academicJournals

Vol. 8(12), pp. 890-896, 23 June, 2013
DOI: 10.5897/ERR2013.1415
ISSN 1990-3839 ©2013 Academic Journals
http://www.academicjournals.org/ERR

Educational Research and Reviews

Full Length Research Paper

A comparision between gifted students and non-gifted students' learning styles and their motivation styles towards science learning

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Accepted 11 April, 2013

This study compared the gifted students and nongifted students' learning styles and their motivation styles toward science learning. In accordance with this purpose, this research was based upon thirty gifted students, who were selected by a specially-designed exam throughout Turkey and have been educated in ASTC (Art and Science Training Center for Gifted Students), and two hundred fifty nongifted students who have been educated in sixth, seventh and eighth grades of primary schools. In this research, learning style scales and motivation toward science learning questionnaire were used as the data collection tool. The data analysis shows that there are significant differences between the gifted students and nongifted students' learning styles and their motivation styles toward science learning. It was determined that participative learning style had the highest average number among the gifted students whereas competitive learning style had the highest average number among the nongifted students. Furthermore, both the gifted students and nongifted students' achievement-oriented learning style had the highest average number.

Key words: Gifted students, nongifted students, learning styles and motivation styles.

INTRODUCTION

Every child has the right to be educated and grow up safely. No matter what level of skills the child has, every child has the right to an education that develops his/her own capacity. However, the students called "gifted" differ noticeably from their peers regarding their skills and abilities. Generally "gifted" is the definition of the students that have 130 scores on the IQ tests (According to IO scores; 130 to 144 moderate gifted, 145 to 159 highly gifted and 160 to 179 exceptionally gifted). But today, in parallel with the current criticism of intelligence tests and the changes concerning the definition of intelligence, intelligence tests alone are not solely accepted to identify gifted students. Kokot (1999) defined giftedness as having awareness, sensitivity and skills in order to understand and transfer the emotional and cognitive experiences related to their peers. According to Feldhusen (1986) giftedness is the product of motivation, general ability and personal consideration. According to Maker and Nielson (1996), gifted students have an extraordinary capacity by having a special ability to understand easily and fast, understand the knowledge, gain, continue, integrate and improve the skill, having a problem solving skill when they face a hindrance to achieve a certain goal and having extraordinary ability to challenge, having a high- level ability when considering alternatives and possibilities. According to U.S. Depart-ment of Education highly-gifted children and youth with outstanding talent perform or show the potential for

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performing at remarkably high levels of accomplishment when compared with others their age, experience, or environment. These children and youths exhibit high performance capability in intellectual, creative, and/or artistic areas, possess an unusual leadership capacity, or excel in specific academic fields (Posner and Rudnitsky, 1994).

The aim of education is to improve the cognitive, affective and psychomotor skills as a whole. Research shows that not only the cognitive skills but also affective skills are important for being successful students (Alsop and Watts, 2000; Thompson and Mintzes, 2002). Each student preferentially takes in and processes information in different ways. In other words, every student has different learning styles. While some students tend to focus on the facts, data and algorithms, some students learn easily with notions and mathematical models. While some students prefer visual forms such as pictures, diagrams and images, some students prefer verbal forms including mostly written and verbal statements. When some students prefer active and interactive learning, some prefer individual and self-motivated learning (Felder, 1996). Dunn and Dunn (1986) defined learning style as the way individuals begin to concentrate on, process, internalize and retain new and difficult information (Dunn and Dunn, 1986). According to Keefe (1990) a learning style is a relatively consistent set of strategies how a student perceives, interacts with and responds his/her learning environment including cognitive, affective and psychological components of learning. Felder and Silverman (1988) stated that learning styles are characteristic preferences of the students for taking in, retaining and processing the information. Willing (1988) asserted that learning styles are innate, intrinsic and preferable learning methods. Jonassen and Grabowski (1993) stated that learning styles include preferences of the learners in different educational and training activities. According to Akkoyunlu (1995), identifying the learning styles of the students will help the teachers in the matter of developing suitable methods for teaching process. Baran (2000) found that there were significant differences between learning styles and department, gender, the educational background of parents. Hein and Budny (2000) pointed out that when the learning environment is designed to accommodate the learning styles of the individuals, their achievement increases.

One of the important affective factors for achievement of students is motivation. Motivation is one of the important affective factors that stimulates people to react, indicates the determination and energy of the behavior, and orientates them by providing continuity. According to Brophy (1998), motivation is a theoretical construct used to express the initiation, direction, intensity, persistence, and quality of behavior, especially goal-directed behavior. Eroglu (2000) stated that motivation directs to direct an individual's effort and activities and concentration towards organizational objectives. Köktürk et al. (2000) asserted that motivation is the factor to orientate the individual to demonstrate certain behavior under certain circumstances. Motivation, in general, can be identified as the impetus for the behaviors that lead the organism to get a certain object or the situation and the process that starts and retains, retain and canalizes the psychological and physical activity (Budak, 2003). Students who have high motivation tend to show more effort and determination in-class activities and tasks compared to students who have low motivation (Wolters and Rosenthal, 2000). Research indicates that motivation can be affected by the perception of self-efficacy, effort intrinsic goal-orientation, value of task, test anxiety, learning environment, learning goal, and learning strategies (Barlia and Beth, 1999; Brophy, 1998; Pintrich and Schunk, 1996; Tuan et al., 2005). Motivation is one of the key concepts for education (Ryan and Deci, 2000). If the motivation increases, the efficiency of teaching and learning will all increase. Therefore, motivation should not be ignored the learning environment. When preparing the learning environment, motivation and learning styles are important regarding self-efficacy, self-regulation, achievement goals and future plans of students. There is sample research about learning styles and motivation styles in the literature. Some special populations have unique learning style preferences (Dunn and Milgram, 1993). Gifted students tend to demonstrate independence, internal locus of control, persistence, perceptual strengths, non-conformity, task commitment, and high self -motivation (Dunn and Griggs, 1985). Gifted students have been found to prefer independent study and discussion while non-gifted peers prefer lectures and class projects (Ristow et al., 1986; Stewart, 1981; Watson, 1981). But there are not enough studies about the comparison the gifted and nongifted students' learning styles and motivation styles toward science learning. Putting the gifted students' and nongifted students' learning styles are important in order to facilitate their learning process. The motivation toward science learning is one of the important affective factors to predict the success of science courses for students. In this respect, detecting the factors that affect the gifted and nongifted students' achievement can be effective to pave the way for creating learning environments, planning programs and regulating students' self-learning process. In this study, the aim was to compare the gifted students and nongifted students' learning styles and their motivation styles toward science learning.

METHOD

Research model

In this research, screening model was used as a quantitative research method. Screening method is a research approach that aims to describe a situation from the past or on that still exists (Ekiz, 2003; Karasar, 2006; Yildirim and Şimşek, 2000).

Table 1. Means and standard deviations of gifted and nongifted students' learning styles.

Learning styles		N	X	SS
Independent	Gifted student	30	3.84	.575
	Nongifted student	250	3.77	.513
Avoidant	Gifted student	30	2.09	.558
	Nongifted student	250	2.80	.745
Collaborative	Gifted student	30	4.12	.719
	Nongifted student	250	3.87	.603
Dependent	Gifted student	30	4.10	.481
	Nongifted student	250	3.98	.556
Competitive	Gifted student	30	4.11	.581
	Nongifted student	250	4.01	.629
Participative	Gifted student	30	4.31	.450
	Nongifted student	250	3.96	.585

Sample

The population and sample of the research was conducted with 30 gifted students studying in Science and Art Training Center for Gifted Students and 250 students from the Siirt City Center Primary School in Turkey.

Data collection

In this research, Students Learning Styles Scales developed by Grasha and Reichmann (1994) and adapted to Turkish by Uzuntiryaki et al. (2003) and 5 point Likert type scales which consists 60 items learning styles scale were used to determine students' learning styles. Validity and reliability studies were conducted while adapting the scale into Turkish and the reliability coefficient was found to be .79. The scale consisted of six sub-levels avoidant, participative, competitive, collaborative, dependent and independent. The students' answers to the items in the questionnaire show which of the styles they have among avoidant, participative, competitive, collaborative, dependent and independent. In our study, Cronbach alpha coefficient reliability was identified as .84. In order to determine the students' motivation styles toward science learning, 33 items 5 point likert type scale which was developed by Tuan et al. (2005) and adapted to Turkish by Yılmaz and Çavaş (2007) was used. Validity and reliability studies were conducted while adapting the scale into Turkish and the reliability coefficient was found to be .78. The scale consisted of 6 sub-levels such as self efficacy, active learning strategies, science learning value, performance goal, achievement goal and learning environment stimulation. In our study, Cronbach alpha coefficient reliability was identified as .90.

Data analysis

For the data analysis, multivariate analysis of variance (MANOVA) was used to determine whether if there was a significant difference between gifted students and nongifted students.

RESULTS

The findings of the research are shown in Table 1. When Table 1 is examined, the gifted students' independent, collaborative, dependent, competitive and participative learning skills ratio are found to be higher than the nongifted students; yet, nongifted students' avoidant learning style ratio is higher than the gifted students. It is determined that the gifted students' highest learning style ratio is participative learning style (X=4.31) and the lowest learning style ratio is avoidant learning style (X=2.09). Nongifted students' highest learning style ratio is competitive learning style (X=4.01) and lowest learning style is passive learning (X=2.09) is found.

As seen in Table 2, it is tested by the multivariate analysis of variance whether the difference between gifted and nongifted students learning styles average is statistically significant or not and the averages are found to be significantly different (Wilks Lamda =.89, F=5.338; p<.001).

As seen in Table 3, there is a significant differentiation between gifted and nongifted students' participative (F=10,339; p< .01), collaborative (F=4.627; p<.05) and avoidant (F=25,399; p<.01) learning styles. Whereas, there is no significant differentiation between independent (F=.400; p>.05), dependent (F=1.405; p>.05) and competitive (F=.662; p>.05) learning styles.

When Table 4 is examined, it is determined that gifted students' motivation styles toward science learning are higher than nongifted students. Gifted students'

Table 2. Gifted and nongifted students' learning styles multivariate analysis of variance (MANOVA) results (Box's M:42.337; F=1.862; p<.05).

	Value	F	Hypothesis SD	Error SD	p
Pillai's Trace	.105	5.338	6.000	273.000	.000
Wilks' Lambda	.895	5.338	6.000	273.000	.000
Hotelling's Trace	.117	5.338	6.000	273.000	.000
Roy's Largest Root	.117	5.338	6.000	273.000	.000

Table 3. Gifted and nongifted students' learning style linearly independent pairwise comparisons test results.

		KT	SD	KO	F	p
Independent	Contrast	.108	1	.108	.400	.528***
	Error	75.303	278	.271		
Avoidant	Contrast	13.476	1	13.476	25.399	.000*
	Error	147.498	278	.531		
Collaborative	Contrast	1.758	1	1.758	4.627	.032**
	Error	105.646	278	.380		
Dependent	Contrast	.423	1	.423	1.405	.237**
	Error	83.767	278	.301		
Competitive	Contrast	.258	1	.258	.662	.416***
	Error	108.526	278	.390		
Participative	Contrast	3.389	1	3.389	10.339	.001**
	Error	91.111	278	.328		

*p<.01; **p< .05; ***p>.05.

achievement goal, active learning strategies, science learning value, performance goal and learning environment stimulation motivation styles are higher that nongifted students; whereas, nongifted students' self efficacy motivation style is found to be higher than gifted students. Gifted and nongifted students' highest motivation style toward science learning is found as achievement goal and the lowest motivation style as self efficacy.

As seen in Table 5, the differentiation found between averages of gifted and nongifted students' motivation styles toward science learning was tested for significance and was found to be significantly different from each other. (Wilks Lamda =.74, F=15,639; p<.001).

As seen in Table 6, it was found that there is a significant differentiation between active learning strategies (F=14,495; p<.01), self efficacy (F=34,704; p<.01), achievement goal (F=11,015; p<.05) and science learning value of gifted and nongifted students' motivation styles toward science learning; whereas, there was no significant differentiation between performance goal (F=,506; p>.05) and learning environment stimulation (F=2,328; p>.05) motivation styles.

DISCUSSION AND RECOMMENDATIONS

Identifying the factors that affect the success of the students is one of the main issues of the science teaching research. The research shows that not only the cognitive skills but also affective skills are important for the success of students (Alsop and Watts, 2000; Duit and Treagust, 2003; Thomson et al., 2002).

The object of this study was to compare the gifted and nongifted students' learning and motivation styles, which are the elements of important affective skills that affect their science learning success. This research found that gifted students' participative, cooperative, competitive, independent and dependent learning styles are higher than nongifted students. While it was determined that participative learning style had the highest average number among the gifted students, competitive learning

Table 4. Means and standard deviations of gifted and nongifted students' motivation styles toward science learning.

Motivation styles		N	X	SS
Self efficacy	Gifted student	30	2.54	.385
	Nongifted student	250	3.47	.854
Active learning strategies	Gifted student	30	4.67	.439
	Nongifted student	250	4.12	.770
Science learning value	Gifted student	30	4.46	.662
	Nongifted student	250	4.09	.825
Performance goal	Gifted student	30	4.17	.731
	Nongifted student	250	4.06	.848
Achievement goal	Gifted student	30	4.68	.435
	Nongifted student	250	4.21	.752
Learning environment stimulation	Gifted student	30	4.15	.813
	Nongifted student	250	3.89	.878

Table 5. Gifted and nongifted students' motivation styles toward science learning multivariate analysis of variance (MANOVA) (Box's M:114.808; F=5.050; p<.05).

	Value	F	Hypothesis SD	Error SD	p
Pillai's Trace	.256	15.639	6.000	273.000	.000
Wilks' Lambda	.744	15.639	6.000	273.000	.000
Hotelling's Trace	.344	15.639	6.000	273.000	.000
Roy's Largest Root	.344	15.639	6.000	273.000	.000

Table 6. Gifted and nongifted students' motivation styles toward science learning linearly independent pairwise comparisons test results.

		KT	SD	KO	F	p
Self-efficacy	Contrast	23.240	1	23.240	34.704	.000
	Error	186.162	278	.670		
Active learning strategies	Contrast	7.998	1	7.998	14.495	.000
	Error	153.400	278	.552		
Science learning value	Contrast	3.580	1	3.580	5.461	.020
	Error	182.264	278	.656		
Performance goal	Contrast	.355	1	.355	.506	.477
	Error	194.848	278	.701		
Achievement goal	Contrast	5.807	1	5.807	11.015	.001
	Error	146.556	278	.527		
Learning environment stimulation	Contrast	1.769	1	1.769	2.328	.128
	Error	211.275	278	.760		

style had the highest average number among the nongifted students. According to that result, it can be said that gifted students are eager to learn the content of the course; they take the responsibility of providing information out of the class, they like sharing the acquired information if asked and they show the effort of meeting the expectations of the teachers. When it comes to nongifted students, it can be said that they prefer teacher-centered learning, they compete with the other students to be more successful, to be rewarded or to draw the teachers' attention; they propose to have higher scores by preparing the materials better than the other students. This study indicated that there is a significant difference between the gifted and nongifted students' collaborative, participative and avoidant learning styles. In similar studies, Lee and Siegle (2008) stated that there is a significant difference between the gifted students and nongifted students' learning styles. Chan (2001) asserted that gifted students prefer mostly the independent learning style compared to the nongifted students. Rayneri et al. (2003) pointed out that gifted students prefer tactile learning style. According to Pyryt et al. (1998) gifted students prefer independent, self-motivated and a tactile learning approach. In her study, Altun (2010) stressed that there was a significant differentiation between the gifted students' visual and tactile learning styles and their academic success. In their study among nongifted primary students, Yazıcı and Sulak (2008) found that the students prefer diverger and assimilator learning styles. In their study among nongifted secondary school students, Uzuntiryaki et al. (2003) found out that students prefer the dependant, participative and competitive learning styles. Kabadayı (2004) found in their research that nongifted primary students have introverted, sensing, feeling and judging learning styles in the result of the research. Güven (2004) pointed out that there is a significant relation between monitoring-affective learning strategies and learning styles of nongifted secondary school students.

This study indicated us that the average of the motivation styles toward science learning of the gifted students is higher than the nongifted students. A significant differentiation was found between the gifted students and nongifted students' motivation toward science learning. In the conducted studies in a similar field, Skollingsberg (2003) stated that the inner motivation of gifted students is on high level; however, the inner and outer motivations of the nongifted students are on middle level. Bolat (2007) determined that there is a significant relationship between the motivation toward science and technology course learning of the primary school students and their academic success. Phillips and Lindsay (2006) indicated that both inner and outer motivations of the gifted students affect these students' success. The results showed that both the gifted students and nongifted students' achievement-oriented learning style has the highest average number, but the self-efficacy motivation has the lowest average number. In respect of this result, it can be said that their satisfactory motivation is high when their competence is getting higher in the learning process and their self-efficacy is low concerning about the failure of science projects/tasks for both group of students. In conclusion, the data analysis showed that there was a significant difference between the gifted students and nongifted students' learning styles and their motivation styles toward science learning. With reference to that information, these are suggested:

1. Gifted students' and nongifted students' learning styles needs to be described and the training programs needs to be planned accordingly,
2. Gifted students' and nongifted students' motivations toward science learning needs to be described; the factors that increased the students' motivation should be actively used in the learning environments by the teachers,
3. Gifted students' and nongifted students' attitudes toward science learning, self-efficacies, academic successes, the learning styles of science literacy level and their motivations toward science learning needs to be examined to regress,
4. Between gifted students' and nongifted students' learning styles, their motivation toward science learning and their problem solving skills, critical thinking skills, active learning strategies, their value orientations need to be deeply examined,
5. The relationship between gifted students' and nongifted students' learning styles and their motivations toward science learning and independent variables such as age, gender, class, the educational background of the parents and the socioeconomic status of the family needs to be examined.

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