

Assess learning styles profile of High and Low Arabic reading achievement in preparatory schools students in Saudi Arabia

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Abstract: This study aim to investigate are their differences in learning style preferences of students grouped as high or low reading achievement scores. A total cohort of 399 students from eight schools participated and responded to VARK questioner. The study was conducted in two phases. The finding inducted that visual students in general achieve higher score in RAAF than students whose preferred other learning styles. Results of the MANOVA indicated that there were significant difference for gender and grade level, but not for the VARK7G learning style categories in relation to the RAAF scores and FT scores.

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1. Learning Styles and Reading Achievement

The learning styles of students are uniquely diverse due to differences in their reading strategies. Corcos and Willows (2009) noted that the reading performance of readers may be attributed to the cognitive perceptual mechanisms that are required in order to carry out the activity of reading. Several studies have been conducted to investigate the relationship between learning style and reading achievement.

Price *et al.* (1981) showed different characteristics between high and low reading achievers. Students in the high group did well in indistinct light and were self-motivated. In addition, they learned to satisfy themselves and were persistent and aware of their responsibility. They preferred not to study in late morning, enjoyed eating while studying, and liked mobility, but they preferred not to use tactile or kinaesthetic factors to learn. While, low achievement preferred an informal and brightly lit environment to study and waited for adults to motivate them to study. Also, they preferred to learn through their tactile and kinaesthetic senses and preferred studying in late morning. Carbo (1983) indicted that tactile and kinaesthetic styles were favoured by poor readers, while good readers exhibited significantly greater visual and auditory preferences. Caldwell and Ginther (1996) found students in the high group showed high motivation, persistence, were more responsible and more aware of teacher motivation.

Research into learning styles and reading continued with Foley (1999) who showed statistically significant differences between low and high reading achievers, as students in the high group were more persistent and took more responsibility. Leone (2008) evaluated the effects of more versus less congruent

parental learning styles on the vocabulary achievement, comprehension and attitudes of elementary students. The results showed no statistically significant increase in the number of correct items on the vocabulary achievement test scores.

Investigating the effect of teaching remedial readers according to their learning styles was the purpose for the study conducted by Brooks (1991). The sample consisted of forty two students from two elementary schools, from grades two through six, who performed at the 36% or lower level on reading achievement tests and attended the remedial reading program. An experimental study was conducted, and the pre-test versus post test results were significant in oral, silent and listening comprehension reading for the experimental group. Furthermore, students in the experimental group tended to achieve higher than the control group. This result showed the effect of using activities and instructions that match students learning styles on their reading achievement.

Some researchers have shown interest in investigating the effect of one or more elements of Dunn's inventory on students' reading achievement. For example, a study was conducted by Pizzo (1981) to investigate the relationship between the auditory element of learning style and the reading achievement of students. The result showed that were no significant differences between students who tested in quiet conditions compared to students who were tested in noisy conditions. Another study was conducted by MacMurren (1985) to investigate the influence of the intake learning style element on reading achievement. The ANOVA result was significantly higher in reading achievement for students whose preferences for intake were matched compared to those students

whose preferences were mismatched. Furthermore, Virostko (1983) examined the relationship between students' preferences for times of day and their instructional schedules in reading and maths. The results were found significant link, with greater achievement in reading for students whose time preferences for reading coincided with their scheduled reading time when compared to those students whose identified time preferences did not coincide with scheduled reading time.

Clyne (1984) conducted a study to evaluate the effect of learning style on Alaskan native students and Anglo students from grades four through six. The results showed that high achieving native students were more responsible and preferred higher sound levels, whereas native students who preferred a lower noise level with less responsibility tended to achieve lower scores. The results also showed that the reading achievement of Anglo students had positive correlation coefficients with six elements and negative correlation coefficients with four elements on Dunn learning style inventory. Study of Littin (2002) was showed positive correlations between learning style and reading achievement, with high level readers showing preference for learning styles elements such as persistence, intake, late morning study period, and close work with teachers. The relationship between reading achievement of disabled students and learning styles was the aim of a study conducted by Lashell (1986). The results showed that the treatment group students achieved three times more than the control group during one school year. The result also represents a significant increase in the internal locus of control when reading style was matched with learning style, with a significant decrease when reading and learning styles were mismatched. The study also showed significant effects on reading achievement when the reading method and materials are designed to match students' strengths of students. The relationship between learning styles and high school students' reading achievement was examined by Murray (1980) The data indicated low reading achievers were less motivated, needed more structure and needed adults to assist in learning, while high reading achiever were more responsible, motivated and preferred learning alone.

Williams (2010) conducted a study to determine the relationship between sensory learning style (kinaesthetic, tactile, auditory and visual) and reading comprehension. The chi square result showed a significant relationship between sensory learning style (kinaesthetic, auditory and visual) and reading comprehension level. The results also represented significant differences in auditory kinaesthetic and visual learning styles between students who struggled in reading and students on grade level. The result also

showed a significant distribution for students with below grade level reading comprehension on kinaesthetic and visual styles. The study also confirmed the relationship between sensory learning styles and reading comprehension.

The relationship between learning styles and reading achievement in elementary and high school students was examined in the previous studies. According to age range in this level of education, most of the researchers depended on Dunns' inventory to determine students learning styles. There was agreement that low achievers studied have different learning styles than high achievers. The kinaesthetic learning style was a common style for all low achieving students according to Price *et al.* (1981) , Carbo (1983) and Williams (2010), while high achievers were more persistent and responsible, whilst also capable at visual and auditory learning.

This study aim to investigate are their differences in learning style preferences of students grouped as high or low reading achievement scores.

2. Method

Sample

The population from which the sample for this study was drawn constitutes the 287 preparatory public schools of the Jeddah administrative area of Saudi Arabia that were operational during the 2008-2009 school years. The Education Department of Jeddah divides the city into four regions: South, Central, East and North. One school for male students and one school for female student were randomly selected from each region as the sample in the study. A total of 8 schools were randomly selected as population for the study; 4schools for males and 4 for females.

A teacher involved in the teaching of Arabic reading at grade 7 and another teacher involved at grade 8 were selected randomly from each school. A total of 16 teachers were selected.

On the basis of the students' results for the Reading Achievement Assessment Form (RAAF) and first term reading exam performance (FT), only the upper and the lower 33 per cent of students of the sample of 602 were selected for the second phase of this study. A total cohort of 399 students from eight schools participated (see Table 1).

Measures

The Reading Achievement Assessment Form (RAAF) designed by the researcher. The Arabic reading teachers used RAAF to evaluate their student in five reading skill areas; comprehension, fluency, understanding tense, vocabulary and reading summary. They used the following assessment categories; Excellent (5), V. Good (4), Good (3), Satisfactory (2) and Weak (1). Moreover, first term reading exam performance (FT) was required. VARK

questionnaire used to assess students learning style. The VARK is an inventory developed by Fleming in 1987, it is an assessment tool which is used to investigate student performance (French *et al.* 2007). Fleming (2006) describes VARK not as a test but as a guide to finding the ways that student's process information. Travis (2006) describes VARK as the first systematic questionnaire which is a non-diagnostic tool designed to advise the user about individual learning style preferences. The data derived from the VARK was categorised using two different

methods. Firstly, students were classified according to their learning styles into two groups, multimodal style (M) and single style (S). The multimodal style group consisted of students who used more than one style to learn, whereas the single style category consisted of students who depended only on one style. The second classification method, labelled as VARK7G, categorised students into seven learning style groups that consisted of visual, aural, read/write, kinaesthetic, bi, tri and quad styles.

Table 1. Composition of Students Participating in the Second Phase of the Study

Grade		Male schools				Female schools				Total
		1	2	3	4	5	6	7	8	
7	N	30	24	24	22	22	24	20	37	203
	%	7.5	6.0	6.0	5.5	5.5	6.0	5.0	9.3	50.9%
8	N	24	21	20	27	18	32	20	34	196
	%	6.0	5.3	5.0	6.8	4.5	8.0	5.0	8.5	49.1%
Total	N	54	45	44	49	40	56	40	71	399
	%	13.5	11.3	11.0	12.3	10.0	14.0	10.0	17.8	100%

Procedure of Data Collection

A meeting was held with the Principal of each school to outline the recruitment procedures for the Arabic teachers in grades 7 and 8. One teacher from each grade was randomly selected and the teachers selected were given the opportunity to read the information sheet and indicated if they were willing to be involved in the project gave their formal consent to participate in the study. In parallel the schools responsible sent the information and consent form to the students' guardians.

In the first phase of data collection, teachers were given a time frame of one week to two weeks to evaluate their students in Arabic reading skills using RAAF; and asked to provide the researcher the FT exam scores for their students in Arabic reading. RAAF and FT exam data were collected from 8 schools and the students were then categorized in the four groups according to gender and grade. The next phase of categorization involved grouping the highest and lowest third of students from each of the previous categories on the basis of their combined RAAF and FT scores.

At the commencement of the session the researcher explained the response procedures pertaining to the VARK Arabic version questionnaires. Time is allocated for students to ask questions about the measures.

3. Results

The Means and standard deviations of reading achievement for VARK7G learning style categories showed in Table 2. Furthermore, the mean and standard deviation of reading achievement for multimodal and single learning style categories showed in Table 3. Students who preferred

multimodal learning styles were more achiever on reading. The means and standard deviations of the reading achievement measure scores (i.e., RAAF and FT) for all participants categorised according to their grade and gender are shown in Table 4. Female students achieved higher than male students for both measures.

Means and standard deviations for RAAF and FT scores of the high or low reading achievement groups categorised according to gender and their VARK7G learning style preferences are shown in Table 5. Visual students in general achieve higher score in RAAF than students whose preferred other learning styles. In addition, tri modal female students in low group achieve higher scores than other learning styles group in low reading achievement groups female and male. Multivariate analysis of variance (MANOVA) analyses were used to examine the effect of gender and each of the learning style categories (VARK7G and multi-single) on differences in RAAF scores and FT scores. Separate MANOVA's were also conducted to examine the effect of grade level and learning styles category (VARK7G and multi-single) on reading achievement differences in the male and female subgroups. ANOVA was conducted on each dependent variable as a follow up test to the MANOVA. Post hoc tests were conducted using the LSD procedures to control for type 1 error. Analysis of variance A preset alpha level of $\alpha = .05$ was used for all statistical procedures.

Results of the MANOVA indicated that there were significant difference for gender and grade level, but not for the VARK7G learning style categories in relation to the RAAF scores and FT scores. For grade level, a significant effects was found for the reading

achievement variables, Wilks' Lambda $\lambda = .040$, $F(2, 370) = 7.749$, $p < .001$, $\eta^2 = .099$. A The MANOVA also revealed a significant gender effect for the reading achievement variables, Wilks' Lambda $\lambda = .040$, $F(2, 370) = 20.432$, $p < .001$, $\eta^2 = .099$.

There was a significant interaction between the grade and gender factors for the reading achievement variables, Wilks' Lambda $\lambda = .974$, $F(2, 370) = 4.981$, $p < .007$, $\eta^2 = .026$. Also there is significant interaction between gender and VARK7G on the dependent variables, Wilks' $\lambda = .625$, $F(12, 740) = 2.458$, $p < .001$, $\eta^2 = .038$.

The ANOVA result showed a significant gender difference in RAAF scores $F(1, 371) = 40.966$, $p = .001$ with small size effect $\eta^2 = .099$. Significant Gender differences were also found for FT scores $F(1, 371) = 26.745$, $p < .001$, $\eta^2 = .067$. A significant effect was found for interaction of grade and gender on the reading RAAF achievement variable $F(1, 371) = 3.971$, $p = .047$, $\eta^2 = .011$. Furthermore the interaction of gender and VARK7G

Table 2 shows visual students in both genders achieve higher scores on RAAF. Furthermore, the mean and standard deviation of reading achievement for multimodal and single learning style categories showed in Table 3. Students who preferred multimodal learning styles were more achiever on reading. The means and standard deviations of the reading achievement measure scores (i.e., RAAF and FT) for all participants categorised according to their grade and gender are shown in Table 4. Female students achieved higher than male students for both measures.

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compassions were found in relation to the reading achievement variables and the independent variables.

A second MANOVA using gender, grade and multimodal and single learning style categories as the independent variable and the reading achievement scores for RAAF and FT as the dependent variables was conducted. The preliminary results revealed significant multivariate effects for grade Wilks'λ = .947, $F(2,390) = 10.819$, $p < .001$, $\eta^2 = .053$.

While gender, Wilks' λ = .887, $F(2,390) = 24.930$, $p < .001$, $\eta^2 = .013$. The interaction effect of the grade level and gender was significant Wilks'λ = .965, $F(2,390) = 7.127$, $p < .001$, $\eta^2 = .035$. Furthermore, the interaction of gender and multimodal and single learning styles categories was significant Wilks' λ = .976, $F(2,390) = 4.759$, $p < .009$, $\eta^2 = .024$.

Table 2. Means and Standard Deviations of RAAF and FT Scores for the VARK7G Learning Style Categories

Gender	Grade	Reading Assessment		Learning Styles						
				Quad	Bi	Tri	V	A	R	K
Males	Grade 7	RAAF	<i>n</i>	42	14	18	6	2	6	12
			<i>M</i>	18.31	14.50	18.39	22.50	15.00	13.67	12.50
			<i>SD</i>	6.96	6.14	7.05	5.20	8.48	9.20	6.33
		FT	<i>M</i>	44.21	42.00	44.67	47.33	41.50	38.83	40.75
			<i>SD</i>	7.09	6.88	7.58	5.20	9.19	8.97	7.17
			<i>n</i>	32	19	15	4	7	7	8
	Grade 8	RAAF	<i>M</i>	20.69	20.63	19.47	18.75	15.71	17.43	19.00
			<i>SD</i>	5.07	4.99	5.38	4.34	6.02	5.6	5.26
			<i>M</i>	42.97	42.74	44.20	39.00	40.00	44.00	44.75
		FT	<i>SD</i>	6.97	7.33	4.69	9.01	7.30	6.85	4.62
			<i>n</i>	74	33	33	10	9	13	20
			RAAF	<i>M</i>	19.33	18.03	18.87	21.00	15.55	15.69
<i>SD</i>	.73	1.09		1.09	1.99	2.10	1.75	1.41		
Total	FT	<i>M</i>	43.67	42.42	44.45	44.00	40.33	41.61	42.35	
		<i>SD</i>	.81	1.21	1.21	2.20	2.32	1.93	1.55	
Females	Grade 7	RAAF	<i>n</i>	30	20	11	8	4	14	16
			<i>M</i>	21.50	21.60	20.00	21.75	23.25	20.57	23.25
			<i>SD</i>	3.46	4.16	2.64	3.05	2.05	2.21	3.69
		FT	<i>M</i>	46.73	46.85	44.27	47.38	47.75	45.21	47.75
			<i>SD</i>	3.37	3.85	3.34	2.26	1.89	4.54	3.69
			<i>n</i>	25	23	17	10	7	9	13
	Grade 8	RAAF	<i>M</i>	21.72	22.17	21.00	21.00	22.71	22.22	20.31
			<i>SD</i>	3.68	3.68	3.60	3.88	4.27	3.83	4.38
			<i>M</i>	46.84	46.43	45.76	45.50	46.86	46.22	44.62
		FT	<i>SD</i>	3.62	4.52	3.83	4.08	5.39	4.60	4.43
			<i>n</i>	55	43	28	18	11	23	29
			RAAF	<i>M</i>	21.60	21.91	20.61	22.91	21.22	21.93
<i>SD</i>	3.53	3.87		3.24	3.46	3.53	3.75	3.62		
Total	FT	<i>M</i>	46.78	46.63	45.18	46.33	47.18	45.61	46.34	
		<i>SD</i>	3.45	4.18	3.66	3.44	4.33	4.49	4.30	

Abbreviations Note: Quad = quad style; Tri = tri style; Bi = bi style; V = visual; A = aural; R = read/write, K = kinaesthetic, RAAF = Reading Achievement Assessment Form, FT = First Term scores

Table 3. Means and Standard Deviations of RAAF and FT Scores for the Multimodal and Single Learning Style Categories

Gender	Grade	Reading Assessment	S	M	
Males	Grade 7	RAAF	<i>n</i>	26	74
			<i>M</i>	15.27	17.61
			<i>SD</i>	7.72	6.91
		FT	<i>M</i>	41.88	43.91
			<i>SD</i>	7.58	7.14
			<i>n</i>	26	66
	Grade 8	RAAF	<i>M</i>	17.65	20.39
			<i>SD</i>	5.16	5.06
			<i>M</i>	42.38	43.18
		FT	<i>SD</i>	6.76	6.57
			<i>n</i>	52	140
			RAAF	<i>M</i>	16.46
<i>SD</i>	6.62	6.25			
G 7 & 8	FT	<i>M</i>	42.13	43.56	
		<i>SD</i>	7.12	6.86	
Females	Grade 7	<i>n</i>	42	61	
		<i>M</i>	22.07	21.26	

	Grade 8	FT	<i>SD</i>	3.28	3.57
			<i>M</i>	46.83	46.91
		RAAF	<i>SD</i>	3.74	7.14
			<i>n</i>	39	65
			<i>M</i>	21.36	21.69
			<i>SD</i>	4.06	3.63
	G 7 & 8	FT	<i>M</i>	45.62	46.42
			<i>SD</i>	4.48	3.97
		RAAF	<i>n</i>	81	126
			<i>M</i>	21.73	21.48
			<i>SD</i>	3.67	3.59
			<i>M</i>	46.25	46.37
<i>SD</i>	4.14	3.78			

Abbreviation Note: S = Single style; M = Multimodal style, RAAF = Reading Achievement Assessment Form, FT = First Term scores

Table 4 Means and Standard Deviations of RAAF and FT by Grade and Gender

Reading Assessment		Grade		Gender	
		7	8	Male	Female
RAAF	<i>M</i>	19.33	20.65	18.26	21.58
	<i>SD</i>	6.04	4.60	6.43	3.62
FT	<i>M</i>	44.98	44.63	43.18	46.32
	<i>SD</i>	5.9	5.6	6.92	3.92

Abbreviations Note: RAAF = Reading Achievement Assessment Form, FT = First Term scores

Table 5 Means and Standard Deviations of High and Low Groups on VARK7G by Gender

Gender	Reading group	Reading Assessment	Learning Styles								
			<i>n</i>	Quad	Bi	Tri	V	A	R	K	
Males	L (n=96)	RAAF	<i>M</i>	13.03	14.47	11.75	15.50	12.00	10.75	11.21	
			<i>SD</i>	3.90	3.93	4.37	2.64	3.28	3.09	3.83	
		FT	<i>M</i>	36.88	37.63	37.08	35.75	36.33	36.38	39.73	
			<i>SD</i>	4.76	5.27	4.33	5.31	4.80	5.34	5.44	
		H (n=96)	RAAF	<i>n</i>	41	14	21	6	3	5	6
				<i>M</i>	24.41	24.21	22.95	24.67	22.67	23.60	24.17
	FT		<i>SD</i>	.89	1.62	2.15	.81	2.08	1.67	1.32	
			<i>M</i>	49.15	48.93	48.67	49.50	48.33	50.00	49.17	
			<i>SD</i>	1.76	2.12	1.68	1.22	1.52	.00	1.32	
			<i>n</i>	26	19	17	9	7	8	13	
	Females	L (n=99)	RAAF	<i>M</i>	16.85	17.26	16.59	17.78	13.86	16.13	15.46
				<i>SD</i>	3.13	2.94	2.69	2.22	3.84	3.60	4.11
FT			<i>M</i>	39.85	39.05	41.53	40.11	37.29	40.50	40.08	
			<i>SD</i>	5.21	4.50	2.23	5.01	4.53	3.96	3.88	
H (n=108)			RAAF	<i>n</i>	33	25	16	6	7	9	12
				<i>M</i>	24.76	24.96	24.50	25.00	24.57	24.22	24.58
		FT	<i>SD</i>	.61	.20	1.21	.00	1.13	1.39	.99	
			<i>M</i>	49.00	49.52	49.06	50.00	49.57	50.00	49.58	
			<i>SD</i>	1.92	1.63	1.61	.00	1.13	.00	.99	

Abbreviations Note: Quad = quad style; Tri = tri style; Bi = bi style; V = visual; A = aural; R = read/write, K = kinaesthetic, RAAF = Reading Achievement Assessment Form, FT = First Term scores

The ANOVA result showed a significant main effect for the RAAF scores between grade levels $F(1,391) = 4.997, P = .026 < .05, \eta^2 = .013$. Significant, gender effects were also found for RAAF scores $F(1,391) = 49.984, P = .000 < .05, \eta^2 = .113$ and FT scores $F(1,391) = 32.712, P = .000 < .05, \eta^2 = .077$. A significant main effect was found for the multimodal and single learning styles on RAAF scores $F(1,391) = 4.431, P = .036 < .05, \eta^2 = .011$. The interaction of grade and gender had a significant effect on the RAAF variable $F(1,391) = 6.218, P = .013 < .05, \eta^2 = .016$. Also the interaction of gender and multimodal or single learning styles had a significant effect on RAAF $F(1,391) = 6.453, P = .011 < .05, \eta^2 = .016$.

MANOVA analysis examines the each gender separately. The result showed no significant effect with female students, while significant effects were found with male students, grade and (VARK7G) category for reading achievement variables. The result showed significant effect for grade level Wilks' $\lambda = .933, F(2,177) = 6.380, p < .002, \eta^2 = .067$.

Also VARK7G showed a significant effect Wilks' $\lambda = .888, F(12,354) = 1.801, p < .047, \eta^2 = .058$.

ANOVA result showed significant effect for the grade level only on the RAAF score, $F(1,178) = 4.015, p = .047 < .05, \eta^2 = .022$.

Post hoc analyses of the MANOVA consisted of finding the differences between the subgroups of

learning style. The male student participants reported a significantly lower number of errors between learning style subgroups in RAAF. There were significant differences within the male sample between Quad style and Read/write style ($P = .049$), between Quad style and Kinaesthetic style ($P = .007$), between Tri style and Kinaesthetic style ($P = .031$), between the Visual style and Read/write style ($P = .041$), and between Visual style and Kinaesthetic style ($P = .014$).

MANOVA analysis furthermore, examines male student, grade and learning style (multi-single) category on RAAF scores and FT scores. The significant multivariate effect were found for grade Wilks' $\lambda = .909$, $F(2,187) = 9.404$, $P < .000$ $\eta^2 = .091$. Also the significant multivariate effect for multimodal and single learning styles categories Wilks' $\lambda = .960$, $F(2,187) = 3.884$, $P < .022$ $\eta^2 = .040$.

ANOVA results showed a significant effect between grade and RAAF scores, $F(1,188) = 6.500$, $P = .012 < .05$ $\eta^2 = .033$. A significant effect was also found between learning style categories (multimodal and single) and RAAF scores $F(1,188) = 6.273$, $P = .013 < .05$ $\eta^2 = .032$.

4. Discussion

A key area of focus for the study was to identify if differences in learning style preference existed between groups categorised according to their reading achievement level. For this reason a MANOVA and ANOVA were both applied to compare the responses of male and female students from grade seven and eight with regard to the VARK and reading achievement (RAAF and FT).

The MANOVA result indicated that female students scored significantly higher than male students on reading achievement. This finding is consistent with the results of Johnson (1973) who found that girls in Canada and the United States achieve better than boys in reading. Lokan et al. (2001) also discussed differences between male and female students in reading achievement. They found female students achieved higher reading test results in Korea, Latvia, Finland, New Zealand, Norway and Australia. Furthermore, studies by Alloway et al. (2002) and U. S Department of Education (2003) highlighted the higher achievement of girls in reading. In addition, White (2007) also found significant differences between genders in reading achievement that favoured female students. The current finding in association with the results from the previous set of studies reinforces the pattern that girls achieve better than boys in reading (Zambo & Brozo, 2008). While most researchers explained this difference between genders as an outcome of biological differences, differences in the current research may be due to a specific cultural affect. The

restriction of girls' involvement in range of activities such as sport in Saudi society may give girls more chance to read than boys and therefore facilitate the opportunity to achieve higher results in assessment of reading skills.

The current study found no direct effect of learning styles classification (i. e., VARK7G and multimodal or single VARK group) on reading achievement, whereas a significant effect existed for the interaction of gender and learning styles (i. e., VARK7G and multimodal or single) on reading achievement (RAAF). Females with a visual learning style preference demonstrated higher scores on RAAF compared with other females with other learning style preferences in the high group. Furthermore, male students with a visual learning style preferences in both the high and low groups and female students with a visual learning style preference in the low group demonstrated higher levels of reading achievement scores than students from the other learning style preference groups within their respective reading achievement groups. Reading resources in Saudi schools typically consist of books with pictures to supports the text ideas. This type of presentation could better serve the needs of visual students rather than students with other style preferences. This result is consistent with Carbo (1983) who reported significant differences in learning style preference between low and high achievers in reading skills. Carbo's study was based on Dunns' theory and utilised an elementary school sample. She reported different learning style preferences for each reading group. She also reported that visual students demonstrated higher achievement in reading. Clyne (1984) reported a relationship between reading achievement and the sub-factors of responsibility and noise level from Dunns' learning styles inventory within a sample of Alaskan native students. Furthermore, Caldwell et al. (1996) studied the relationship between learning styles using Dunns' inventory and reading achievement for third and fourth grade students. The result showed significant differences between high achieving readers and low achieving readers. This was supported by Foley (1999) who also found evidence that supports the effect of learning style preference on reading achievement. The results showed statistically significant differences between low and high performing students in their reported learning style preferences. Students in the high achieving group showed a greater preference for the sub-factors persistence and responsibility. Littin (2002) reported a significant positive correlation between reading achievement in the high achieving group and persistence, intake, late morning, and work with teacher sub-factors of Dunns' inventory and a

negative correlation between reading achievement and early morning and external motivation sub-factors. Williams (2010) also found significant differences between students grouped according to their reading achievement in relation to auditory kinaesthetic and visual learning styles.

The significant association between learning style preference and reading achievement found in the current study result is consistent with previous research. Virostko (1983) assessed the preferred time of day learning style sub-factor in relation to reading with two student groups from grade three and four. One group studied reading when reading was scheduled at times preferred by them, the other group studied reading at a scheduled time that was a mismatch with their preferred time. The study found a significant effect for time of day learning style preference on reading achievement. Students who studied at the time they preferred achieved greater results in reading than those who did not. Furthermore, MacMurren (1985) found a similar effect for the intake learning style sub-factor on reading achievement. Forty students from grade six who had high or low preferences for the intake element on Dunns' inventory were divided randomly into two experimental groups. One group studied reading with an intake environment while the others studied without. Significantly higher reading achievement was reported for students whose intake sub-factor learning styles preference matched the intake environment in both groups. Lashell (1986) investigated the effect of teaching reading to disabled students' at the elementary school level according to their specific learning styles. The Gry Oral Reading Test was used to assess students' progress in reading. This test provides an objective measure of oral reading skills. The results showed an increase in reading achievement in the experimental group three times more than the students in the control group in one school year. In addition, Brooks (1991) examined the effect of learning style preference on oral and silent reading and listening comprehension. The sample consisted of students who attended a remedial reading program. They were divided into control and experimental groups. Learning styles for both groups were determined by a reading styles inventory. Each student in the experimental group was taught according to their learning style preference (kinaesthetic, visual or auditory) while students in the control group did not receive reading instruction based upon their learning styles preference. The results showed students in the experimental group achieved significantly higher results than students in the control group. Although congruence between teaching style and learning style has an important role in reading achievement improvement other

important factors should not be ignored. These factors include student levels of intelligence and parental levels of education.

Separate MANOVA's for each gender in relation to reading achievement, and learning style preference determined no significant differences for female students, whereas male students' demonstrated significant differences in reading achievement (RAAF) according to their grade and preferred learning style. In general, school students continue to develop their reading skills as they progress to higher grades. The results also showed significant differences in reading achievement (RAAF) according to learning style preferences (VARK7G and multi-single). The current results provided evidence that highlighted male students were distributed across VARK learning styles. The post hoc analyses showed the quad male students achieved higher results on RAAF than male students whose preferred the learning styles of read/write and kinaesthetic. In addition students who preferred tri style achieved better results than kinaesthetic students on reading achievement (RAAF). Visual students also scored higher on the RAAF than the read/write and kinaesthetic students on RAAF. Students with a visual learning style demonstrated higher scores in reading achievement than those with preference for read/write style. This could be attributed to an increase in the use of visual technology such as T.V, computers and the Internet. According to Griffin and Schwartz (1997):

While young people today may be less inclined to read and thus less verbally literate than the previous generation, it has become a cliché that they are more visually facile and skilled. This increased visual literacy is attributed to children's copious exposure to and experience with television, video games, and computers (p. 41).

The higher achievement obtained by students who prefer tri learning style could support the previous finding since visual learning style could be one of the tri styles. As the visual learning style is one of the quad learning styles, the quad males have also achieved higher results in RAAF than those with a preference for read/write or those with a kinaesthetic learning style.

The current findings indicate that knowledge concerning students' learning styles has an important role in the management of classroom instruction. Incorporating a learning styles focus within reading classes may improve students' reading abilities by providing instruction that is better suited to students learning style preferences. National curriculums and education administrators need to provide teachers with guidance to address learning styles preferences within their lesson plans.

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