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Student learning style in vocational higher education

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Abstract

When student learning styles are known, teaching can be designed according to student interests through teaching strategies, teaching methods and techniques, and selecting and applying the necessary teaching tools. This research aims to describe vocational students' learning styles using Forster learning styles and investigate the relationship between these learning styles and mathematics learning achievement. Researchers analyzed vocational students' mathematics learning styles using the "How Do I Learn?" developed by Forster. By using a screening model and quantitative research methods, data collected. The collected data from the instrument containing questions related to the student's mathematics learning style are then processed using SPSS, analyzed using descriptive statistics and one-way analysis of variance (ANOVA). Descriptive statistics were applied to view participant demographics and an overview of each learning style score, while one-way analysis of variance (ANOVA) was conducted to assess differences in mathematics learning styles among students based on mathematics scores. The results showed no relationship found between reflective, curious, diligent, and user learning styles using the questionnaire developed by Foster and the students' mathematics scores.

Keywords: *Learning styles, mathematics learning styles, vocational colleges*.

1. Introduction

A globalized world with science and technology development requires quality human resources, which have higher intelligence, creativity, arts, leadership capacities, or specific academic fields. The story of technology and business increases the importance of vocational education necessary for quality human resources [1]. Vocational education, which focuses on the professional competencies needed by today's world and aims to train a high-quality workforce, plays an essential role in facilitating human-oriented development. Therefore, it is crucial to provide quality education and human resources training according to current and future industry needs.

Several critical factors affect education quality, such as teacher qualifications, learning environment and materials, and student characteristics [2]. Previous education research has shown that individual differences are essential for education and training, especially given students' attributes [3]. Learning is more accessible, more effective, and permanent in a student-friendly learning environment sensitive to student characteristics[4]. Each individual has a specific learning style, which helps to learn information more easily through suitable learning environments and materials [5]. Quality education and skills development can be achieved through various learning experiences compatible with students' learning styles and can have an active role [6][7].

Information obtained by determining student learning styles can help educators develop teaching and learning environments designed for students [8]. Moreover, how individuals learn and

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what teaching designs should be organized can be understood more efficiently when the individual learning styles have been determined.

Therefore, educators can create a tea-drinking environment, especially for themselves [9]. When student learning styles are known, teaching can be designed according to student interests with teaching strategies, teaching methods and techniques, and selecting and applying the necessary teaching tools.

Learning style or the way individuals prefer to learn a subject is an individual learning style [10]. Learning styles are described as individuals' preferred method of receiving and processing information privately [11]. Students can learn without paying attention to learning styles. However, mathematics and science education is realized by taking into account student learning styles, which makes learning more efficient and economical and provides the opportunity to effectively teach some concepts and skills that are difficult to teach and learn in traditional teaching styles.

Significant research on learning styles in education has been carried out over the last forty years. Educators believe that "everyone has a learning style and the learning style of people as an individual is their signature" [12]. In general, learning styles represent a way in which "every learner begins to concentrate on processing and retaining new and difficult information" [13].

Researchers who study learning styles argue that the most appropriate teaching method is to identify and adapts to individual learning styles [14]. The main objective of research on learning techniques is to improve the teaching and learning process [15].

There are different definitions of learning styles in the literature. Grasha defines learning styles as "personal qualities that affect students' ability to obtain information to interact with peers and teachers, and vice versa to participate in learning experiences" [16]. One opinion suggests that learning styles refer to the organization and control strategies and knowledge acquisition and are configured by learners' cognitive, emotional, and personality characteristics [17]. Other opinions describe learning styles as the preferred way for individuals to acquire, retain, and process information [18]. In a broad sense, learning styles are the most appropriate way for individuals to understand, understand and use what they learn [19].

The most common models used in learning style research are Dunn and Dunn (1978), Kolb (1984), Gregorc (1985), Felder-Silverman (1988), and Grasha (1996) [20]. There are various ways to assess Learning style based on multiple theoretical learning models. VAK Felder-Silverman, Honey and Murnford, Kolb, Dunn and Dunn (Visual, Auditory, and Kinesthetic) and VARK (Visual, Aural, Read and Kinesthetic) theories reflect the most common frameworks in education. Several learning style theories are based on preferences for certain types of cognitive processing [21][11], while others are based on specific personality areas (Felder-Silverman, 1988). A critical study characterizing students' learning preferences in mathematics is also proposed by Forster (1999), considering models according to four fundamental dimensions that help educators to plan learning environments in mathematics courses [22]: Reflective, Inquisitive, Diligent, and User.

The reflective dimension represents how individuals learn by responding to classwork questions. Students with reflective learning styles are defined by their ability to answer teachers and their peers' questions and explain their work in class. However, the Inquisitive dimension represents how individuals learn by asking for explanations in the whole class's work. Students with exciting learning styles are reflected by their ability to ask the teacher if they agree with his ideas in full classwork, ask for explanations in full classwork and ask teachers and friends to explain something. Furthermore, the diligent dimension represents how individuals learn by listening to the teacher in the whole classroom work. Students with an academic learning style are characterized by their ability to work with the class on problems, work alone, and to write solutions. Then, the user dimension represents how individuals tend to learn using graphic/computer calculators and listen to the teacher in the whole class's work. Students with user learning styles are characterized by using calculators/computers, experiment with calculators/computers, and listen to the teacher in the whole class's work [23].

One of the research focuses of various educational research types is learning styles. However, research studies investigating student learning styles in learning mathematics are minimal; more

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researchers are examining learning models. The purpose of this research describes the learning styles of vocational students using the Forster learning model and investigate the relationship between these learning styles and mathematics learning achievement.

2. Method

This study uses a screening model with quantitative research methods in determining the mathematics learning style of AMIK Royal Kisaran students. This screening model aims to describe past situations or exist as they are. The event, person, or object that is the subject of research is defined as it is, in the conditions as it is, and the characteristics of the individual, group, or physical environment (abilities, preferences, behavior, etc.) [24].

Participants consisted of 71 AMIK Royal Kisaran students, with a total of 41 boys and 30 girls. Based on the math score (M = 53.43; SD = 19.94), students were grouped into 5 categories, namely 1 = very low (score 0 - 20), 2 = low (score 21 - 40), 3 = moderate (score 41 - 60), 4 = high (score 61 - 80), and 5 = very high (81 - 100). To more clearly the distribution of students' math scores is shown in Table 1.

Data were collected by distributing instruments containing questions related to students' mathematics learning styles. This questionnaire had been developed by Forster (1999) with the title "How Do I Actually Learn?", Adapted to Turkish by Yenilmez and Cakir (2005) by validating and correlating it. This questionnaire contains 22 questions with a 5-point Likert scale item. Questions cover four learning styles consisting of: reflective learning styles (items 8, 9, 12, 13, 14 and 18), inquisitive (items 6, 15, 16, 17, 19 and 20), diligent (items 2, 3, 7,10 and 11) and user (items 1, 4, 5, 21, and 22 items). Yenilmez and Cakir calculated the instrument reliability coefficient of 0.80[25]. Meanwhile, Yorganzi got a result of 0.82 [23], and in this study, the results were found to be 0.87.

The instrument's collected data were processed using SPSS and then analyzed using descriptive statistics and one-way analysis of variance (ANOVA). Descriptive statistics were used to see the participants' demographics and an overview of each learning style score. This study conducted a one-way analysis of variance (ANOVA) to assess students' differences in mathematics learning styles based on math scores.

Table 1. Distribution of Student Math Scores

Score criteria	N	%
1	1	1,408
2	21	29.58
3	26	36.62
4	14	19.72
5	9	12.68

3. Results and discussion

The results of distributing questionnaires to AMIK Royal students as a whole can be seen in table 2. This table shows the overall average score of AMIK Royal students based on the item "How Do I Actually Learn?".

Table 2. Overall average scores of students

Question Items	Respondents (n)	Average value
1	71	3.54
2	71	3.49
3	71	3.59
4	71	3.73
5	71	3.49
6	71	3.52
7	71	3.52
8	71	3.49
9	71	3.76
10	71	3.70

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11	71	3.41
12	71	3.55
13	71	3.70
14	71	3.66
15	71	3.75
16	71	3.90
17	71	3.85
18	71	3.66
19	71	3.69
20	71	3.89
21	71	3.89
22	71	3.90

Figure 1 presents AMIK Royal students' mean score for the questionnaire "How Do I Actually Learn?" Based on Figure 1, the participants' average scores are primarily between 3.50 and 4.50. The majority of students answered that the questionnaire's statement was correct. This result shows that most AMIK Royal students have a tendentious to use mathematics learning style, and they use it to learn mathematics.

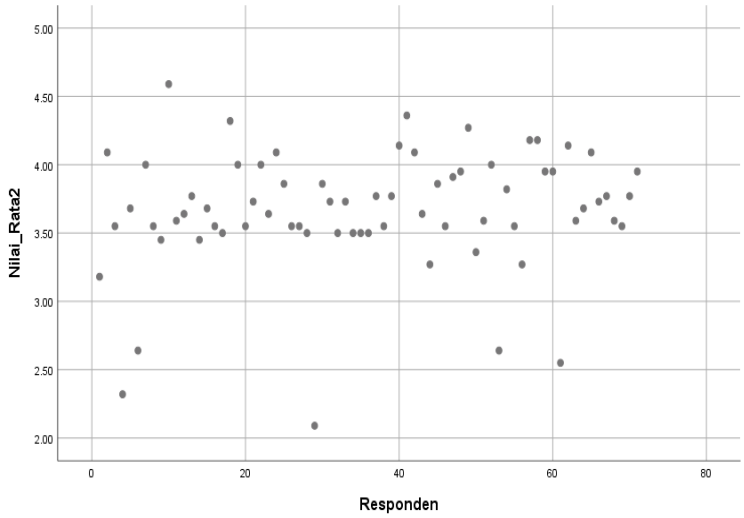

Figure 1. Distribution of students' mean scores

Figure 2 presents the item's average score in the question list "How Do I Actually Learn?" Of the 22 question items in Figure 2, the highest scores are 16 and 22 (M = 3.90). Item 16 states that students learn a lot. by using diagrams, pictures, and the like, while item 22 states that students actually learn by reading notes or their work. The lowest score is in item 11 (M = 3.41), which says students learn by providing ideas and ideas for approval and other student friends.

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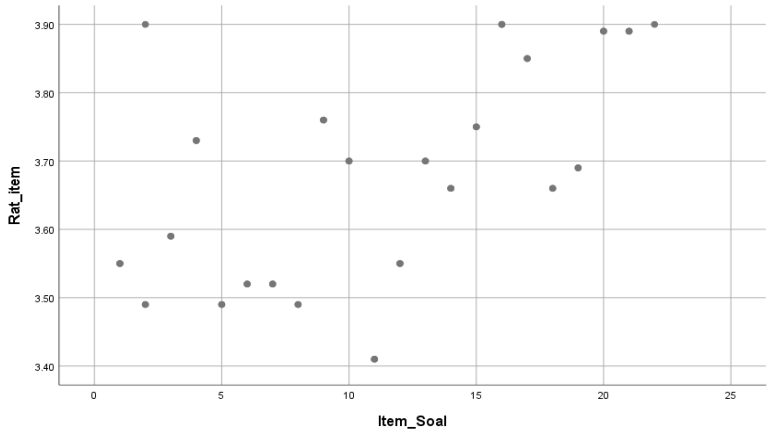

Figure 2. Distribution of the average item scores

Descriptive statistical test results list the "How Do I Actually Learn?" can be found in Table 3. Based on table 3, the average score for learning style, inquisitive, diligent, and user are 3.56, 3.57, 3.75, and 3.80, respectively. It shows that the highest average score is the user's learning style (M = 3.81), and the lowest average score is the reflective learning style (M = 3.56). This result means that descriptively AMIK Royal students more widely use the user learning style in improving their mathematics learning abilities compared to reflective, curious, and diligent learning styles. Students tend to study using graphic calculators or computers and listen to the teacher working in class. Students generally believe that using a graphic or computer calculator can help them learn and understand mathematics. The results are inconsistent with previous studies investigating learning styles in mathematics learning. Uz's learning styles of middle school students aged 12-14 years in Mersin (Turkey) and Riga (Latvia) reported that the most preferred learning styles in Turkey and Latvia are intelligent and reflective learning styles [26].

Table 2. Descriptive Statistics for All Learning Styles

Learning Style	N	Mean	Std. Dev.
Rat_Reflective	71	3,5631	.57768
Rat_Inquisitive	71	3,5727	.52864
Rat_Diligen	71	3.7535	.45216
Rat_user	71	3.8056	.57864
Valid N (listwise)	71		

In table 3, the distribution of the average value of the mathematics learning style of AMIK Royal students with mathematics scores is presented. Students scored the highest average score of reflective learning styles (3.67) and diligent (3.77) with a moderate level (3), and students achieved the highest average score of inquisitive learning styles (3.73) and user (3.86) with a high level (4). On the other hand, the lowest average score of reflective learning styles (3.34), diligent (3.63), and user (3.2) were scored by students with a very high level (5), and the lowest average score of The inquisitive learning style (3.57) was assessed by students with a low level (1). Based on the average total learning styles, the highest (3.74) is located at levels 3 and 4, which means that the students' math scores are medium and high.

P-ISSN: 1411-3414
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Table 3. Average score and standard deviation of mathematics learning styles according to mathematics scores

Gaya_Lajar		1	2	3	4	5
Reflective	Mean	3,5631	3.6131	3.6731	3.6431	3.3431
	Std. Deviation	.57768	.57768	.57768	.57768	.57768
Inquisitive	Mean	3,5727	3.6427	3.7027	3,7327	3.6827
	Std. Deviation	.52864	.52864	.52864	.52864	.52864
Diligent	Mean	3.6655	3,7155	3,7755	3,7355	3,6355
	Std. Deviation	.53776	.53776	.53776	.53776	.53776
User	Mean	3.7042	3.7542	3.8142	3.8642	3.2642
	Std. Deviation	.63142	.63142	.63142	.63142	.63142
Total	Mean	3.6264	3.6814	3,7414	3,7439	3.4814
	Std. Deviation	.57048	.57007	.57007	.57275	.59546

One-way ANOVA method used to describe the differences in student learning styles according to the mathematics scores they obtained, and the results can be seen in Table 4.

Table 4. Differences in the average score of learning styles according to students' math scores

		Sum of Squares	df	Mean Square	F	Sig.
Rat_Reflective	Between Groups	18,059	53	.341	1,093	.439
	Within Groups	5,301	17	.312		
	Total	23,360	70			
Rat_Inquisitive	Between Groups	15,937	53	.301	1,410	.220
	Within Groups	3,625	17	.213		
	Total	19,562	70			
Rat_Diligen	Between Groups	11,864	53	.224	1,555	.159
	Within Groups	2,448	17	.144		
	Total	14,312	70			
Rat_user	Between Groups	17,924	53	.338	1,043	.485
	Within Groups	5,513	17	.324		
	Total	23,438	70			

In table 4, the price F = 1.093 and p-value = 0.439> 0.05 for the reflective learning style, F = 1.410 and p_value = 0.220> 0.05 for the inquisitive learning style, F = 1.555 and p-value = 0.159> 0.05 for diligent learning styles and F = 1.043 and p-value = 0.45> 0.05 for user learning styles, this means that mathematics scores are not significant to learning styles. This study's findings align with Rahman and Ahmar's investigations on first-year students; no relationship was found between students' learning styles and their academic achievement in mathematics [27]. However, some findings contradict these findings, such as Yenilmez and Cakir, who reported that students with high mathematics success rates preferred the inquisitive learning style [28]. Another study by Vizeshfar and Torabizadeh on nursing students showed a statistically significant difference between learning styles and academic achievement, considering students' learning styles in achieving better educational outcomes are significant. The difference between these results can be attributed to the fact that this study was conducted in different cultures [25]. Similar studies can be carried out in environments with different samples [29].

P-ISSN: 1411-3414
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4. Conclusion

AMIK Royal students have various learning styles in learning mathematics based on the observations. This study indicates that no relationship was found between reflective, curious, diligent, and user learning styles with math scores. Based on research related to learning techniques, it is thought that personal differences are the riches in the learning environment[30]. According to the study of Scales (2000), it is suggested that if the learning style and teaching style are suitable, it will affect the learning achievement of tutoring students.

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