994). Educational planning has focused on providing the types of training required to fill the manpower needs of the nation's economic development. However, such training may not be effectively reaching all students. Students with a learning style classified as diverger formed 40.7% of the study sample. Those students are characterized by a cognitive function that combines concrete experience with reflective observation. Accommodators, on the other hand, who formed 14.5% of the study, combine concrete experience and active experimentation as their learning style. Divergers enjoy working with people and tend to be imaginative and feeling-oriented. Accommodators are interested in carrying out plans or tasks and in getting involved in new experiences. Since many instructional methods in geography education in Korea emphasize an abstraction process, not a concrete experience, it was not surprising to find divergers and accommodators obtaining lower achievement scores than assimilators and convergers, both of whom prefer contemplating abstract conceptualizations. Based on the cycle of learning involving matching and mismatching, learning style seems to be an important factor in the geography achievement of the students in this study.

From the data available in this study, it was not possible to determine all characteristics of Korean geography education with respect to instructional methods and learning style, but some trends were observed that permit the researcher to speculate. The first trend is that tests and entrance exams have influenced the instructional methods employed in the Korean geography education system. Current test formats in Korean geography education consist

Multiple R	R-Square	Adjusted R-Square	Standard Error	F	Signif F
0.30018	0.09011	0.08664	9.61356	25.97846	P<0.000

Table 6. Regression results for learning style and achievement.

Learning Style Deviation	Gender	Mean	Standard
Diverger	Boy	46.6377	9.0788
	Girl	47.9150	10.4781
Assimilator	Boy	54.3664	10.1884
	Girl	53.8576	8.8724
Converger	Boy	50.7921	9.2446
	Girl	49.3876	9.9629
Accommodator	Boy	46.4587	8.5652
	Girl	48.5911	9.3423

Table 7. Achievement by gender and learning style expressed as t-scores.

	Concrete Experience	Reflective Observation	Abstract Conceptualization	Active Experimentation
Mean	14	26	28	12

Table 8. Instructional methods mean scores by teacher subjects.

of 70% multiple choice and 30% short answer. This has led teachers to depend heavily on lecturing, rote learning, and memorization of isolated facts. In this type of environment for geography education, teachers probably neglect individual student's learning styles. In order to encourage higher order thinking, creativity, and problem solving among students, new and varied geography assessments that include essays, oral examinations, discussion, practice, experimentation, interviews, observation, projects, and performance portfolios, as well as multiple choice examinations, are necessary. Furthermore, those changes may also require changes in the geography curriculum.

The second trend is that too little attention is focused on processes and outcomes. The knowledge that students acquire is important in education, but an understanding of how students acquire knowledge and how they apply information and content is equally important. Instructional methods and discipline strategies that worked ten or twenty years ago may no longer be

effective in light of the current knowledge regarding the variety of student learning styles. It is important for teachers to not only know the content of geography, but to also teach it in a way that matches students' learning styles. Teachers must (1) challenge the intellectual capacity, (2) nurture the emotional stability, (3) encourage the social sensitivity, (4) facilitate the physical well being, and (5) coach the psychological maturity of learners. The challenge facing Korean geography educators is to determine how to raise academic achievement levels by enhancing the motivation of students. Students' growth is facilitated by teachers who consider instructional methods and learning style agreement as important in the process of education (Atman 1991).

The third trend is a deficiency in the scope of teacher education. Teachers must be prepared in new and various instructional methods that permit them to address varied student learning styles. Especially in geography, teachers must be well versed in technology education, such as geographic information systems (GIS). Policy makers in the educational system in Korea must respond to (1) the need for technology in teaching, (2) the need for teacher education in the use of new instructional technologies and methods, and (3) the increasing need for access to technology facilities by all students.

The fourth trend is the absence of action-oriented education. Traditionally, the evaluation of characteristics within the affective domain with Confucian values and evaluation of content proficiency in the cognitive domain through multiple-choice examinations have dominated. Inclusion of concrete goals and content for both domains in the geography curriculum is necessary. Instructional methods and evaluation techniques that measure achievement of clearly stated educational goals must be introduced to students, teachers, and parents. Good communication about educational goals among students, parents, and teachers is essential to the success of students in achieving the goals and objectives established by the educational system. This research suggests that instructional methods that complement student-learning style may be an initial important step.

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