International Journal of Archaeology
2024, Vol. 12, No. 2, pp. 49-57
https://doi.org/10.11648/j.ija.20241202.14

Research Article

The Influence of Learning Styles on Students' Academic Achievement in Secondary Schools at Harari Regional State, Eastern Ethiopia

Moti Gelata Sakata*

College of Health and Medical Sciences, Haramaya University, Harar, Ethiopia

Abstract

The aim of this study assess the influence of learning styles on students' academic achievement in Secondary Schools at Harari Regional State, Eastern Ethiopia. An explanatory sequential method design was used for the study. The target population of this study was four secondary school students included in the Harari Regional State. A stratified random sampling technique was employed to get the sample size (n_i = 347) from the population. Learning Styles Questionnaire (LSQ) and 2023/2024 first-semester students' academic scores were used as data collection instruments. Firstly, it was identified that there was a statistically significant positive relationship between students' learning styles and their academic achievement. Among the learning styles, kinesthetic was found a statistically significant strong positive relationship between it and academic achievement r (347) =.42**, p <.05. Secondly, in the stepwise multiple linear regression analysis, it was found that kinesthetic, as a learning style was the strongest predictor of students' academic achievement. To conclude, learning styles were significantly contributing to students' academic achievement. It was, therefore recommended that teachers should vary their teaching methods and strategies to pave the way for students to use different learning styles.

Keywords

Academic Achievement, Learning Styles, Haramaya University

1. Introduction

The academic achievement reflects the students' results of their learning process. It also directly affects their next stage of study in the future, the ability to find a job, to seize business opportunities. There are several studies investigating the factors that affect students' academic achievement. According to [9], students' academic achievement factors can be divided into three major groups: [1] Subjective factors like learning motivation, learning style, self-study ability, beliefs on personal competencies, student persistence in learning, and student's academic competitiveness; [2] Objective factors such as teachers' competencies, school facilities, friends; and [3] Control factors like gender, region, input, financial conditions. Among these factors, learning style is a stable psychological state of learners that affects their learning performance by answering the question: Do learners acquire knowledge in their preferred way? [2] Indicated this about the relationship between learning styles and academic achievement.

Learning style is first concerned with "how students learn",

*Corresponding author: motigalata053@gmail.com (Moti Gelata Sakata)

Received: 10 October 2024; **Accepted:** 1 November 2024; **Published:** 22 November 2024

but not focused on "what they learn" [8, 5]. Knowledge of the various learning style preferences of students admitted to science education programs will eventually lead to more effective learning experiences. The impact of learning styles on academic achievement stated that students' academic achievement could be optimal when students' learning styles are consistent with teachers' teaching styles [22]. Learning styles can be considered as a series of distinct conduct gathered in a single abstract description presented by [1]. Learning styles are good as cognitive, affective, and psychological behavior which show how learners perceive, interact with, and respond to the learning environment. Participating in this view and based on Piaget's experiential learning theory, [13] argued that experience plays a great role in learning.

However, the current teaching and learning methods in the world have changed significantly; education is greatly influenced by digital technology. The Visual, Auditory, Read and Kinesthetic [VARK] model of learning styles according to [19] suggests that there are four crucial types of learners: visual, auditory, reading, and writing preference, and Kinesthetic. Visual learning style through modern information technology systems in which learners receive information through visual stimuli. If the material is visual and vivid, clear images will be formed in the learner's brain [9]. However, without the support of visual materials, learners will find it difficult to memorize. Learners of this type are not suitable for teaching forms such as dialogue, or oral explanation. Visual learners are those that learn best things seeing them" [6]. These learners discover by seeing and watching. To enhance their level of knowledge they prefer to observe things such as snaps, films, demonstrations, paintings, charts, and graphics.

On the other hand, the auditory learning style is supported by an ultramodern information technology system where learners receive information through auditory stimuli. Learners of this type are suitable for teaching forms such as oral explanation and discussion in class but are not suitable for visual learning style [9]. Learners receive information through auditory stimuli. Learners of this type are suitable for teaching forms such as oral explanation and discussion in class but are not suitable for visual learning style. To aid with their learning style, aural students discuss answers or listen to recordings of the examination topics [17].

The third option is the reading or writing mode of learning style that the learners in this group learn best when they read and write down on a paper or board what they have read. Their tools of choice are dictionaries, the Internet, PowerPoint, written responses, and text signs [9]. The fourth mode of learning style is kinesthetic with the support of ultramodern equipment systems. Learners like to approach problems through their body movement experiences in class, such as games, and role-play in class. Priority kinesthetic refers to learning achieved using experience and practice. In other words, kinesthetic students should go through experience to learn something [17]. The method of instruction for those students includes demonstrations, simulations, videos, and case studies. Learners of this type often feel uncomfortable when sitting for a long time [9].

Gender was another possible issue when considering learning styles and academic achievement. [2] Argued that, in general, there are no significant gender differences in learning styles. Even though the differences in learning styles exist, academic performances for males and females were more similar than unlike [11]. The relationship among learning styles, gender, and academic performance has been studied in the aforementioned studies individually. The purpose of this study was to assess the influence of learning styles on students' academic achievement.

The problem of academic achievement has assumed a worrisome dimension in the secondary school education system in general and the study area in particular. From the literature reviewed, the majority of the studies have presented mixed results regarding learning styles on students' academic achievement [23]. However, most of these studies were done in developed countries and they examined learning styles on students' academic achievement with other variables. Furthermore, these studies were based on university and college students. Only a few studies focused on secondary school students. Academic achievement is the result that has been achieved or acquired form of the student's subject. Every student has a different learning style beneath it all students' learning styles are influenced by innate factors. The researchers want to research the influence of students' learning styles on academic achievement. If there was a positive hypothesis, it would help the students know about how their learning style, and that could increase their academic achievement. In addition, these studies explained methodological gaps and the results were inconsistent and inconclusive. In doing this research, the researchers limited the research to learning style and academic achievement. The researcher only focuses on students' learning styles and academic achievement in secondary schools at Harari Regional State.

Purposes of the Study

The main purpose of this study was to:

1. Identify gender differences in the learning styles of students in secondary school in Harari Regional State.
2. Describe the relationship between learning styles and students' academic achievement at Secondary school in Harari Regional State.
3. Predict the influence of learning styles on students' academic achievement in Secondary Schools in Harari Regional State.

Basic research question

A research question was forwarded by the researchers to answer the problems under the study.

1. What is there a statistically significant gender difference in the learning styles of secondary school students in Harari Regional State?
2. What is there a statistically significant relationship among learning styles, and students' academic

achievement of secondary school in Harari Regional State?

3. To What extent do learning styles predict students' academic achievement in secondary school in Harari Regional State?

Hypothesis

Researchers to answer the problems under the study forwarded two hypotheses.

H_{01}: There is no statistically significant mean difference between genders in the learning styles of secondary school students in Harari Regional State.

H_{02}: There is no statistically significant relationship between students' learning style and their academic achievement in the secondary schools of Harari Regional State.

2. Review of Related Literature

2.1. Academic Achievement

According to ultramodern teaching theory, learning is the acquisition and processing of information mainly by intellectual manipulations grounded on the biological characteristics and acquired knowledge of individuals, thereby acquiring a new understanding of human culture, and scientific concepts, and reproducing those concepts for themselves. Using them as tools to obtain other knowledge or expand and deepen that knowledge to a higher level, master theoretical systems to apply them in practice, and explore and produce new knowledge is very fundamental [10].

Learning in the teaching process is a cognitive activity conducted by learners under the control of teachers [24]. Learning enriches learners' understanding. The value of learning is to make learners' experiences change sustainably, helping them develop their inherent nature to adapt and integrate with the community, nation, and humanity. Learning is the students' actions done by learners no one can replace them. Learning aims at absorbing human cultures and transforming them into the physical and mental capacities of each individual, and changing the intellectual, emotional, and physical behavior of each individual. Academic results achieved by learners are the most important basis for assessing the quality of education. It can be understood that the assessment of performance outcomes is a comparison of the real knowledge, skills, and attitudes achieved by learners with the expected results identified in the learning objectives. Therefore, appropriate recommendations will be given. Measurement of learning results must provide reliable conclusions about student performance to help teachers make appropriate decisions in the teaching process, and promote learning motivation and responsibility. To accomplish this goal, the measurement must perform its functions and be based on evidence gathered from a wide range of activities [24].

Academic achievement is the confirmation of what learners need to know, understand, or be able to demonstrate after the completion of academic courses. Learning performance is often indicated in terms of knowledge, skills, or attitudes. Performance outcomes are statements of the competencies that the learner aspires to acquire after the learning process. The student's achievement is properly measured according to the knowledge, experience, and abilities that learners gain after completing an academic course. A separate study, [6], indicated that academic results often include many factors such as knowledge, experience, abilities, and understanding that learners will gain when participating in a particular educational program. Therefore, learning leads to new achievements, new results for learners, and changing themselves to acquire new knowledge, skills, and attitudes, which is the real achievement of the learning process. In the teaching process, student performance represents the quality of instructional methods which results in positive changes in student's awareness and behavior. It reflects what learners gain after the academic course of study. It can be understood in two ways: the first is the extent to which the learner has achieved compared to the defined goals; the second is the extent to which the learner has achieved compared to other learners. In this study, students' academic achievement is investigated from the point of view of [26], who stated that students' overall assessments of acquired knowledge, understanding, and skills developed and the efforts they made after studying at school.

2.2. Learning Styles

Learning may be defined as relatively permanent changes in behavior induced by life. Consistently, to experiential learning theory, learning is the process whereby knowledge is made through experience transformation [3]. Researchers have studied the association between students' learning styles and academic performance. In research [2], it was discovered that there was a positive connection between learning styles and the academic performance of students. [15] Also researched learning styles and academic performance and found a significant relationship between learning styles and students' academic performance.

Some like to learn by trial, others like to learn by observation. Consequently, [13] defined a learning style as a learner's harmonious response to and utilization of environmental stimuli in a particular learning context, individual ways of dealing with information processing, emotions, and behavior in learning situations. According to [1] pupils use different learning styles, although one learning style is often preferred. This leads to confirmation that all humans develop learning styles, some dominant over others, but it is essential to identify them and use them in learning. However, the current teaching and learning methods in the world have changed significantly; education is greatly influenced by digital technology. Therefore, in this study, the learning style of students is based on Ried's point of view and the author has made the following adjustments:

Visual learning style through modern information tech-

nology system: Learners receive information through visual stimuli. If the material is visual and vivid, clear images will be formed in the learner's brain [9]. However, without the support of visual materials, learners will find it difficult to memorize. Learners of this type are not suitable for teaching forms such as dialogue, or oral explanation. Visual learners are those that learn best things seeing them" [6]. These learners discover by seeing and watching. To enhance their level of knowledge they prefer to observe things such as snaps, films, demonstrations, paintings, charts, and graphics.

Auditory learning style supported by modern information technology system: Learners receive information through auditory stimuli. Learners of this type are suitable for teaching forms such as oral explanation and discussion in class but are not suitable for visual learning style. To aid with their learning style, aural students discuss answers or listen to recordings of the examination topics [18]. Students who learn with this mode are easily interrupted by noise [4]. Kinesthetic learning style with the support of modern equipment systems: Learners, like to approach problems through their body movements, and experiences in class, such as games, and role-play in class. Learners of this type often feel uncomfortable when sitting for a long time [9]. Priority kinesthetic refers to learning achieved using experience and practice. In other words, kinesthetic students should go through the experience to learn something [18].

2.3. Methods and Materials

This study employed a mixed-method research design. Specifically, it used an explanatory sequential mixed research method design which is perhaps the most popular form of mixed methods design in educational research. An explanatory sequential mixed method design is also called a two-phase model [12]. It consists of first collecting quantitative data and then collecting qualitative data to help explain or elaborate on the quantitative data. It was used to determine what quantitative results need further explanation. The population of this study was the four selected secondary school students [Aboker, Hamaresa, Shekib Abdulahi, and Harari Senior School] in Harari Regional State. Students were chosen using a stratified random sampling technique because there were also variations in population sizes of different strata in this case [sex, grade, and school] of the populations. The total students of in these four secondary schools were 3503. The sample size of this study was 347 out of which, 177 of them were male and 170 of them were female students. The sample was determined by the [25] formula with a 95% confidence level.

$$ni = \frac{Ni}{1+Ni(e)^2}$$

Where: n = sample size required
N = number of people in the population
e = allowable error (%)
i= strata (1, 2, 3… i)

$$n = \frac{3503}{1+3503(0.05)2} = \frac{3503}{1+3503(0.0025)} = \frac{3503}{10.09} = 347$$

A self-administered questionnaire, interview, and document review were used to collect the data. A questionnaire that was adapted from Reid [1995] was administered to the participants by the researchers themselves. It was adopted in the way that it allows participants to indicate their learning style preferences on a five-point scale. The participants filled in the items to show how much they agreed or disagreed with each item on a scale from one to five: [5] strongly agree, [4] agree, [3] undecided, [2] disagree, and [1] strongly disagree. To this end, the reliability of the instrument was maintained through conducting a pilot test on secondary school students before it was used for the actual data collection purpose. The overall learning styles reliability result was 0.82, which was of course in the acceptable range. The interview permits a greater response depth that is impossible through any other means. Thus, the interview aimed to collect more supplementary opinions to substantiate and triangulate the questionnaire responses. The researchers used the document of the first-semester average score of the students [GPA] was also collected from each school's student roster for the year 2023/24.

The collected data were checked for completeness and cleaned before entering into a computer. Then the questionnaire was coded and entered into Epi data version 3.1 by a data clerk. Then the data was exported to the Statistical Package for Social Science [SPSS] version 23 for further data cleaning and analysis. The method of data analysis was both descriptive and inferential statistics. Descriptive statistics such as frequency, percentages, means, and standard deviation were used to summarize the demographic variables of the respondent's responses to the student's learning styles. Inferential statistics, like independent t-test, bivariate correlation, and stepwise multiple linear regression were used to show mean differences, the degree of strength or relationship, among the variables, and the average relationship to predict or estimate the foremost possible value of those variables respectively.

3. Results and Discussions

Table 1. *Background of participants (n = 347).*

Demographic variable		Frequency	Percentage (%)
Sex	Male	177	51.00
	Female	170	49.00
	Total	347	100.00
Grade	9	71	20.50

Demographic variable	Frequency	Percentage (%)
10	91	26.20
11	99	28.50
12	86	24.80
Total	347	100.00

Table 1 show shat 177(51%) of them were male respondents whereas 170 (49%) of them were female respondents. On the other hand, the majority, 99(28.5%) of them were from grade-11; 91(26.2%) of them were from grade 10; 86(24.8%) of them were from grade-12 whereas 71(20.5%) of them were from grade-9.

As it was shown in Table 2, the Visual learning mean score of 3.87 and standard deviation of 0.46 for students identified that there were agreed-upon scores. Auditory learning mean score of 3.84 and standard deviation of 0.71 for students' were identified as there were agreed-upon scores. A kinesthetic learning mean score of 3.85 and a standard deviation of 0.98 for students' were identified there were agreed-upon scores. Academic achievement mean score of 69.71 and standard deviation of 12.37.

Table 2. *Mean and Standard deviation of learning styles.*

No	Variables	Mean	Std. Deviation
1	Visual	3.87	.46
2	Auditory	3.84	.74
3	Kinesthetic	3.85	.98
4	Academic achievement	69.71	12.37

Table 3. *Group statistics on learning styles (n= 347).*

Variable	Sex	Mean	Std. Deviation	Std. Error Mean
Visual	Male	3.87	.48	.04
	Female	3.86	.45	.06
Auditory	Male	3.65	.72	.07
	Female	3.70	.69	.06
Kinesthetic	Male	3.90	1.10	.08
	Female	3.81	.91	.07

As indicated in Table 3, the mean score of visual learning males was 3.87 and that of the females was 3.86 where the males' mean scores were greater than females' mean scores by 01. In the same way, the mean score of auditory learning females was 3.70 and that of their counterpart males was 3.65 where the females' mean score was greater than that of the males by 05. Finally, the mean score of kinesthetic learning in males was 3.90, and females 3.81. The mean score of males was greater than females by 0.09. Generally, the result of the above table shows that there was very little mean difference between males and females in learning styles.

Table 4. *Independent t-test between genders in learning styles (n = 347).*

Learning styles	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	T	Df	Sig. (2-tailed)	Md	Std. Error Difference	95% CID	
								Lower	Upper
Visual	.42	.53	-1.42	345	.16	-.01	.05	-.17	.10
Auditory	.04	.86	.95	345	.35	.05	.08	-.08	.22
Kinesthetic	1.06	.31	-.93	345	.36	-.09	.11	-.31	.11

Levene's test for equality of variances showed that there were equal variances assumed, as the F- ratio was not statistically significant. As it was indicated in Table 4, there was no statistically significant mean difference between males and females in learning styles, t (345) = -1.45, t (345) = 0.95, t (345) = -.93, p > 0.05, two-tailed respectively for the three learning styles (visual, auditory and kinesthetic). This means that both males and females were not different in the levels of learning styles. According to [20, 14], the result indicated no statistically significant difference between males and females in learning style preferences. On the contrary, a finding by [18] stipulated that males preferred to use the kinesthetic learning style over female students while female students preferred to use the auditory learning style.

Table 5. *Correlation matrices between GPA and learning styles (n = 347).*

No	Name of variable	GPA	Visual	Auditory	Kinesthetic
1	GPA	1	.33**	.40**	.42**
2	Visual		1	.19*	.17*
3	Auditory			1	.15*
4	Kinesthetic				1

**. Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

As it is indicated in Table 5, academic achievement has a statistically significant positive relationship among the three learning styles (visual, auditory, and kinesthetic), r (345) =.33**, r (345) = .40**, r (345) = .42**, p < .01, two-tailed respectively. From this result, it was investigated that academic achievement had a higher positive correlation with kinesthetic learning style than the rest two learning styles. This finding was supported by the previous study by [27] in that the kinesthetic learning style was more prevalent than the visual and auditory learning styles. There exists a positive correlation between kinesthetic learning style and students' academic achievement. A positive correlation was found between visual learning style and academic achievement of students whereas a positive moderate correlation was observed between auditory learning style and academic achievement of students. Therefore, kinesthetic learners are more benefited in traditional classrooms at the secondary school level. There exists a significant effect of different learning styles and academic achievement of students [27].

Table 6. *Stepwise multiple linear regression of academic achievement and learning styles (n= 347).*

			USC		SC		
Model	**R**	**R Square**	**B**	**Std. Error**	**Beta**	**T**	**Sig.**
	0.80	0.65					
1. Constant			1.62	.06		27.72	.00
Visual			.24	.09	.13	2.43	.003
Auditory			.29	.06	.19	3.49	.002
Kinesthetic			.38	.03	.11	3.67	.001

a. Dependent Variable: GPA
b. Predictors: (Constant), Kinesthetic, Visual, Auditory

As indicated in Table 6, there was a statistically significant relationship between academic achievement and learning

styles. R square of 0.65 implies that learning styles jointly contributed 65% (R^2 *100%) to students' academic achievement whereas 35% (1- R^2)*100% were unexplained variables that contributed to students' academic achievement. As shown in the table, the analyzed data indicated that a stepwise multiple linear regression equation was developed to predict the contribution of the three learning styles (visual-X_1, auditory-X_2, and kinesthetic-X_3) jointly on students' academic achievement. Therefore, the multiple linear regression equation for the dependent variable- students' academic achievement- measured by GPA (Y) could be expressed in terms of these statistically significant variables, $Y= 1.62 +.24X_1 +.29X_2 +.38X_3$ where 1.62 is constant. The positive sign slope (+.24), showed that with an average increase in a unit of visual learning style (X_1), the student's academic achievement tends to increase by an average of +.24; the positive sign slope (+.29) also showed that an average increase in a unit of auditory learning style (X_2), the student's academic achievement tends to increase in an average by +.29. In the same fashion, the positive sign slope (+.38) showed that an average increase in a unit of kinesthetic learning style (X_3), the student's academic achievement tends to increase by an average of +.38.

4. Discussions

The main purpose of this study was to investigate the influence of learning styles on students' academic achievement in secondary schools in Harari Regional State. To this effect, basic research questions addressing issues related to learning styles on academic achievement of secondary school students. Based on the findings of the 347 participants, the majority of respondents 177 (51%) were found to be males. Relatively, the female respondents were in number constituting out of 170 (49%). However, grade level of participants the majority 99 (28.5%) of the respondents were from grade 11; 91(26.2%) of them were from grade 10; 86(24.8%) of them were from grade 12 whereas 71(20.5%) of them were from grade 9. Regarding to mean score of gender differences there was no statistically significant between males and females in learning styles $p > 0.05$. This means that both males and females were not different in the levels of learning styles. According to (18), the result indicated no statistically significant difference between males and females in learning style preferences. On the contrary, a finding by [21] stipulated that males preferred to use the kinesthetic learning style over female students while female students preferred to use the auditory learning style.

The result of learning styles related to academic achievement. Kinesthetic learning style r (347) = 0.42**, auditory learning style r (347) = 0.40**), and visual learning style r (347) = 0.33** were statistically significantly positively related to academic achievement. This finding was supported by the previous study [27] in that the kinesthetic learning style was more prevalent than the visual and auditory learning styles. There exists a positive correlation between kinesthetic learning style and students' academic achievement. A positive correlation was found between visual learning style and academic achievement of students whereas a positive moderate correlation was observed between auditory learning style and academic achievement of students. Therefore, kinesthetic learners are more benefited in traditional classrooms at the secondary school level. There exists a significant effect of different learning styles and academic achievement of students [27].

They also from the finding regression analysis revealed that learning styles accounted for 65% jointly influence students' academic achievement. In this study, results from regression analysis showed that kinesthetic was good and the strongest individual predictor coefficient of $\beta = 0.38$, on academic achievement. This finding was supported by a previous study by [27] who indicated that the kinesthetic learning style remained one of the favorite and preferred learning styles for students in secondary school education. Kinesthetic and auditory learning styles were also preferred among students as indicated by [16] in the current study, is statistically significant relationship was found between learning styles and the academic achievement of students. Our results are consistent with some studies [14, 7]. Although, in the present study, there was no relationship between academic performance and learning style nursing professors need to adapt their teaching methods to the students' learning style. In this way, students can be expected to boost their interest in studying and actively attend classes. However, inattention or insufficient attention to students' learning styles reduces the effectiveness of teachers' educational activities and students' academic motivation and leads to their academic failure.

5. Conclusions

From finding, a positive correlation between learning styles and students' academic performance was found. All learning styles are positively and quite closely correlated with students' academic achievement. This means that the more students adopt these learning styles, the better achiever they are in their academics. Our findings confirmed that learning style preferences have a statistically significant positive relationship with student academic achievement. The study revealed the Kinesthetic learning style was the most important predictor of students' academic achievement.

The findings of this study can also emphasize the necessity of informing curriculum developers on individual differences of learners; to help them consider such individual differences, and be more flexible while developing educational curricula. From the findings of this study, a mixed approach tutoring and learning activities can enhance the learning experience of students from different backgrounds, and these activities have to be tailor-made for individual courses and institutions. Given that the majority of students were unimodal learners, it is also indicated that the teachers may make efforts in the future to encourage a wider variety of learning methods.

Moreover, the finding of this study pointed out that multi-sensory learning may help students improve in recalling information for the betterment of their academic achievements in their academic life in general and secondary school of the Ethiopian in particular.

6. Recommendations

Knowing the students' learning styles and preferences can be more helpful to each student. Teachers must know that how students learn varies greatly. Individual student has particular strengths and weaknesses, which can be erected upon and enhanced through effective instruction in their learning styles as a predictor of students 'academic achievement.

Perhaps the most important thing is to be aware that people do not see the world in the same way. Therefore, teachers should be aware that there are diverse learning styles among students. Thus, there should be as many ways of teaching as there are to learn. Hence, teachers have to appreciate the diversity of learning styles and use them in classroom situations rather than being confirmed to one style to benefit all types of learners., teachers in secondary schools need to know the types of learning styles and adopt appropriate teaching styles with students' learning styles to attract student interest in exploring the subject taught for better understanding and comprehension for better academic achievement in their future careers.

Abbreviations

GPA	Grade Point Average
LSQ	Learning Styles Questionnaires
SPSS	Statistical Package for the Social Sciences
VARK	Visual, Auditory, Reading and Kinesthetic

Acknowledgments

The author of this study would like to acknowledge Haramaya University, for giving this golden opportunity. I would like to express my deepest gratitude to the Students' and Teachers' of Secondary schools in Harari Regional State.

Author Contributions

Moti Gelata Sakata is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author declares no conflicts of interest.

References

[1] Alonso Garc á, C. M., & Gallego Gil, D. J. (2000). *Aprendizaje y ordenador*: Dykinson.

[2] Demirbas, O. O., & Demirkan, H. (2007). Learning styles of design students and the relationship of academic performance and gender in design education. *Learning and instruction, 17*(3), 345-359.

[3] Arthurs, J. B., 2007. A juggling act in the classroom: managing different learning styles. Teach Teach Nurse, 2(1) 2–7.

[4] Drago W. A. and Wagner R. J., 2004. *VARK preferred learning styles and online education. Management Research News*, 27(7): 1-13.

[5] Fardon, M. (2013). Relationships between students' learning style preference and exam achievement in differing forms of assessment during an advanced apprenticeship at a vocational Further Education College. *Institute of Learning, Department of Education, University of Oxford*.

[6] Fleming, N. (2006). Teaching and Learning Styles: VARK Strategies. 2nd. *Christchurch, New Zealand: Microfilm Digital Print and Copy Center, 128*.

[7] Gebru, A. A., Ghiyasvandian, S., & Mohammadi, N. (2015). The relationship between learning style and undergraduate nursing students' academic achievement in School of Nursing and Midwifery, Tehran University of Medical Sciences, Tehran, Iran. *American Journal of Nursing Science, 4*(4), 147-153.

[8] Gokalp, M. (2013). The effect of students' learning styles on their academic success. *Creative education, 4*(10), 627.

[9] Ha, N. T. T. (2021a). Effects of learning style on students' achievement: experimental research. *Linguistics and Culture Review, 5*(S3), 329-339.

[10] Ha, N. T. T. (2021b). Evaluate the effectiveness of teaching physics through teaching knowledge about the motion of the thrown object. *Universal Journal of Educational Research, 9*(6), 1224-1232.

[11] Hattie, J. (2008). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*: Routledge.

[12] Klassen, A. C., Creswell, J., Plano Clark, V. L., Smith, K. C., & Meissner, H. I. (2012). Best practices in mixed methods for quality of life research. *Quality of Life Research, 21*, 377-380.

[13] Kolb, D. A. (1984). Adaptive Style Inventory: Self-scoring instructions and interpretation booklet. *Boston: McBer*.

[14] Liew, S.-C., Sidhu, J., & Barua, A. (2015). The relationship between learning preferences (styles and approaches) and learning outcomes among pre-clinical undergraduate medical students. *BMC Medical Education, 15*, 1-7.

[15] Magulod Jr, G. C., 2019. Learning styles, study habits and academic performance of Filipino University students in applied science courses: Implications for instruction. *JOTSE: Journal of Technology and Science Education, 9*(2), pp. 184-198.

[16] Mozaffari, H. R., Janatolmakan, M., Sharifi, R., Ghandinejad, F., Andayeshgar, B., & Khatony, A. (2020). The relationship between the VARK learning styles and academic achievement in dental students. *Advances in medical education and practice*, 15-19.

[17] Murphy, R. J., Gray, S. A., Straja, S. R., & Bogert, M. C. (2004). Student learning preferences and teaching implications. *Journal of Dental Education*, *68*(8), 859-866.

[18] Negari, G. M., & Barghi, E. (2014). AN EXPLORATION OF IRANIAN EFL LEARNERS STYLE PREFERENCES. Modern Journal of Language Teaching Methods, 4(2), 17.

[19] Nja, C. O., Umali, C.-U. B., Asuquo, E. E., & Orim, R. E. (2019). The Influence of Learning Styles on Academic Performance among Science Education Undergraduates at the University of Calabar. *Educational Research and Reviews*, *14*(17), 618-624.

[20] Núñez-Peña, M. I., Suárez-Pellicioni, M., & Bono, R. (2016). Gender differences in test anxiety and their impact on higher education students' academic achievement. *Procedia-Social and Behavioral Sciences*, *228*, 154-160.

[21] Nuzhat A, Salem RO, Ashour N. (2013). Gender differences in learning styles and academic performance of medical students in Saudi Arabia. *Med Teach*; 35 Supple 1: S78–82.

[22] Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2008). Learning styles: Concepts and evidence. *Psychological science in the public interest*, *9*(3), 105-119.

[23] Shaka, G. W. (2020). The relationship between students' personality types and their academic achievement in Oromia Colleges of Teachers' education. *International Journal of Psychological and Brain Sciences*, *5*(3), 47-53.

[24] Tuminaro, J., & Redish, E. F. (2007). Elements of a cognitive model of physics problem solving: Epistemic games. *Physical Review Special Topics—Physics Education Research*, *3*(2), 020101.

[25] Yamane, T., (1967). *Statistics. An Introductory Analysis*, *2nd Ed*., New York: Harper and Row.

[26] Young, M. R., Klemz, B. R., & Murphy, J. W. (2003). Enhancing learning outcomes: The effects of instructional technology, learning styles, instructional methods, and student behavior. *Journal of Marketing Education*, *25*(2), 130- 142.

[27] Vaishnav, R. S., & Chirayu, K. (2013). Learning style and academic achievement of secondary school students. *Voice of research*, *1*(4), 1-4.

Research Fields

Moti Gelata Sakata: Educational Psychology, Social Psychology, Education and Learning Psychology, Cognitive Psychology, General Psychology.