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Science process skills of students having field dependent and field independent cognitive styles

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This study has been carried out to compare the integrated science process of the students having field dependent and independent cognitive style. A total of 496 students (285 female, 211 male) participated using by stratified sampling method from seven high schools located in the Cappadocia Region of Turkey. While students' science process skills were evaluated using science process skills measurement test (SPSMT) developed by Temiz (2007), cognitive styles (field dependent and independent) were determined using group embedded figures test (GEFT), developed by Witkin et al. (1977). Scores obtained for identifying manipulated, responding and controlled variables, and formulating hypotheses, manipulating variables, interpreting data science process skills were compared in terms of cognitive styles possessed by the students. As a result of this comparison, it has been observed that students with field independence were more successful than field dependent students in all science process skills examined. Results of the independent sample t-test demonstrated statistically meaningful differences in identifying responding variable, controlled variables, formulating hypotheses and manipulating variables skills.

Key words: Science process skills, cognitive styles, science education, Achievement.

INTRODUCTION

Science, an inherent part of humanity's endeavor to comprehend the environment and enhance conditions of living, comprises two main groups of components: scientific knowledge and methods of knowledge acquisition. Scientific knowledge content involves theories, principles and laws. Knowledge acquisition methods, on the other hand, are ways of obtaining scientific information. These methods may be examined in two groups: science attitudes and process skills. Science attitude, inclination and orientation are the basic requisitions for those who engage in scientific activities. Among these basic requirements, most significant characteristics are curiosity, humility, determination, open mindedness, modesty and honesty (Oğuzkan, 1984). Subject of this study are the science process skills (SPS) which facilitate the learning of science, provide active involvement of students, develop sense of personal responsibility in self-learning, increase permanence of learning, as well as gaining of investigative attitudes and methods (Çepni et al., 1997). According to Lind (1998), SPS are thought skills used while considering problems and in formulation of conclusions. These skills are used by scientists during their work. It can be used to assist students in gaining these important skills, thus enabling them to understand and learn the world in which they live. These skills are the basis for scientific thinking and research. According to Abruscato (2000), discoveries of scientists arise from a group of very different and important abilities referred to as their scientific process skills. According to Carin and Bass (2001), scientists use various methods to discover and explain the wonderful mysteries of our cosmos. These methods are known as SPS in science teaching.

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These form the foundational constituents of scientific thinking and are also used for problem resolving in other fields as well. Science processes are mental and physical skills utilized in data collection, data organization through various methods, explanation of extraordinary circumstances and problem resolution. Science processes are mental (and sometimes bodily) activities used in thinking, data collecting, data interpreting, or acquiring knowledge and understanding through manipulation of data [Organization for Economic Co-operation and Development (OECD) Programme for International Student Assessment (PISA), 1999].

In Science-A Process Approach (SAPA), these skills (SPS) are defined as a set of broadly transferable abilities, appropriate to many science disciplines and reflective of the behavior of scientists. SAPA grouped process skills into two types-basic and integrated. The basic science process skills (BSPS) provide the intellectual ground work in scientific enquiry, such as the ability to order and describe natural objects and events. The BSPS are the fundamentals to the integrated process skills. BSPS are observing, classifying, measuring and predicting. The integrated science process skills (ISPS) are the essential skills for solving problems or doing science experiments. It includes identifying and defining variables, collecting and transforming data, constructing tables of data and graphs, describing relationships between variables, interpreting data, manipulating materials, formulating hypotheses, designing investigations, drawing conclusions and generalizing information (Padilla, 1990; Hughes and Wade, 1993; Rezba et al., 1995; Harlen, 1999; Abruscato, 2000; Beaumont-Walters and Soyibo, 2001; Carin and Bass, 2001).

SPS are also a major goal of science education, since these skills are not only needed by scientists, but by everyone in order to become a scientifically literate person able to function in a society where science has a major role and impact on everyone's personal, social and global life (Harlen, 1999). The importance of the scientific process skills have been revealed with various studies. For instance, relations have been found to exist amongst reading and comprehension skills, oral and written communication skills, language development and learning, problem solving skills in math and scientific creativity and scientific process skills (Simon and Zimmerman, 1980; Mechling and Oliver, 1983; Ostlund, 1998; Aktamış and Ergin, 2007). Another area regarding the cognitive process skills is the mental development process of individuals. The studies have proven that there is a positive relationship between science process skills and Piagetian development level. Also that has been proven that there is a close link between cognitive development and science process skills. Studies by Tobin and Capie (1982), Padilla et al. (1983), Brotherton and Preece (1995) revealed that there is high correlation (r=0.73) between integrated science process skill and formal thinking abilities. The cognitive styles which are the subject of this study are similarly the important individual characteristics that can affect the students' usage of integrated science process skills. So, the study examines the identifying variables, formulating hypotheses, manipulating variables and interpreting data skills of the students of different cognitive styles. In this study, identifying variables, formulating hypotheses, manipulating variables and interpreting data skills were investigated.

Nowadays, another variable which should be attended to during the education-teaching process is the issue of individual differences. Individual differences are those variables which arise from mental, physical, environmental, cultural, economic and emotional reasons (Küçükahmet, 1997). Among most of the widely researched individual differences are gender, attitudes, thinking skills, cognitive styles, intellect areas and motivation types (Ateş and Karaçam, 2010; Çelik, 2010). One of the individual differences subject to this study and others is cognitive styles.

The concept of "Cognitive Style" which was initially advanced by Allport (1935) has been defined as "the name given to an individual's general and customary problem solving manner, thinking, perceiving and recollecting" (As quoted in: Ongun, 2006). In the ensuing years, cognitive styles have drawn the attention of many researches and were the subject of numerous studies.

Cognitive styles are the personal methods which individuals prefer to collect information, and organize, interpret, analyze, assess, save and use these collected information (Wapner and Demick, 1991; Harrison and Rainer, 1992). Based on the knowledge obtained from numerous studies using various theoretical and techniques, many cognitive styles are being suggested today. Examples which seem to have attracted most research attention and known widely are: reflection-impulsivity, field dependence–independence, holist–serialist, and deep-level/surface-level processing (Güven, 2007). Whereas, the subject of this study are "field dependent" and "field independent" styles defined by Witkin and Goodenough (1981).

Individuals are unable to perceive identically the events occurring in their environment. While some individuals consider events by abstracting them from the environment, some individuals exhibit the inclination to evaluate events in the environment in which they occur. In order to express these differences and in terms of cognitive styles, individuals may be categorized in two groups in accordance with the Field Dependence-Independence Theory advanced by Witkin and Goodenough (1981). If the individuals acquiring information are able to perceive by distinguishing that information from other surrounding information, components and the whole, then these individuals are defined as "field independent". These individuals are more analytic and demonstrate an inclination for analytic approach in problem solution (Bacanlı, 2003; Çakan, 2005).

Individuals possessing field-independent cognitive style do not exhibit an inclination with trust towards the field in their behavior (that is, towards other people or the environment).These people focus on the components rather than the whole. They are very good in distinguishing the differences contained in the whole. While learning, they pay attention to the details. They are inclined to evaluate each event separately. For this reason they may also exhibit a weakness in determining what a single event might mean in terms of the whole. They enjoy working alone. In discussions, they trust their own ideas and not those of others. They are unable to establish good relationship with others and are inclined to hide their feelings. But they possess greater certainty in their personal perceptions. Generally, they prefer studying science, mathematics and engineering (Liu, 2003; Şimşek, 2006). According to the studies of Witkin, field-independents trust innate cues and are more autonomous in cognitive restructuring tasks (DeTure, 2004).

Individuals with field-dependent cognitive style exhibit an inclination with trust towards the field in their behavior (that is, towards other people or the environment). These individuals approach problems in more general terms and perceive information in a more holistic way. They are more successful in grasping the main theme rather than distinguishing components. They are less capable in distinguishing information components from other surrounding information and elements (Witkin and Goodenough, 1981). Persons with field-dependent cognitive style focus on the whole while perceiving the outside world and see the big picture first. For this reason they do not immediately notice the components contained in the whole. Rather than seeing singular events, they are fairly good at seeing the general situation caused by various events. They enjoy sharing feelings and listening to others. They are successful in social relationships. They do not enjoy working alone and prefer friendship circles and team-work. While acquiring knowledge they trust others. They are more successful in social sciences (Liu, 2003; Çakan, 2005; Şimşek, 2006). At the same time, field-dependent individuals are less autonomous and have larger trust in others. In cognitive restructuring tasks they are dependent on external environment (DeTure, 2004).

As advised in the Science and Technology Curriculum of Turkey, teachers are required to be attentive to individual differences as much as possible. Field dependence or independence may also be seen as individual differences in the perception dimension (Tinajero et al., 2011). Since cognitive styles are the preferred methods of individuals in knowledge acquisition, using and preserving, they can be listed among the important individual differences. When these differences which develop over a long period and not easily modified are taken into consideration, identification of students' cognitive styles during education process are important from the perspective of students' outcomes targeted by the Science and Technology Curriculum (Horzum and Alper, 2006; Altiparmak, 2009).

In this study, the achievements of the first year high school students in identifying manipulated, responding and controlled variables, and formulating hypotheses, manipulating variables, interpreting data skills will be compared by their cognitive styles. Thus, it will be researched whether or not the cognitive processes of the students make any difference by their cognitive styles.

In this respect, answers to the following sub-issues shall be sought:

1. Which cognitive styles are possessed by 1st year high school students?
2. What are the levels of 1st Year high school students in identifying and controlling variable, formulating hypotheses and interpreting data skills?
3. Do the 1st Year high school students' SPS exhibit differences according to their cognitive styles?

METHODOLOGY

Research model

In this study, integrated science process skills of the students with the field dependent and field independent cognitive styles were compared using the relational scanning model, which aims is to describe a current situation in its current condition. The relational skills models which are one of the general scanning models are the investigation models which aim to determine any presence and/or degree of together-change amongst two or more variables (Büyüköztürk et al., 2009; Karasar, 2011). According to Çepni (2007) the researches in such research models investigate the relations amongst the variables and they make comparisons amongst the situations consisting of at least two variables in order to achieve it. Variables considered in this study are: SPS (*variables identification, changing and controlling of variables, Formulating hypotheses, and interpreting data skills*) and cognitive styles (*field dependent and field independent*). In consideration of these variables, students have been categorized according to their cognitive styles. Furthermore, the integrated science process skills of the students were compared by their cognitive styles.

Participants

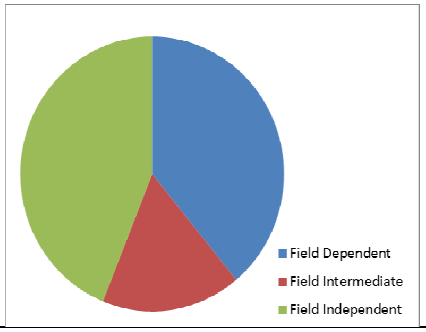
The participants were high school students in the Cappadocia region of Turkey. Sample is a total of 496 students (285 female, 211 male) from 7 different high schools (Science, Anatolian and Anatolian Teacher high schools). The participants of this study consist of high school freshman which have completed primary education and not yet chosen a field.

Data collection tools

In order to measure SPS of students, Science Process Skills Assessment Test (SPSAT) developed by Temiz (2007) has been used in this research. SPSAT is a question pool consisting of multiple format items developed for measuring 1st year high school students' variable identification, formulating hypotheses, variables modification and control, data recording (table formation), graphical representation and graph interpretation skills. SPSAT comprises six modules in total. *Module-1*: 60 multiple choice questions to measure variable identification and formulating hypotheses skills, *Module-2*: 30 questions (5 open ended, 25 multiple choice) to

Table 1. Cognitive styles distribution of sample workgroup.

Cognitive styles	f	%
Field Dependent	189	39.0
Field Intermediate	83	17.1
Field Independent	213	43.9
Total	485	100
Missing	11	



measure controlling and manipulating variable (designing an experiment) skills, *Module-3*: 8 open ended questions to measure constructing data table skills, *Module-4*: 8 open ended questions to measure graphical representation skills, *Module-5*: 55 multiple choice questions to measure graph interpretation skills, and *Module-6*: 10 open ended questions to measure identifying variables and formulating hypotheses skills. SPSAT has been developed by pilot applications conducted on 1584 students at 1st year high school level. In order to verify the tests, studies for content, construct and criterion validity were done, and in order to examine their reliability, internal consistency analyses, inter-rater reliability analyses and test-retest reliability studies were also done. Detailed statistics concerning the test development process are given in the unpublished doctoral dissertation titled "Science Process Skills Measurement in Physics Teaching" (Temiz, 2007). The SPSAT test used in this study comprises 16 questions from Module-1, 4 from Module-2, and 10 from Module-5 of SPSAT. Some examples of these questions are presented in Appendix 1. Against the possibility of respondent unfamiliarity with terms *responding variable*, *manipulated variable*, and *controlled variable*, an example with drawing has been given in the test directive. Mentioned terms are described in the example given.

SPS test reliability analysis has been examined by calculation of internal consistency coefficient(s). SPS test Cronbach's Alpha internal consistency coefficient has been calculated as 0.882 for the sampling.

Determinations of individual cognitive styles were done with the group embedded figures test (GEFT) developed by Witkin et al. (1977). In GEFT, respondents are required to identify an embedded figure in a complex drawing and outline its perimeter with a pencil. Participants are classified as field dependent or independent on the basis of results obtained (DeTure, 2004). In this study, GEFT has been used to identify the cognitive styles of students (field dependent, field independent and median-field dependent). Test's adaptation to Turkish language has been done by Bahar (2003). In the test; there are a total of 20 complex diagrams distributed as 2 per page. The last page of the test provides the embedded answer figures. Each question diagram contains only one embedded figure. Two example diagrams and figures were provided on the first page of the test.

GEFT's reliability analysis was examined with the calculation of internal consistency coefficient. Cronbach's Alpha internal consistency coefficient for sampling has been calculated as 0.815.

Data collection process

Data collection tools used in the study was applied at the beginning of the semester in 2010 to 2011 academic year at the seven high schools located in the Cappadocia Region of Turkey. SPS test application session was 45 min. In the GEFT application session, a total of 20 min were given, 1 min for each question. Students were given information on tests prior to an application. The GEFT and SPS tests were carried out on different days in order for the students not to get bored by the consecutive tests and help them answer the tests correctly. All sessions were conducted in person by the researchers.

In calculation of students' SPS successes, a score of 1 was given for each correct answer, and total scores obtained from related items for each skill was calculated to form the skills score.

GEFT correct answers (that is, identified figures in diagrams) were scored as 1. GEFT contains 20 items; therefore maximum score possible for figure identification task is 20 points. These scores are evaluated and cognitive classification is achieved. The formula ($\bar{X}$ ± 0.25 SD), where 'SD' is standard deviation, suggested by Alamolhodaei (1996) was utilized in the classification. Excel and SPSS 15.0 software packages were used in the statistical analyses relating to SPS and GEFT scores.

FINDINGS

Which cognitive styles are possessed by 1st year high school students?

Initially, students in the sample group were classified as field-dependent and field-independent according to their cognitive styles. During this categorization, arithmetic mean ($\bar{X}$ =13.48) of GEFT scores and standard deviation (SD=4.05) was calculated. Later, in accordance with Alamolhodaei (1996) formula, interval upper limit 14.49 and lower limit 12.47 were found. Cognitive styles of students were determined according to these intervals are shown in Figure 1.

Student categorization was done by locating the total GEFT score obtained within the interval range. Those with total GEFT score greater than 14.49 were accepted as *field independent*, and those lesser than 12.47 were deemed *field dependent*. Students whose test scores were within the range of 12.47 to 14.49 have been qualified as *field intermediate* cognitive style. Table 1 exhibits the cognitive styles distribution.

According to data in Table 1, while *field independent cognitive* style students form greater sector with 43.9%, minority is held by *field intermediate cognitive style*

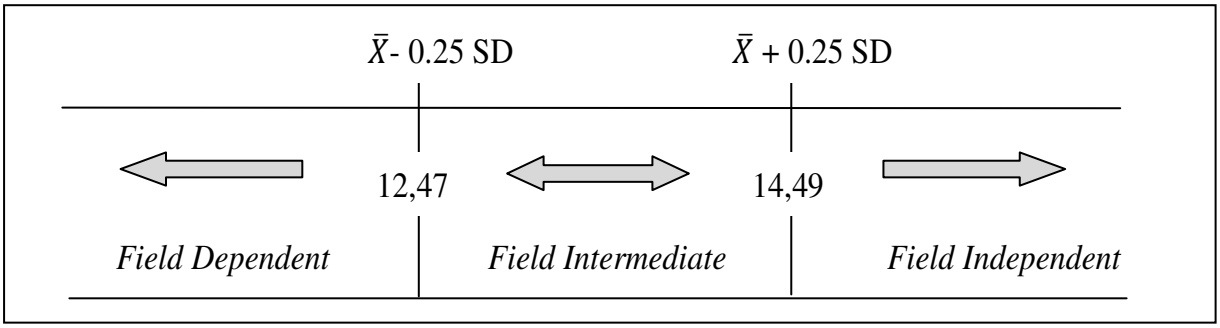


Figure 1. Cognitive style determination according to GEFT score.

students with 17.1%. Since this study, as in numerous others (Alamolhodaei, 1996; Ateş and Karaçam, 2005, 2010; Ateş and Çataloğlu, 2007) will only consider the score ranges of cognitive style students in both ends, field intermediate section shall be ignored.

What are the levels of 1st year high school students in determining manipulated variable, responding variable, controlled variable, and formulating hypotheses, control and interpreting data skills?

SPS test successes of students have been identified separately for each skill. Skill success scores of students have been calculated on the basis of 100 points and descriptive statistical functions have been applied. These statistics are given in Table 2.

When Table 2 data are examined, it can be seen that the average scores of students in different SPS exhibit variations. The highest performing skill in the workgroup is "*Formulating Hypotheses*" and the lowest is "*Identifying Controlled Variables*" skill. Average scores calculated for each skill was used in the score interpretations of field dependent and field independent groups.

Do the 1st year high school students' SPS exhibit differences according to their cognitive styles?

SPS test scores of students categorized as field dependent and independent according to cognitive style are calculated separately for each skill. Distributions of scores according to cognitive styles are shown in the Figure 2.

It can be seen in Figure 2 that the average scores (in all SPS) of the field independent group is higher than that of field dependent group. According to this, the field independent group is more successful than field dependent group in variables identification, formulating hypotheses, manipulating and controlling variables and interpreting data. When successes of both groups are examined on the basis of their SPS, it can be seen that highest performing skill is *formulating hypotheses*, and the lowest is *identifying controlled variables*.

In order to examine whether students' SPS exhibited any variations according to their cognitive styles, an independent samples t-test has been applied. These statistics are presented in Table 3.

According to the statistics exhibited in Table 3, the field independent group scored higher average points in all skills as compared to the field dependent group. These variations are observed to be statistically meaningful in terms of responding variable identification, controlled variable identification, Formulating hypotheses, variables modification and control skills. Additionally, when the average scores given for the entire workgroup in Table 2 are compared on the basis of both groups, it can be seen that the field independent group is higher than average in all skills, whereas field dependent group is below the average.

DISCUSSION

Information acquisition, utilization and preservation preference variations of individuals possessing field dependent and field independent cognitive styles have also exhibited themselves in this study. According to this exhibited variance in the workgroup, SPS successes of field independent cognitive style students are higher as compared to the field dependent students. Differences in favor of field dependent students have been established in six skills considered within this investigation. This striking result is discussed below with their different dimensions in consideration of cognitive style characteristics possessed by both groups.

Differences in acquiring and processing knowledge

According to Saracho (1988), although there is no significant difference between field dependent and field independent individuals in terms of cognitive capacity, there are some differences in their information acquisition and processing styles. For instance, according to Coffey

Table 2. Science process skill success of sample workgroup.

Science process skills	N	Mean	SD
Identifying manipulated variable	486	72.07	37.93
Identifying responding variable	486	70.42	39.17
Identifying controlled variables	486	63.84	39.91
Formulating hypotheses	486	77.16	35.43
Fair testing/manipulating variables	486	74.18	35.82
Interpreting data	486	68.11	31.37

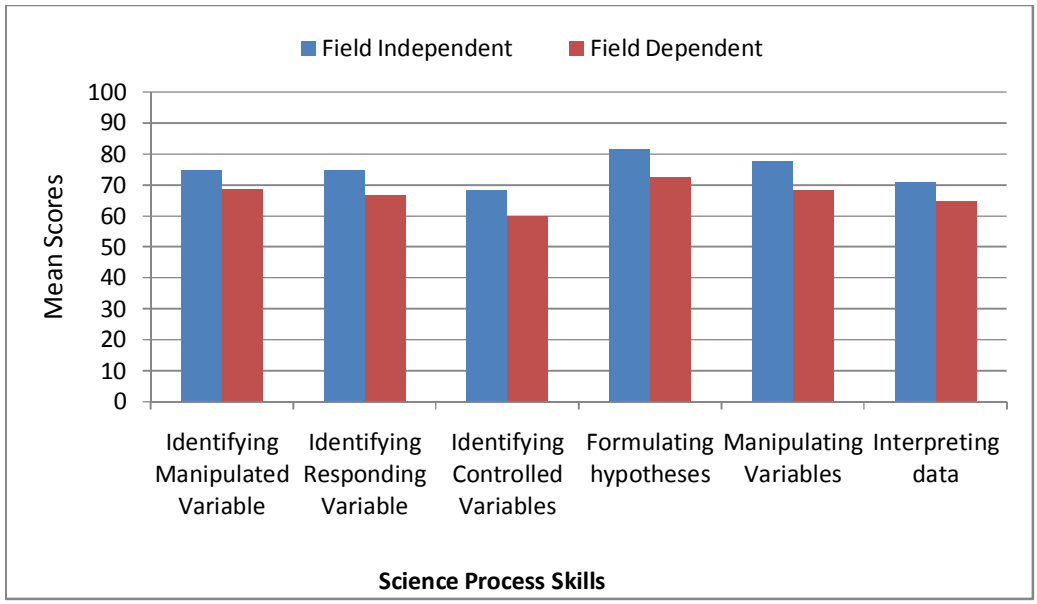


Figure 2. Distribution of mean SPS scores according to cognitive styles.

Table 3. Independent samples t-Test.

SPS	Cognitive styles	N	Mean	SD	t	FD	p
Identifying manipulated variable	Field dependent	186	68.55	38.36	1.626	394	0.105
	Field independent	210	74.76	37.57			
Identifying responding variable	Field dependent	186	66.40	40.60	2.026	394	0.044*
	Field independent	210	74.40	37.68			
Identifying controlled variables	Field dependent	186	59.81	39.61	2.097	394	0.037*
	Field independent	210	68.21	39.94			
Formulating hypotheses	Field dependent	186	72.58	36.50	2.455	394	0.015*
	Field independent	210	81.31	34.22			
Fair testing/manipulating variables	Field dependent	186	68.28	36.42	2.521	394	0.012*
	Field independent	210	77.38	35.36			
Interpreting data	Field dependent	186	64.91	31.16	1.794	394	0.073
	Field independent	210	70.64	32.16			

*p<0.05.

and Canas (2001), while field-dependent individuals process information in an integral and passive manner, field-independent individuals divide the information into pieces and analyze the relations amongst them and process the information in a different way. Additionally, while field dependent cognitive style individuals prefer ready informational structures, field independent students prefer to reach information after investigation. Because, field dependent individuals have less self-confidence, and since their cognitive restructuring abilities are limited, they are defined as passive students who accept what is presented to them without questioning. In contrast, since field independent individuals are more self-sufficient, they prefer active involvement in acquiring information (Riding and Cheema, 1991; Altun, 2003). Field-dependent individuals tend to be more passive and rule-based. So, field independent individuals are more skillful than the field-independent ones in terms of analytical thinking and cognitive restructuring during the course of information process (Frank and Noble, 1985). In science, the process skills, which are methods of achieving information, are also defined as skills enabling students to be active and developing responsibility for self-learning (Çepni et al., 1997). Results obtained in this study point at SPS success difference between the two groups. It may be considered that these differences arise from the reasons described above.

Attitudes towards to science

Some researchers compared the academic successes of field dependent and independent students in various science courses. Generally, the findings of these studies manifested that in some courses containing mathematics and science the field independent students were more success-ful than field dependent students (Horzum and Alper, 2006; Karaçam and Ateş, 2010). According to Green (1985), cognitive styles of individuals also affect their career choices. Field dependent individuals are generally more inclined towards careers relying on social communication and relationships. Whereas, field independent individuals are inclined towards careers (engineering, doctor, biologist, etc.) (Witkin et al., 1977). According to Şimşek (2006), in comparison to scientific fields of mathematics, physics, chemistry and biology, there are more field dependent students in social sciences. As the inclination of field independence increases, so does the interest in abstract and analytic fields. Inclination characteristics of field independent individuals to sciences may be another factor in explanation of SPS success difference identified by this study.

Problem solving abilities

SPS do not only provide students with scientific information but at the same time learning of these skills assist them in logical thinking, asking reasonable questions and seek answers, and in problem solving confronted in their daily lives (Germann, 1994). According to Carin and Bass (2001), SPS essentially form the basic foundation of thinking and are used in problem resolution in other areas as much as in science. Science processes are mental and physical skills used in gathering information, organizing collected data by various methods, explaining extraordinary situations and in problem resolution. Based on this definition, the reason for the success of field independent group in SPS may be explained. Because, there are also some problem resolution behavior differences among individuals with field dependent and field independent cognitive styles. According to Çakan (2005), field independent individuals perceive information apart from surrounding data, components or the whole and this provides them with an ability to approach problems analytically. Whereas field dependent individuals approach problems in more general terms and perceive information in a wider scope and conceive it more holistically. They are less successful in separating information components and distinguishing them from other information and elements. The behavioral differences in approaching and resolving problems among field dependent and independent individuals mentioned above may also be used in explaining variances in SPS success.

CONCLUSION

In this study an investigation is done to determine whether 1st year high school students' success in identifying manipulated, responding and controlled variables, and formulating hypotheses, manipulating variables, interpreting data skills exhibit variations according to their field dependent and independent cognitive styles. Following findings were obtained:

When the cognitive styles of workgroup participant students were examined three groups, i.e., field dependent, field independent and field intermediate individuals were identified. Two larger groups similar in size comprise field dependent and field independent cognitive style students. Intermediate field students were in the minority. When it is considered that the sample consisted of 1st year students who hadn't yet elected a field of study, the approximately balanced distribution of students in terms of their cognitive styles is an expected result.

SPS test was used to determine the SPS levels of sample student workgroup in identifying manipulated, responding and controlled variables, formulating hypotheses, variables manipulation and control, interpreting data. Test scores were calculated in a scale of 100 points separately for each skill. When the scores were evaluated and interpreted, it can be stated that students demonstrated success in upper mid-level in identifying

manipulated variable, responding variable, controlled variable, as well as formulating hypotheses, in manipulating variables and interpreting data skills.

In the sample workgroup, SPS scores of students were examined in terms of whether they showed variations according to cognitive styles. In this respect, students' SPS scores in identifying variables, formulating hypotheses, manipulating variables and interpreting data skills were compared according to their cognitive styles. As a result of this comparison, in all SPS investigated, it was observed that field independent students were more successful than field dependent students. The results of independent samples t-test done demonstrated that the differences were statistically meaningful in skills of responding variable identification, controlled variable identification, formulating hypotheses, manipulation of variables and controlling.

Individual differences are variables which should be taken into consideration during the planning of education-teaching process. Cognitive styles also subject to this study are among the individual differences such as gender, thinking skills, learning skills, areas of intellect, motivation styles widely dealt with and defined in literature. Cognitive styles which encompass perception differences in knowledge (information) attainment and processing by individuals are also exhibited in SPS which are an important component of sciences. These differences should be taken into consideration in planning of science activities to be conducted with field dependent and field independent individuals. Especially, for the development of SPS of field dependent individuals, appropriate cooperative learning activities which conform to their cognitive styles, such as think-discuss-share, jigsaw, group investigation, brain storming, teamwork within age groups can be employed.

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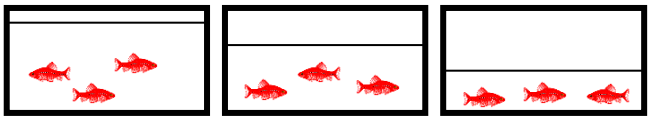
Appendix 1: Sample SPSAT questions

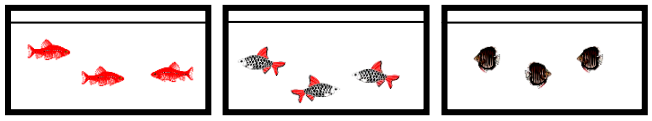
5) Which following experiment set is appropriate to test the hypothesis? As "if the number of fish in an aquarium increases, the rate of pollution of aquarium water will also rise"

a

b

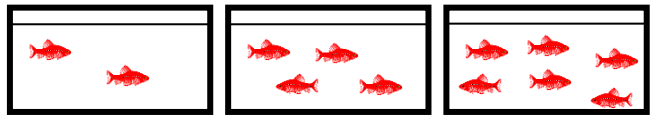


c

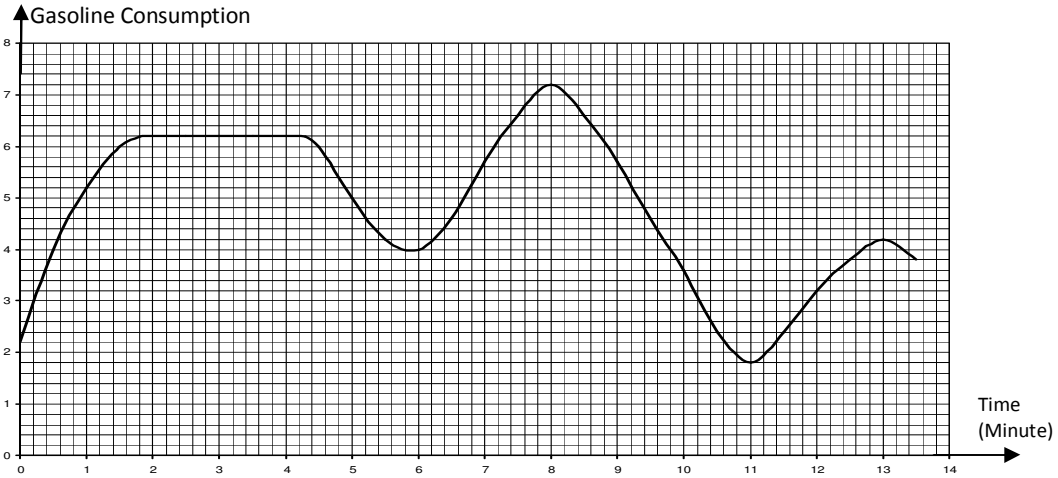


d

e



The following graphic shows the amount of gasoline consumption of a car per every minute. Please answer the questions 21, 22, and 23.



21) Which moment is the highest the gasoline consumption of a car?
a) Second minute b) Fifth minute c) Sixth minute
d) Eighth minute e) Eleventh minute

22) In the following pair of minutes, the fuel consumption values are the same?
a) 6 and 11 b) 0.8 and 9.8 c) 0.4 and 10
d) 10.4 and 12 e) 3 and 7

23) Which moment is the lowest the gasoline consumption of a car?

a) Zero minutes b) Second minute c) Sixth minute
d) Eighth minute e) Eleventh minute