A study of the Correlation between Primary School Students' Reading Comprehension Performance and the Learning Styles Based on Memory Modeling

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Abstract

A review of literature on learning styles suggest that they are often focused on determining learning styles on the basis of learning preferences, while the number of studies there are fewer studies which determine learning styles on the basis of memory modeling. In addition, the number of studies on the correlation between reading comprehension skills and learning styles remains limited. Designed to determine the correlation between the former and the latter, the present study seeks an answer to whether reading comprehension skills is correlated with learning styles. The population of the study was comprised of 71 4th grade students. It employed "Reading Comprehension Test (RCT)" and "Test on Learning Styles (TLS). The study concluded that there is a slight correlation between reading comprehension skills and learning styles and that no learning style is a significant predictor of reading comprehension skills. The results suggested that learning styles do not have a significant effect on reading comprehension skills.

Keywords: Reading comprehension skills, learning styles, memory modeling

Introduction

Learning style is a conceptual structure which refers to the individual's learning characteristics on the basis of individual differences in learning. Through this construct with which one can observe learners' tendencies and formations related to their learning, judgments related to the individual's learning characteristics can be reached. While this judgment differs on the basis of growth and time (Dunn & Griggs, 1998), it yields generalizable results related to the individual's learning.

The analysis of effects of the learning material on retention of the learnt topic, which dates back to Ebinghaus (1885/1913) aims to remove the effect of previous learning in the memory on new learning (McShane, 1994, p. 161). Vester's (1991) determination of learning styles through memory modeling for the same purpose supports Einghaus' approach and determines learning styles through surveys and aims to specify the information types that the memory uses directly instead of measuring personal preferences and tendencies. Despite Looß's (2001) criticism that there will be no relationship between perception in the memory and the mind, this approach can perceptually form a learning profile by means of the information stored in the memory through visual, auditory, and kinesthetic perceptions (Vester, 1998). Contemporary brain research (Wesson, 2002) has already demonstrated that the individual's numerous acts and experiences have neuropsychological underpinnings. In their study of "Understanding Students' Differences", Felder & Brent (2005) claim that knowledge of learning styles provides an opportunity for effective teaching while misuse and misapplication of learning styles in education bring about disadvantages.

In addition to studies that focus on determining learning styles (Dunn & Griggs, 1998; Dunn, Griggs, Olson, Gorman & Beasley, 1995; Park, 2001, 2000, 1997a, 1997b; Price, 1980), there are also many studies on the correlation between learning styles and level of achievement (Collinson, 2000; Dunn & Gianitti, 1990; Jacobs, 1987; Klavas, 1993). The number of studies on the correlation between

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reading instruction and learning styles is lower than those on learning styles in general (Price, Dunn & Sanders, 1981). The former group of studies focuses on the correlation between learning styles and reading instruction (developing speaking, listening, writing and narrative skills) and achievement in reading (Aragon, Johnson & Shaik 2002; Dunn, Krimsky, Murray & Quinn, 1985; Krimsky, 1982; Dunn, Price & Sanders, 1981; MacMurren, l985; Hickerson-Roberts, l983; Matthews, 1996; French, l991; Murray, 1980; Pizzo, Dunn & Dunn, 1990; Settle, 1989; Stahlnecker, l988; Sinatra, Primavera & Waked, l986; Wade & Schuh, 2006).

It is observed that Turkish studies on learning styles at a primary school level have similar characteristics and tendencies (Erginer, 2002). The majority of the studies are based on learning styles in general, preferences, attitudes, motivation and study habits (Bedir, 2007; Erginer, 2002, 2006, 2007; Ersoy, 2003; Gurgen, 2010; Incik Yalcin, 2009; Karagoz Bolat, 2007; Ultanır & Ultanır, 2002; Usta, 2006; Vester, 1998) as well as the correlation between learning styles and level of achievement (Agca, 2006; Bilgin & Durmus, 2003; Cengizhan, 2006; Demirbas, 2001; Gezmis, 2005; Gokdag, 2004; Kilic, 2002; Koc, 2007; Kocak, 2007; Onder, 2006; Otrar, 2006; Ozbek, 2006; Oztan, 2006; Ozturk, 2007; Tezic, 1994; Usta, 2006; Yazici, 2004).

A study on the correlation between learning styles and achievement in reading and math (Braio, 1995) found that those curricula developed in accordance with learning styles help increase the level of achievement, a finding which is not surprising. Another study on 4th to 6th grade students (35 of them with a low level of achievement whereas 81 of them subject to a special instruction process) suggested that both groups experienced a significant increase in their level of achievement in reading when learning preferences (sensory preferences and preferences regarding action, seating, temperature, light, sound) and strategies were employed step by step. The study proved that the level of achievement got decreased when the approaches to learning preferences were excluded from the process. Similarly, the study by Spires (1983) concluded that a notable increase was observed in the level of achievement in reading and math when a curriculum based on learning preferences was implemented.

It is obvious that Carbo (1984) provided a different perspective on learning styles with her modeling on reading styles. It was a very useful approach to consider reading characteristics as a learning preference and to name them "reading style" as a whole, which contributed to the theory a lot. Especially studies on the correlation between learning preferences and reading that were conducted in cooperation with learning style theorists are original examples since they consider reading from a perspective based on learning preferences (Carbo, Dunn & Dunn, 1986).

A study on 2nd to 5th grade South African students (Nganwa & Mwamwenda, 1991) investigated the effect of environment preference on reading comprehension. It concluded that achievement in reading comprehension increases when the environment is arranged in accordance with students' preferences. Furthermore, it underlined that their level of achievement gets decreased when they are in an environment incompatible with their preferences.

Shea's study (1983) on the correlation between reading comprehension and learning preferences found that students with a low level of achievement in reading comprehension choose a more informal seating order whereas those with a higher level of achievement in reading comprehension can become successful in more formal environments. This finding is supported also by Hodges (1985). In this respect, it can be argued that reading comprehension skills get better developed in more disciplined environments.

When comparing sensory learning styles and reading comprehension, the results indicated that there was a relationship between kinesthetic, auditory, and visual learning styles and reading comprehension levels (Williams, 2010). Among interesting studies on the correlation between reading comprehension skills and different learning preferences are, for example, a study by DeGregoris (1986) on reading comprehension and sound preferences and another one by Pizzo (1981) on the interaction between reading comprehension and learning in acoustic environments. The latter study

yielded interesting findings concerning children's reading and learning preferences. It discovered that acoustic learning environments have a positive influence on students with a high level of achievement in reading comprehension.

Cagiltay & Bichelmeyer (2000) found that Turkish students do not prefer to get involved in cooperative learning due to the problems caused by the system based on memorization and that learning preferences are heavily shaped by culture. As for learning preferences, it is known that young children are sensitive to visual learning environments and they do not have a stable disposition towards reading and studying activities (Erginer, 2002, 2007, 2008). A review of literature suggests that the number of studies on the correlation between reading comprehension and learning styles or learning preferences is limited (Nganwa & Mwamwenda, 1991; Shea, 1983). It is hoped that the present study will fill a gap in Turkish literature, considering that it does not include any such studies. It is thought that studies on the issue will contribute to getting to know about learning characteristics of children and establishing new learning environments for them.

Methods

Study Design

The present study is designed through a quantitative method. The reliability and validity of the study was analyzed through the measuring instrument developed by the researcher. The correlation between the students' learning styles and reading comprehension skills was investigated through a predictive statistical method. The following steps were followed throughout the study:

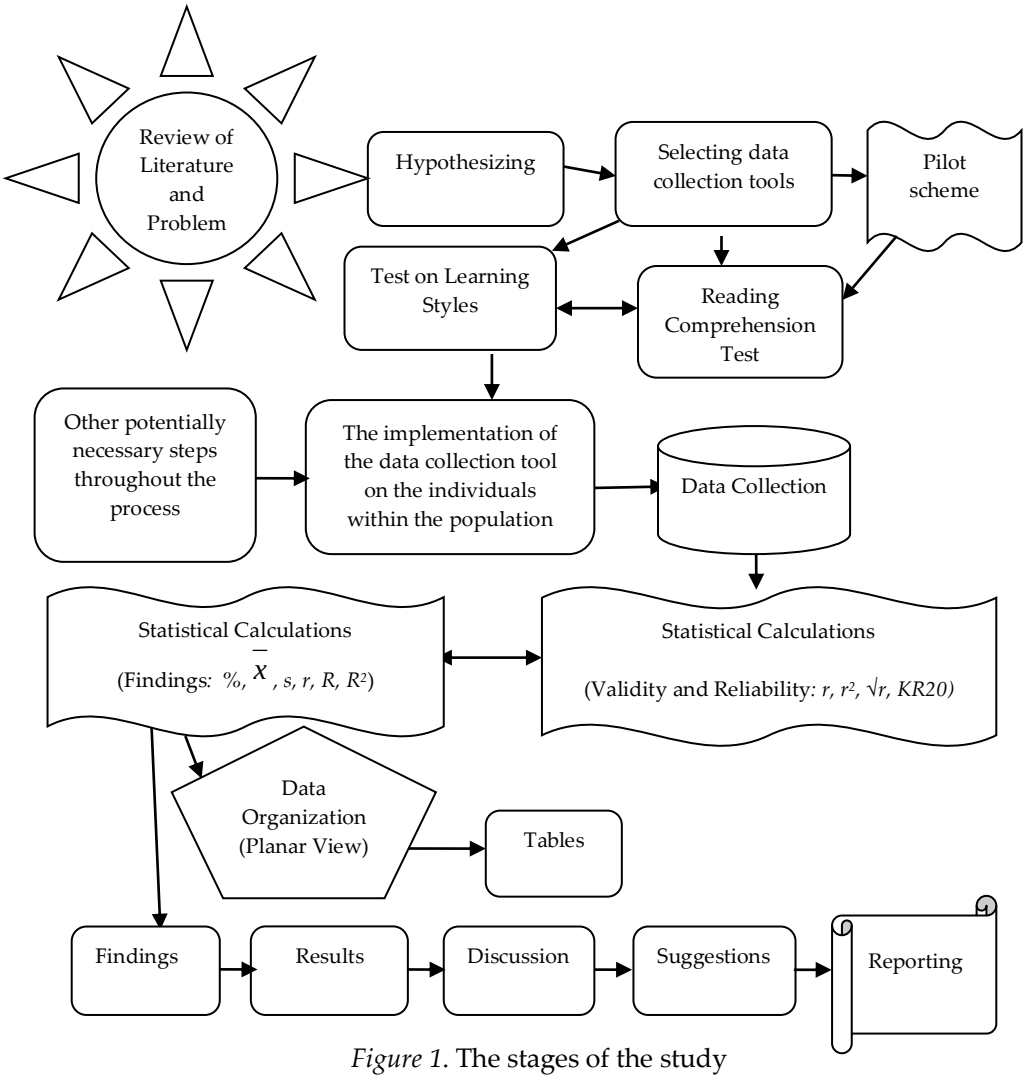

Figure 1. The stages of the study

First of all, the problem of the study was stated, which was followed by a review of literature that continued until the reporting stage. In the meantime, the pilot scheme was initiated after the data collection tool was selected. Then, the actual implementation was carried out. The statistical calculations were made, the data were analyzed and arranged, and finally the report was prepared. In cases where it was not possible to administer the measurement instruments at the same time, the learning styles test and reading comprehension test were administered at different times.

Problem of the Study

The study sought an answer to the following question:

- Is there a correlation between students' reading comprehension skills and their learning styles?

Population

The population of the study was comprised of 4th grade students. Selected through random sampling, 77 students were voluntarily exposed to The Reading Comprehension Test and their learning preferences were analyzed. The data from 71 of them were usable. When determining the sample size, some limitations were present due to difficulties in administration. Although reaching a larger size was aimed at, due to the necessity for obtaining parental consent, only children whose parents gave consent for participation in the study were included in the sample. In addition to this, due to the necessity for avoiding contact between the students, fewer participants were selected.

Measuring Instruments and Proofs of Validity/Reliability

Two measuring instruments were employed throughout the study. These were "The Reading Comprehension Test (RCT)" and "The Test on Learning Styles (TLS)".

RCT (The Reading Comprehension Test)

The test was designed by Erginer (2000). For validity purposes, learned opinion was received and a pilot scheme was carried out on a group of 30 individuals. The pilot scheme enabled the author to observe the points that the students found difficult to understand, and to finalize the items. Afterwards, the test was implemented on a group of 146 students. For reliability purposes, an item analysis and choice analysis were conducted through Henryson's method. The test contained 45 items that tested 15 different skills- three different items for each particular skill. Following the analyses, those items with a higher item discriminatory index than 0.30 were included in the test, which contained 20 items in the end. Fifteen skills and five skills were tested by one single test item and two different test items respectively.

Table 1.
Validity and reliability calculations of the reading comprehension test

Variable	$\bar{x}$	***Pj***	***Sx***	***KR-20***
Initial Implementation	21.8	.43	7.12	.81
Ultimate Implementation	10.3	.51	5.54	.90
	r	***r²***	**√*r***	***p***
The implementation in the present study	.97	.94	.98	.00*

p< .01

The mean score of the test is $\bar{x}$ = 21.8; its mean difficulty *pj*= 0.43; standard deviation*: Sx*= 7.12; and reliability: *KR-20*= 0.81 (Table 1). The reliability score suggests that the test is a homogenous one and characteristics are tested in less error. It also proves that it is good at distinguishing among individual differences. The data are supported also by the variances of the items. The mean score of the ultimate test is $\bar{x}$ = 10.3; its mean difficulty *pj*= .51; standard deviation *Sx*= 5.54; and reliability *KR-20*= .90 (Table 1). As for the implementation conducted within the scope of the present study, its test-retest reliability coefficient is *r*= .97, predictive power r^2= .94, maximum validity coefficient √*r*= .98 and significance level *p*=.01. The values provide highly strong proofs.

TLS (The Test on Learning Styles)

The Test on Learning Styles is comprised of five common modules that analyze visual, auditory, kinesthetic, reading and combined learning characteristics and the module of the box of mental procedures (Erginer, 2002, p. 194-206).

The Module of Visual Learning Style

In order to test visual learning style, the module consists of ten pictures that are free of meaning relations with each other and do not connote one another. After students look at each one of ten different pictures of objects for two seconds, the practitioner removes them and asks them to answer the questions included within the box of mental procedures in thirty seconds. In the next twenty seconds, he or she asks them which pictures they are able to recollect. The number of pictures students are able to recall is their scores in visual learning style.

The Module of Auditory Learning Style

In order to test auditory learning style, the module consists of ten words, free of meaning relations with each other and not connoting one another, which were placed on an A4 paper by using 14-font book letters. The practitioner loudly reads the words at ten-second intervals. Upon finishing reading, he or she wants students to answer the questions included within the box of mental procedures in thirty seconds. In the next twenty seconds, he or she asks them which words they are able to recollect. The number of words students are able to recall is their scores in auditory learning style.

The Module of Kinesthetic Learning Style

In order to test kinesthetic learning style, the module consists of ten objects which are free of meaning relations with each other and do not connote one another. The practitioner presents the students with the objects they are required to touch blindfold for two seconds. Afterwards, he or she wants them to answer the questions included within the box of mental procedures in thirty seconds. In the next twenty seconds, he or she asks them which objects they are able to recollect. The number of objects students are able to recall is their scores in kinesthetic learning style.

The Module of Reading Learning Style

In order to test reading learning style, the module consists of ten words, free of meaning relations with each other and not connoting one another, which were placed on an A4 paper by using 14-font book letters. The practitioner asks the students to read the words on the paper at two-second intervals. Following the reading section, he or she wants them to answer the questions included within the box of mental procedures in thirty seconds. In the next twenty seconds, he or she asks them which words they are able to recollect. The number of words they are able to recall is their scores in reading learning style.

The Module of Combined Learning Style

In order to test visual, auditory, kinesthetic and reading learning styles together, the module is comprised of picture forms, written forms on an A4 paper and object forms of ten concepts, which are free of meaning relations with each other and do not connote one another. The practitioner presents students with ten pictures at two-second intervals, loudly reads the ten words in the pictures at two-second intervals, allows them to touch the object forms of the ten words, each for two seconds, and makes them to read the words. After the practice, he or she wants them to answer the questions included within the box of mental procedures in thirty seconds. In the next twenty seconds, he or she asks them what they are able to recollect. The number of pictures/words/objects students are able to recall is their scores in combined learning style.

The Module of the Box of Mental Procedures

The module consists of questions addressed to students within the thirty seconds at the end of the process for each learning style. The questions are as to their name, favorite food, hobbies and simple mental calculations. When they complete answering the questions in the module, the practitioner proceeds to the next module of learning style.

Table 2.
Validity and reliability of the test on learning styles (n=60)

Learning Styles	***r***	**√*r***	***r²***	***p***
Visual LS	.89*	.95	.81	.00
Auditory LS	.85*	.92	.73	.00
Kinesthetic LS	.84*	.92	.71	.00
Reading LS	.87*	.93	.75	.00
Combined LS	.90*	.95	.81	.00

*p<.01

In Table 2, r stands for the test-retest reliability coefficient; r^2 for the predictive power of the correlations; √r for maximum validity coefficients; and p for significance level. The values are highly strong proofs of validity and reliability.

Data Analysis

The mean scores in the test on learning styles and the reading comprehension test were obtained and learning domains were displayed on a quinary plane. The widest learning domain and the narrowest learning domain were determined by adding 1 to and subtracting 1 from the standard deviation of the mean scores respectively. The correlation between reading comprehension skills and learning styles was analyzed through multiple regression analysis.

Results

The results of the study were analyzed in two sections. The first one included an analysis of the correlation between reading comprehension skills and learning styles. On the other hand, the second one discussed the planar view of the learning characteristics and the widest/narrowest learning domains as well as potential correlations.

The Analysis of the Correlation between Reading Comprehension Skills and Learning Styles

Table 3 presents the scores concerning the correlation between reading comprehension skills and learning styles:

Table 3.
Predictive power of the 4th grade students' reading comprehension skills

Variable	***B***	***Standard error***	***Beta***	***t***	***p***	***r***
Reading Comprehension	6.53	1.25		5.24	.00	*with*
Visual Learning Style	.07	.14	.06	.48	.63	.03
Auditory Learning Style	.01	.14	.01	.076	.94	.08
Kinesthetic Learning Style	-.24	.18	-.19	-1.37	.18	-.13
Reading Learning Style	.19	.16	.15	1.20	.23	.12
Combined Learning Style	-.002	.14	-.002	-.01	.99	-.04

R=.21 R^2=.05
F (5, 71) = .67 p=.65

A look into the correlation between predictive variables and dependent variable suggests that there is a slightly positive correlation between visual learning style and reading comprehension skills (r= .03). A similar correlation exists between auditory learning style and reading comprehension skills (r= .08). There is a slightly negative correlation between kinesthetic learning style and reading comprehension skills (r= -.13), a slightly positive one between reading learning style and reading comprehension skills (r= .12) and a slightly negative one between combined learning style and reading comprehension skills (r= -.04). Schmeck (1980, p. 462) examined the relationships between the Inventory of Learning Processes scale scores and the Vocabulary, Comprehension, and Reading Rate, the Inventory of Learning Processes scale was significantly correlated with Vocabulary and Comprehension and was not related to Reading Rate. Considering the fact that reading comprehension skill is related to memory capacity (Siegler, 1991, p. 318), it is not surprising to find

significant relationships between reading comprehension and learning styles measured through memory modeling, and considering the fact that reading comprehension is influenced by the content of reading (Hiebert & Raphael, 1996), the relationship between reading learning style and reading comprehension skills would be expected to be significant. It is thought that individuals with reading comprehension skills can read all kinds of reading materials effectively (Honig, 1996, p. 84).

Six dependent variables, important predictors in regression equation indicate that there is a correlation of 21% between the 4th grade students' reading comprehension skills and learning styles and that learning styles account for 5% of the total variance in reading comprehension skills. There is a slight correlation between reading comprehension skills and visual, auditory, kinesthetic, reading and combined learning styles together (R= .21, R^2=.05, p= .65). These figures suggest that the correlation is not significant.

According to the standardized regression coefficient (*Beta*), the order of importance regarding the effect of predictive variables on reading comprehension skills is as follows: kinesthetic, reading, visual, auditory and combined learning style. An overview of the results of the t-test concerning the significance of regression coefficients suggests that reading comprehension is not an important predictor of any of the learning styles.

An Overview of Reading Comprehension Skills and Learning Styles on the Same Plane and Potential Correlations

Table 4 presents the mean scores and standard deviation of reading comprehension skills and learning styles, and the change in standard deviation when 1 is added to or subtracted from it.

Table 4.
The scores in reading comprehension and learning styles

Variables	$\bar{x}$	s	$1+s$	$1-s$
Reading Comprehension	6.36	1.50	7.86	4.86
Visual Learning Style	5.71	1.30	7.01	4.41
Auditory Learning Style	3.27	1.29	4.56	1.98
Kinesthetic Learning Style	5.61	1.16	6.77	4.45
Reading Learning Style	4.06	1.22	5.28	2.84
Combined Learning Style	6.22	1.39	7.61	4.83

An overview of the mean scores in reading comprehension and learning styles indicates that the highest score is in reading comprehension (63.6%). The students' scores in learning styles in ascending order are as follows: 62.2% in combined learning style, 57.1% in visual learning style, 56.1 % in kinesthetic learning style, 40.6% in reading learning style and 32.7% in auditory learning style. The scores are equal to or below the mean scores.

Figure 2 presents an overview of the mean scores in reading comprehension skills and learning styles on the same plane.

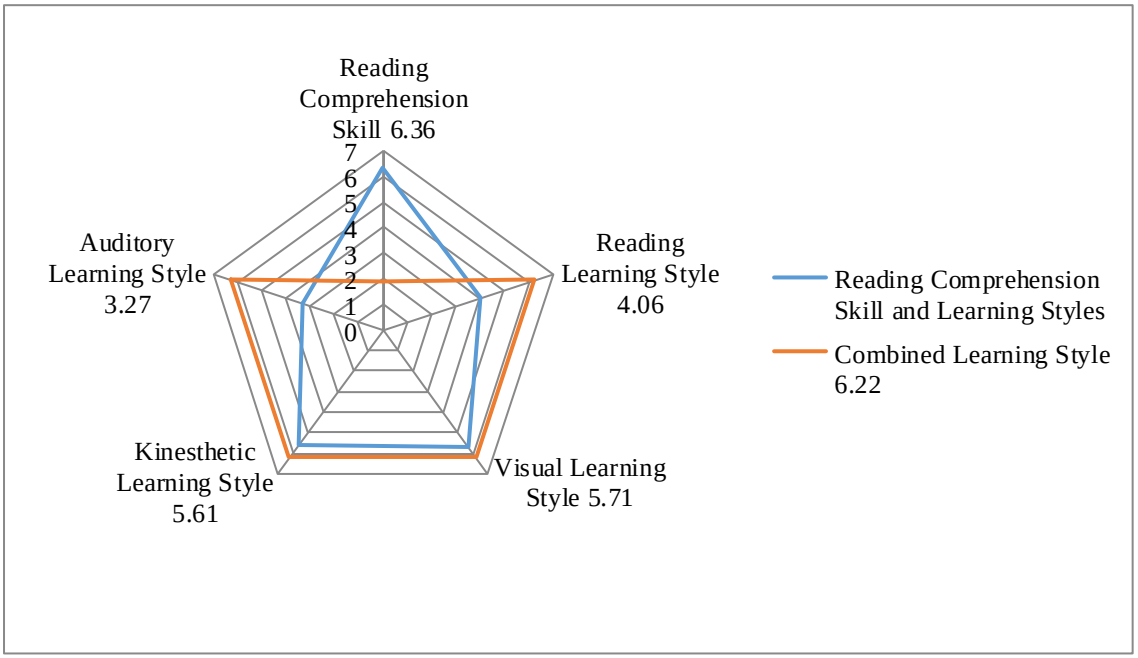

Figure 2. Planar view of learning characteristics

An overview of reading comprehension skills and learning styles on the same plane shows that the highest mean score is in reading comprehension. It is followed by visual learning style, kinesthetic learning style, reading learning style and auditory learning style. Considering that combined learning style covers all the other learning styles, it is not surprising that the mean scores in it are higher than those in the others. Even so, it is interesting that the mean score in reading comprehension is higher than the one in combined learning style. Since the study is based on memory modeling, this finding might mean that reading comprehension is influenced not only by storing information in memory but also other variables. Furthermore, the students' scores in reading learning style is lower than the one in reading comprehension, which might mean that reading comprehension is much more than or more different than just storing information. This is also the case for visual characteristics. Reading comprehension is broader and more different than seeing. The students can be said to have fewer auditory learning characteristics but more visual and kinesthetic learning characteristics.

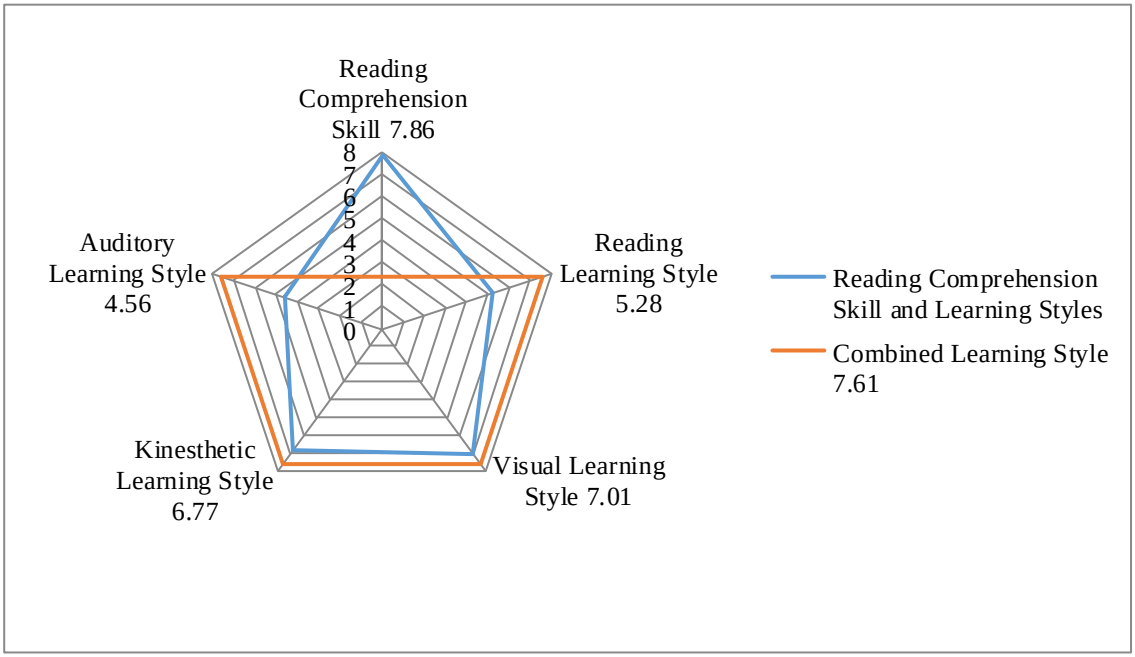

Figure 3. Planar view of the widest learning domain

An overview of reading comprehension skills, learning styles and the widest learning domain on the same plane indicates that learning characteristics are the same as their planar view. It might be natural that learning domain increases slightly with the addition to standard deviation. The mean score in reading comprehension skills increases from 64% to 79%, which signals that students can increase their reading comprehension performances to a maximum percentage of 79%. Reading learning style increases from 41% to 53%; visual learning style from 58% to 70%; kinesthetic learning style from 56% to 68%; auditory learning style from 33% to 46%; and combined learning style from 62% to 76%. Guided by standard deviation, the mean score in reading comprehension is higher than the ones in the other learning styles. This is also the case for especially combined learning style, in which all mnemonic characteristics are measured collectively (Reading Comprehension Skill $\bar{x} = 7.86 >$ Combined Learning Style $\bar{x} = 7.61$, difference= 0.25).

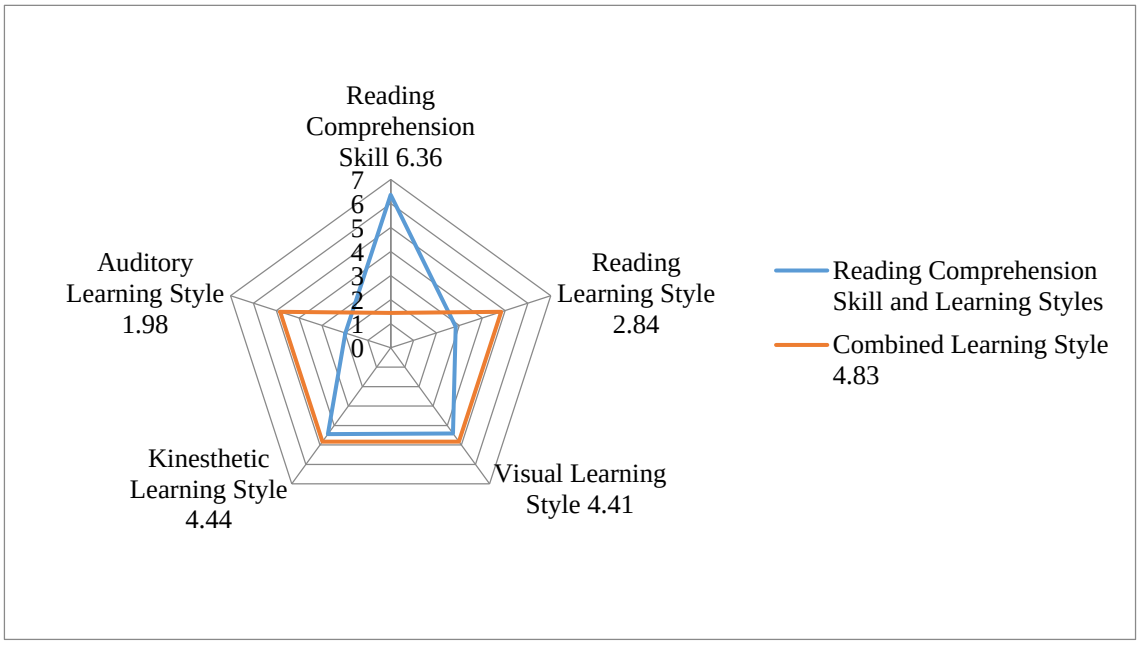

Figure 4. Planar view of the narrowest learning domain

An overview of reading comprehension skills, learning styles and the narrowest learning domain on the same plane indicates that learning characteristics are the same as their planar view. It might be natural that learning domain decreases slightly with the subtraction from standard deviation. The mean score in reading comprehension skills decreases from 64% to 49%, which signals that students can decrease their reading comprehension performances to a minimum percentage of 49%. In addition, this finding means that students already have the ability to exhibit nearly half of their reading comprehension skills. Reading learning style decreases from 41% to 28%; visual learning style from 58% to 44%; kinesthetic learning style from 56% to 44%; auditory learning style from 33% to 30%; and combined learning style from 62% to 48%. Guided by standard deviation, the mean score in reading comprehension is higher than the ones in the other learning styles. This finding might suggest that the students' scores in reading comprehension have an immense influence on the ones in learning styles when they perform better whereas the effect of the scores in reading comprehension on learning styles gets diminished when they perform worse. The reason for this is that the difference between the scores in reading comprehension and combined learning style gets decreased when the learning domain is narrowed (Reading Comprehension Skill $\bar{x} = 4.86 >$ Combined Learning Style $\bar{x} = 4.83$, difference= 0.03). This finding suggests that reading comprehension gets improved, though slightly, when reading activities are supplemented by memory aids. In other words, activities supplemented by memory aids make a greater contribution to reading comprehension development than simple

activities. Furthermore, it can be argued that a slower improvement/progress is observed in reading comprehension when reading activities are routine and lack memory aids.

Discussion

Reading comprehension could serve as a predictor of learning performance (Royer, Marchant III, Sinatra, & Lovejoy, 1990). Therefore, evaluation of studies relating reading comprehension performance with different learning styles is highly difficult. Findings of the present research concluded that learning styles do not have a significant influence on reading comprehension skills. Nevertheless, reading comprehension performance tends to increase, though slightly, when activities are supplemented by memory aids. Considering that reading comprehension is a cognitive structure, it should be natural that it is not in correlation with a behavioral structure based on memory modeling. This finding supports the assumption that reading comprehension is not a behavioral skill (Guthrie, 1973) but rather a cognitive process (Dole, Duffy, Roehler & Pearson, 1991; Duffy, Roehler, Sivan, Rackliffe, Book, Meloth, Vavrus, Wesselman, Putnam & Bassiri, 1987; Klingner, 2004; Knuth & Jones, 1991; Pearson, 1985; Pressley & Ruth, 1997; Pressley & Ruth, 1997).

Duffy and Roehler (1999), and Duffy, Roehler, Sivan, Rackliffe, Book, Meloth, Vavrus, Wesselman, Putnam and Bassiri (1987) note that reading strategies are more reliable than reading skills. On the basis of the constructivist approach and of the idea that "the remedy for the lack of learning concerning the complexity and irregularity of knowledge requires teaching learning processes with more cognitive flexibility", Spiro, Feltovich, Jacobson and Coulson (1992) maintain that, when used duly, multi-dimensional texts designed on computer will lessen the complexity of learning. This approach shifts the focus in theories of reading instruction from reading and reading comprehension skills to the process of interpreting what is read. All the same, in order for reading comprehension performance to get improved it is necessary to keep away from neither behavioral models, nor cognitive models nor the support of technology and to adopt an eclectic approach. Considering that individual differences are prevalent throughout the process of learning, one-dimensional approaches are bound to fail to improve reading comprehension performance.

In a study investigating the relationship between reading comprehension skills and learning style preferences (William, 2010), a significant relationship was found with regard to kinesthetic, visual, and auditory learning style preferences. In his study investigating the relationship between word acquisition skills and perceptual learning styles, Tight (2010) also found a similar relationship between word acquisition and learning styles. A holistic analysis of these findings confirms Erginer's (2008) findings that "there is a small relationship between visual learning preferences and reading comprehension". Since memory modeling cannot be considered in this context, it could be argued that presence of such relationships are natural. This confirms the view that evidence from learning styles studies using perceptual learning styles, namely preferences are not reliable (Pashler, McDaniel, Rohrer, & Bjork, 2008). In this regard, Miller's (2011) emphasis on analyzing the relationships between memory and attention rather than the relationship between learning styles and other learning content is highly appropriate.

Cesur & Fer (2011) found that memory strategies and especially, auditory learning style predicts reading comprehension in a foreign language. In this sense, the effects of listening on language learning and the effect of cognitive-oriented approaches on language learning cannot be disregarded. Sabet & Mohammadi's (2013) approach is similar to this. Such analyses should not be restricted to second language studies, but need to be carried out in first language acquisition studies, too.

An analysis of the relationships between cognitive features and learning styles reveals that students with high working memory capacity prefer reflective, intuitive, and consecutive types while students with low working memory capacity have active, perceptual, visual, and holistic learning style preferences (Graf, Lin, & Kinshuk, 2008; Graf, Liu, Kinshuk, Chen & Yang, 2009). On the basis of this, it could be argued that students with high working memory capacity give importance to

reasoning and thinking while low working memory capacity students tend to give importance to perception and seeing. The findings of the present study support the finding that perceptual learning structures are not in linear relationships with learning structures which require cognitive thinking. In addition, Alloway, Banner & Smith (2010) have found that the relationship between high working capacity students' cognitive styles and achievement level is insignificant. There is a similar condition in computer-assisted learning environments (Guan, 2009). Hsieh & Dwyer (2009) also discuss whether reading strategies facilitate learning of different objects equally. Mahiroglu & Bayir's (2009) findings have also demonstrated that students' learning styles did not influence their achievement and retention at a significant level. This might be related to the presented education. However, the effect of learning styles on other learning-related factors, including reading comprehension skills, necessitates further research.

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